Genossenschaftliche Ansätze im Energiesektor

Eine institutionenanalytische Betrachtung der Nachhaltigkeitstransformation des Energiesektors unter Rückgriff auf das Social-Ecological Systems Framework

Der Fakultät Wirtschaftswissenschaften
der Leuphana Universität Lüneburg

zur Erlangung des Grades
Doktor der Wirtschafts- und Sozialwissenschaften
- Dr. rer. pol. -

genehmigte Dissertation von
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geboren am 20.11.1979 in Neumünster

Eingereicht am:	22. Mai 2019
Mündliche Verteidigung (Disputation) am:	19. November 2019

Erstbetreuer und Erstgutachter:	Prof. Dr. Heinrich Degenhart
Zweitgutachter:	Prof. Dr. Stefan Schaltegger
Drittgutachter:	Prof. Dr. Wolfgang Hein

Die einzelnen Beiträge des kumulativen Dissertationsvorhabens sind oder werden wie folgt veröffentlicht:

[1] Holstenkamp, L. (2019). What do we know about cooperative sustainable electrification in the global South? A synthesis of the literature and refined social-ecological systems framework. *Renewable & Sustainble Energy Reviews*, *109*, 307-320. DOI: 10.1016/j.rser.2019.04.047

[2] Hein, W. & Holstenkamp, L. (2018). Global Governance and the Interplay of Coordination and Contestation: The Case of Renewable Energies in the South. *Global Governance*, *24*(3), 431–449. DOI: 10.1163/19426720-02403008

[3] Bauwens, T., Gotchev, B. & Holstenkamp, L. (2016). What drives the development of community energy in Europe? The case of wind power cooperatives. *Energy Research and Social Science*, *13*, 136-147. DOI: 10.1016/j.erss.2015.12.016

[4] Hall, S., Roelich, K. E., Davis, M. E. & Holstenkamp, L. (2018). Finance and Justice in Low-Carbon Energy Transitions. *Applied Energy*, *222*(July 2018), 772-780. DOI: 10.1016/j.apenergy.2018.04.007

[5] Holstenkamp, L., Mey, F. & Radtke, J. (under review). Who benefits from participatory energy transitions? International experiences of community energy. *In veränderter Form neu eingereicht*.

[6] Holstenkamp, L. & Kahla, F. (2016). What are community energy companies trying to accomplish? An empirical investigation of investment motives in the German case. *Energy Policy*, *97*, 112-122. DOI: 10.1016/j.enpol.2016.07.010

Danksagungen

Wenn ein Projekt über einen so langen Zeitraum läuft, gibt es viele Menschen, die Anteil genommen und auf die eine oder andere Weise dazu beigetragen haben, dass diese Dissertation ihre finale, hier vorliegende Gestalt angenommen hat.

Zunächst gilt mein Dank Herrn Prof. Dr. Heinrich Degenhart, der letztendlich die Aufgaben als Erstgutachter und Betreuer übernommen hat. Herrn Prof. Dr. Stefan Schaltegger sei für die Übernahme des Zweitgutachtens und die Betreuung in den ersten Jahren gedankt. Den Kolleginnen und Kollegen des Center for Sustainability Management sei für die Anregungen bei den Retraites mein Dank ausgesprochen. Schließlich möchte ich Herrn Prof. Dr. Wolfgang Hein danken, dass er das Drittgutachten übernommen hat, und Herrn Prof. Dr. Robert Kappel für die Zweitbetreuung in den ersten Jahren. Auch am GIGA German Institute of Global and Area Studies durfte ich mein Dissertationsvorhaben vorstellen und mit Kolleginnen und Kollegen diskutieren. Darüber hinaus hatte ich das Vergnügen, mit Daniela García Sánchez und Esther Ishengoma in einem Forschungsprojekt zusammenzuarbeiten.

Die Dissertation ist parallel zur Bearbeitung zahlreicher Forschungsprojekte an der Professur für Finanzierung und Finanzwirtschaft entstanden. Meine ehemaligen und aktuellen Kolleginnen und Kollegen Sabine Clausen, Steve Janner, Frank Wessel, Maik Plenz, Daniela Wachter, Mathias Schneider, Franziska Kahla, Martin Doliwa, Felix Obbelode, Jennifer Kowallik, Carola Bettinger, Laura Welle, Nikolai Strodel, Katharina Scherge und Moritz Ehrtmann haben so unterschiedliche Phasen dieser Arbeit begleitet. Ein Dank gilt auch meinen Koautorinnen und Koautoren für die Publikationen, die Teil dieser Dissertation sind.

Zuletzt und zuvorderst möchte ich meiner Familie danken, meinen Eltern und Geschwistern, vor allem aber meinen drei Kindern und meiner Frau, die gerade auch in den letzten Wochen intensiver Arbeit am Rahmenpapier und vor der Disputation ein weiteres Mal zurückstehen mussten.

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Abkürzungsverzeichnis

Allgemeine Abkürzungen

ABC	Anchor-Business-Community
AWG-LCA	Ad Hoc Working Group on Long-term Cooperative Action under the Convention
Bencom	Society for the Benefit of the Community
BFC	bona fide cooperative
BMFSFJ	Bundesministerium für Familie, Senioren, Frauen und Jugend
BOT	Build-Operate-Transfer
CE	Community/Cooperative Energy
CEO	Chief Executive Officer
CfD	Contract for Difference
CME	Coordinated Market Economy
CPR	Common Pool Resources
CRE	Community Renewable Energy
CSE	Cooperative Sustainable Electrification
CSO	Civil Society Organization
CSR	Corporate Social Responsibility
DANIDA	Danish International Development Agency
DECC	Department of Energy and Climate Change [UK]
Defra	Department for Environment, Food and Rural Affairs
DESA	Department of Economic and Social Affairs
ECOWAS	Economic Community of West African States
ECREEE	ECOWAS Centre for Renewable Energy and Energy Efficiency
ECS	Electricity Consumer Society
ED	Electricity Directive
EEAG	Environment and Energy State Aid Guidelines
EEG	Erneuerbare-Energien-Gesetz
eG	eingetragene Genossenschaft
EIS	Entreprise Investment Scheme
EnWG	Energiewirtschaftsgesetz
EU	Europäische Union
e.V.	eingetragener Verein
FCA	Financial Conduct Authority
FiP	Feed-in Premium
FiT	Feed-in Tariff

G7	Group of Seven
G8	Group of Eight
G20	Group of Twenty
GbR	Gesellschaft bürgerlichen Rechts
GCC	Gulf Cooperation Council
GmbH	Gesellschaft mit beschränkter Haftung
GmbH & Co. KG	Gesellschaft mit beschränkter Haftung und Compagnie Kommanditgesellschaft
HNWI	High Net Worth Individual
I/S	Interessentskab
IAD	Institutional Analysis and Development
IAM	Integrated Assessment Model
IBAST	Interrelations Between Agency and Structure in Transitions
IBRD	International Bank for Reconstruction and Development
ICA	International Co-operative Alliance
IEA	International Energy Agency
IGO	Intergovernmental Organization
IMF	International Monetary Fund
IPS	Industrial and Provident Society
IR	International Relations
IRENA	International Renewable Energy Agency
IUCN	International Union for Conservation of Nature
KfW	Kreditanstalt für Wiederaufbau
KG	Kommanditgesellschaft
LLC	Limited Liability Company
LLDC	Least Developed Country
LME	Liberal Market Economy
MaP	Multi-actor Perspective
MFI	Multilateral Financial Institution
MLP	Multi-Level Perspective
NEA	National Electrification Authority
NECP	National Energy and Climate Plan
NGO	Non-Governmental Organization
NPO	Non-Profit-Organisation
NRECA	National Rural Electric Cooperative Association
NSW	New South Wales
O & M	Operation and Maintenance

ODA	Official Development Aid
ODE	Opslag Duurzame Energie (Dutch Organization for Renewable Energy)
OECD	Organisation for Economic Co-operation and Development
P2B	Peer-to-Business
P2C	Peer-to-Consumer
P2P	Peer-to-Peer
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PV	Photovoltaik
RCEF	Rural Community Energy Fund
RD&D	Research, Development, and Demonstration
RE	Renewable Energy
REA	Rural Electrification Agency
	Renewable Energy Sources Act [Dänemark]
REB	Rural Electrification Board
REC	Rural Electric Cooperative
RED II	revised Renewable Energy Directive
REIPPP	Renewable Energy Independent Power Producer Procurement programme
REN21	Renewable Energy Network for the 21st Century
RHI	Renewable Heat Incentive
RO	Renewable Obligation
SDG	Sustainable Development Goal
SE4All	Sustainable Energy for All
SEB	State Electricity Board
SEIS	Seed Enterprise Investment Scheme
SES	Socio-Ecological Systems / Social-Ecological Systems
SETS	Socio-Ecological and Technical Systems / Social-Ecological-Technical Systems
SME	Small and Medium(-sized) Enterprise
SNM	Strategic Niche Management
SPV	Special Purpose Vehicle
SRI	Socially Responsible Investment
SRU	Sachverständigenrat für Umweltfragen
STS	Science & Technology Studies
TIS	Technological Innovation Systems

UCEF	Urban Community Energy Fund
UG	Unternehmergesellschaft
UK	United Kingdom
UN	United Nations
UNCED	United Nations Conference on Environment and Development
USA	United States of America
UTS	University of Technology Sydney
VEC	Village Electricity Committee
WBGU	Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen
WCD	World Commission on Dams
WSSD	World Summit on Sustainable Development

Währungen

AUD	Australischer Dollar
€	Euro
£	Britisches Pfund
RMB	Renminbi
US$	US-Dollar

***Notation für Elemente im SES* framework**

A	Actors
ECO	Ecosystems
GS	Governance Systems
I	Interactions
NAAS	Network of Adjacent Action Situations
O	Outcomes
RS	Resource Systems
RU	Resource Units
S	Social, economic, and political settings
TS	Technical Systems
U	Users

A Einleitung

1 Nachhaltigkeitstransformation des Energiesektors: Herausforderungen und die institutionell-organisatorische Seite

Der Energiesektor befindet sich weltweit in einem Transformationsprozess. Dabei sind nach der Liberalisierung global zwei wesentliche Gründe für die Notwendigkeit eines grundlegenden Umbaus der Energiesysteme ausgemacht worden: die Abkehr von einer von fossilen Energieträgern dominierten Erzeugungsstruktur und die Schaffung eines Zugangs zu modernen Formen der Energieversorgung für alle Menschen weltweit (Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen [WBGU], 2003). Vor dem Hintergrund des globalen Klimawandels wird vor allem eine stärker auf erneuerbare Energien basierte Versorgung angemahnt und infolge technologischer Innovationen projiziert (International Energy Agency [IEA], 2018; Sachverständigenrat für Umweltfragen [SRU], 2011; WBGU, 2011). Zugleich besteht die Herausforderung darin, den eine Milliarde Menschen ohne Zugang zu Elektrizität, insbesondere in ländlichen Räumen von Entwicklungsländern, einen solchen zu verschaffen (IEA, 2018). Die Visionen zur Technologiewahl, aber auch zur organisatorischen Umsetzung dieser Transformation variieren erheblich, damit auch die Kostenprojektionen. So schätzt beispielsweise IRENA die Kosten der Transformation bis 2050 auf jährlich etwa 770 Milliarden US-Dollar global (International Renewable Energy Agency [IRENA], 2018, S. 41).

Der Wandel des Energiesystems ist eine der zentralen Nachhaltigkeitstransformationen, denen sich die Forschung widmet (Grin, Rotmans, Schot & Geels, 2010; Markard, Raven & Truffer, 2012). Im Anschluss an Arbeiten von Polanyi (1944) und Boulding (1964) wird in diesem Kontext von der „Großen Transformation" (WBGU, 2011) bzw. „Great Transition" (Daily & Walker, 2000; Jorgensen, 1986; Raskin et al., 2002) gesprochen. In diesen Werken wird die institutionelle Seite von Nachhaltigkeitstransformationen zwar angesprochen und u. a. auf derzeit mangelnde Kohärenz und Koordination hingewiesen (WBGU, 2011, S. 202–203). Wie für die Transition-Forschung verschiedenlich festgestellt (Avelino & Wittmayer, 2016; Markard, 2017), besteht allerdings eine gewisse Lücke bei der Frage, wie Nachhaltigkeitstransformationen organisiert und finanziert werden. Insbesondere fehlt es an dieser Stelle erstens an einer Ausdifferenzierung und vertieften Analyse einzelner institutionell-organisatorischer Lösungen (institutioneller bzw. finanzieller Arrangements, *siehe C3.1*) und zweitens an einer Darstellung im Zusammenhang der komplexen sozio-ökologisch-technischen Systeme (*siehe C2.2*), in die konkrete Organisationslösungen für eine nachhaltige Energieversorgung eingebunden sind. Dabei sind Finanzierungs- und Organisationsfragen in der Praxis global, regional und national

ein Thema. Exemplarisch sei auf die Diskussionen um *blended finance* (Organisation for Economic Co-operation and Development [OECD], 2018) und um Akteursvielfalt, Bürgerenergie und Akzeptanz (Grashof et al., 2019; Olsen, 2014) verwiesen.
In der vorliegenden Arbeit werden mit genossenschaftlichen Ansätzen, also Organisationslösungen mit (Teil-)Eigentum der Bürgerinnen und Bürger an den Anlagen (*siehe C3.4*), spezifische hybride finanzielle Arrangements im Energiesektor in den Fokus gerückt – Zwischenformen zwischen staatlichen, privaten (rein) profitorientierten und informellen gemeinschaftsbasierten Formen der Organisation (*siehe C3.3*). Sie stellen eine Möglichkeit der Finanzierung transformativer Vorhaben dar (WBGU, 2011, S. 182). Hybriden Organisationen wird in der jüngeren Literatur eine besondere Rolle bei Nachhaltigkeitstransformationen beigemessen (Alexius & Furusten, 2019). Genossenschaftliche Ansätze sind beispielsweise mit Blick auf technologische Innovationsprozesse im dänischen Windenergiesektor (Garud & Karnøe, 2003) und für die ländliche Elektrifizierung in Entwicklungsländern (Barnes, 2007b) untersucht worden. Barnes (2007a) hebt hervor, dass es keine Lösung gebe, die sich für alle Fälle eigne (*one-size-fits-all*), sondern dass es vielmehr auf den jeweiligen Kontext ankomme. Dabei stellt sich allerdings die Frage, unter welchen Bedingungen genossenschaftliche Ansätze eine geeignete Organisationslösung für eine nachhaltige Energieversorgung darstellen, zumal es sich bei diesem Begriff um eine Gruppe im Detail unterschiedlicher institutioneller Arrangements handelt, bei denen vielfältige Wechselwirkungen mit Institutionen auf verschiedenen Ebenen auftreten.

2 Übergeordnete Forschungsfrage, theoretische Verortung und methodisches Vorgehen

Genossenschaftliche Ansätze im Energiesektor sind in der jüngeren Vergangenheit verstärkt in den Fokus sowohl der energiepolitischen Praxis als auch der Wissenschaft gerückt (*ausführlicher dazu: siehe* C4). Die Bewertung ist dabei nicht frei von Idealisierungen. Die konkrete Rolle genossenschaftlicher Ansätze bzw. von „Bürgerenergie“ oder „community energy“ (*zu den Begriffen siehe C3.4*) dürfte je nach Kontext – Ziel, technologischer Entwicklungsphase und institutioneller Umwelt – variieren. Eine vertiefte Analyse dieser Rolle, die unterschiedliche genossenschaftliche Ansätze in Nachhaltigkeitstransformationen des Energiesektors spielen, fehlt bislang. Diese Lücke wird im Rahmen der vorliegenden Arbeit adressiert.
Hierzu ist ein Verständnis der Entwicklung dieser Organisationen, der Vielfalt der konkreten institutionellen Arrangements und ihrer institutionellen Umwelten erforderlich. Die Notwendigkeit einer solchen umfassenden Abbildung und Analyse verschiedener Ebenen und ihrer Wechselwirkungen lässt sich ökonomisch wie folgt begründen:

- Auf komplexe Wechselwirkungen zwischen institutionellen Arrangements und institutionellen Umwelten weisen beispielsweise die institutionenökonomischen Arbeiten von

Douglass C. North (1990, 2005) und die Forschung zu polyzentrischen Governancestrukturen von Vincent und Elinor Ostrom (Aligică & Boettke, 2009; Aligică & Tarko, 2012; McGinnis & E. Ostrom, 2012; V. Ostrom, 1953) hin.

- Die Forschung zu Allmendegütern zeigt, dass es entgegen der theoretischen Überlegungen zur „Tragedy of the Commons“ (Hardin, 1968) sehr wohl Konstellationen gibt, in denen Gemeinschaftslösungen für das Management solcher Allmenden erfolgreich operieren (E. Ostrom, 1990, 2005). Dies ist ebenso ein Hinweis auf die begrenzten Analysefähigkeiten partialanalytischer ökonomischer Modelle im Kontext „großer Herausforderungen“ (*siehe B2.1*).
- Schließlich ist in normativer Perspektive aus wohlfahrtsökonomischen Arbeiten bekannt, dass bei Vorliegen von unveränderlichen Abweichungen von den Bedingungen des Pareto-Optimums die zweitbeste Lösung weitere Abweichungen beinhalten kann (Lipsey & Lancaster, 1956; Lipsey, 2007). Diese Theorie des Zweitbesten impliziert, dass bei institutionellen Reformen mögliche Interaktionen mit anderen Institutionen beachtet werden müssen (Rodrik, 2008) und eine angemessene Wahl institutioneller Arrangements von den Ausgangsbedingungen einer Gesellschaft abhängt (Djankov, Glaeser, La Porta, Lopez-de-Silanes & Shleifer, 2003).

Eine solche detaillierte Betrachtung institutioneller Arrangements und Umwelten im Kontext von Nachhaltigkeitstransformationen erfordert die Nutzung und Weiterentwicklung theoretischer Rahmen (*siehe B4.1*) und Integration unterschiedlicher disziplinärer und interdisziplinärer Perspektiven (*siehe B4.2*), um die angedeutete Komplexität adäquat berücksichtigen zu können. In diesem Zusammenhang erscheint der Rückgriff auf unterschiedliche Methoden – je nach konkreter Forschungsfrage bzw. untersuchtem Teilaspekt – zweckmäßig (*siehe B4.3*). Es handelt sich bei der vorliegenden Arbeit mithin um eine institutionenanalytische Betrachtung der Nachhaltigkeitstransformation des Energiesektors. Um möglichst allgemeingültige Aussagen für einen spezifischen Typ an Organisationen ableiten zu können, werden genossenschaftliche Ansätze innerhalb des Energiesektors in unterschiedlichen Konstellationen und mit Blick auf verschiedene Einflussfaktoren und Prozesse analysiert. Mit dem Fokus auf genossenschaftliche Ansätze wird die vormals vorherrschende Dichotomie zwischen Markt- und staatlicher Lösung aufgebrochen und eine alternative Perspektive auf die institutionell-organisatorische Frage von Nachhaltigkeitstransformationen zu dem beispielsweise beim WBGU sehr ausgeprägten Vertrauen auf den gestaltenden Staat (Gawel & Bedtke, 2016) geboten. Dabei werden zum einen aus einer systematischen Literaturauswertung und aus eigenen empirischen Untersuchungen Differenzierungen des genossenschaftlichen Energiesektors vorgenommen. Die Fachartikel bilden Unterschiede in den institutionellen Umwelten (Globaler Süden, verschiedene europäische Länder mit gegenseitigen Beeinflussungen bei übergeordneter europäischer Rahmengesetzgebung, verschiedene Finanzsysteme, divergierende politische Rahmensetzungen), variierende Zielstellungen (Elektrifizierung und ökologische Transformation) und unterschiedliche Technologien und technologische Entwicklungsphasen (Elektrifizierung allgemein, erneuerbare Energien, Windenergie; *frontrunner*, Nachahmer) ab. Zudem werden verschiedene Governanceebenen und deren Wechselwirkungen adressiert (*global governance*, sektorale Betrachtungen, Mikroebene der Investorinnen und Investoren). Zuletzt werden, ausgehend von institutionenökonomischen Überlegungen, Schnittstellen zu angrenzenden Disziplinen ausgelotet. Solche „cross-overs into adjacent discplines“ (Markard, 2017) können als Ansatzpunkt dienen, bestehende Forschungsparadigmen herauszufordern und neue theoretische Perspektiven zu entwickeln (Wittneben, Okereke, Banerjee & Levy, 2012).

Wie der Überblick in Abschnitt C4 zeigt, sind in den letzten Jahren zahlreiche Arbeiten auch zu genossenschaftlichen Ansätzen im Energiesektor erschienen. Vor diesem Hintergrund werden in der vorliegenden Arbeit gezielt ausgewählte Aspekte adressiert, die nach Ansicht des Verfassers Forschungslücken darstellen oder der weiteren Ausdifferenzierung und Vertiefung bedürfen:

- die Anpassung des *social-ecological systems (SES) framework* an den vorliegenden Anwendungsfall, also die (nachhaltige) Energieversorgung mittels genossenschaftlicher Ansätze;
- die Synthese von Erkenntnissen zu genossenschaftlichen Ansätzen der (nachhaltigen) Elektrifizierung im Globalen Süden;
- die Integration von Erkenntnissen aus den Internationalen Beziehungen zu *multilevel governance*;
- ländervergleichende Untersuchungen zu Entwicklungen genossenschaftlicher Ansätze,
- die Betrachtung von Wechselwirkungen zwischen Energie- und Finanzsystem,
- die Konkretisierung relevanter Normen (Variable A6 im *framework*) und schließlich
- die Ausdifferenzierung der Organisationsformen mit Blick auf genossenschaftliche Ansätze.

Insofern geht die vorliegende Arbeit der Frage nach, welche Formen genossenschaftliche Ansätze im Energiesektor in den dargelegten Kontexten einnehmen, welche Rolle sie wahrnehmen und wie sich die Entwicklungen erklären lassen. Dabei wird auf ein adaptiertes SES *framework* zurückgegriffen und Optionen zur Weiterentwicklung dieses *framework* erarbeitet.

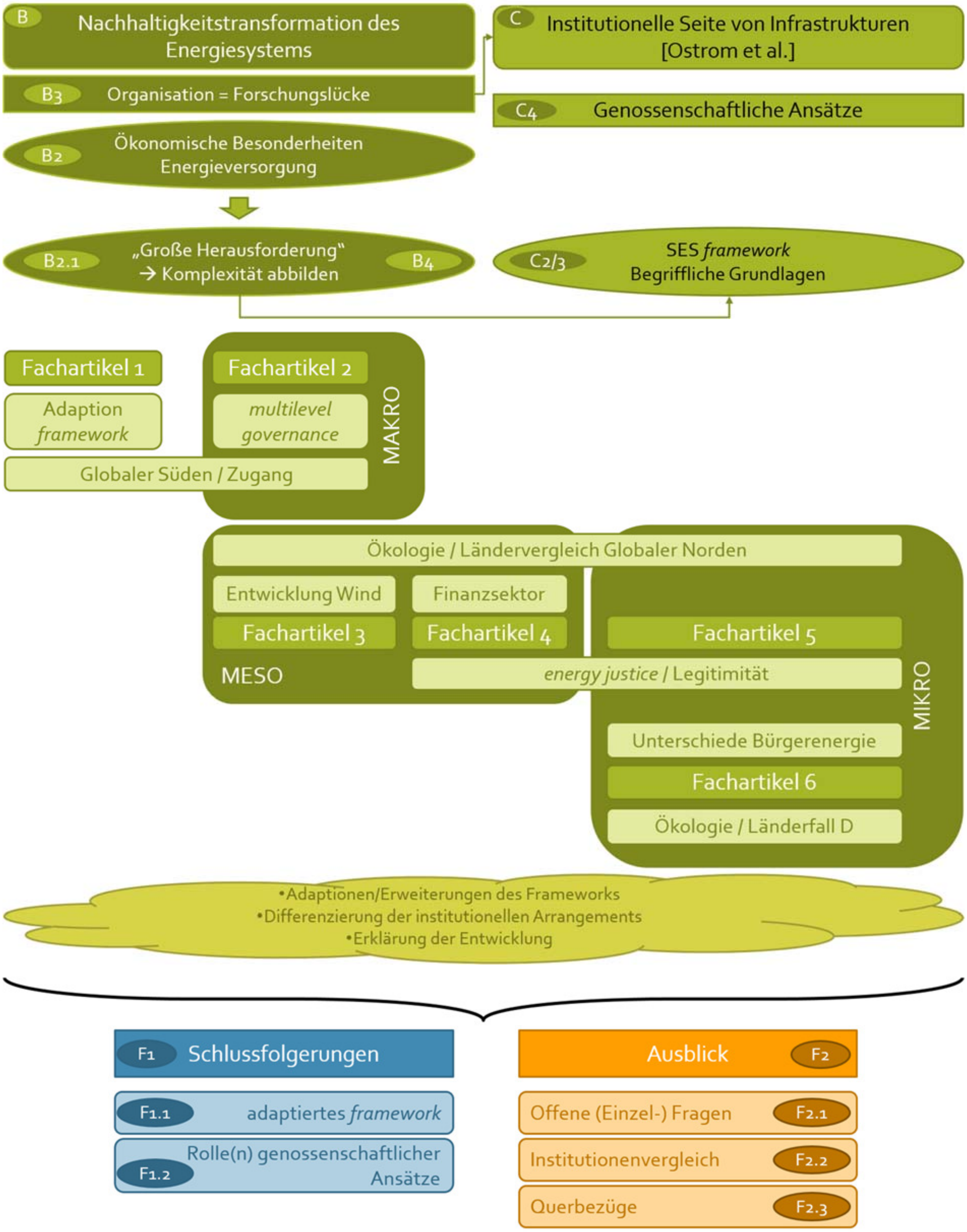

Abb. 1: Ausgangspunkte der Arbeit und Erkenntnisse

3 Gang der Untersuchung

Die Kapitel B und C bilden den Ausgangspunkt der Analyse (*siehe Abb. 1*). In Rückgriff auf die Literatur zu Nachhaltigkeitstransformationen (Kapitel B) wird eine Begründung für das (methodische) Vorgehen in der Arbeit gegeben und aufbauend auf einer Darstellung institutionenanalytischer Arbeiten (Kapitel C) die begriffliche und theoretisch-konzeptionelle Grundlage gelegt. Auf diese Weise werden die einzelnen Problemstellungen, die (1) die Wahl des methodischen Vorgehens, (2) die Auswahl des *SES framework* und (3) die in den Fachartikeln aufgegriffenen Aspekte begründen, nach und nach entfaltet und vertieft.

Im Kern der Arbeit stehen die sechs Fachartikel. In Kapitel D wird zunächst ein Überblick über die Artikel einschließlich der Querbezüge und Beiträge zur Anpassung und Erweiterung des SES *framework*, zur Differenzierung der institutionellen Arrangements und Erklärung der Entwicklung genossenschaftlicher Ansätze im jeweils betrachteten Kontext gegeben. Die Fachartikel selbst folgen in Kapitel E.

Im Anschluss an die Artikel werden in Kapitel F wesentliche Erkenntnisse, unterteilt nach Anpassungen des *framework* und Ergebnissen zur Rolle bzw. zu den Rollen von genossenschaftlichen Ansätzen bei der Nachhaltigkeitstransformation des Energiesektors, herausgearbeitet. Einzelne offene Fragen werden zu Beginn des Ausblicks erörtert (*siehe F1*). Die Beiträge lassen sich in ein weiter gefasstes Forschungsprogramm einbetten, das im Abschnitt F2 skizziert wird. Auf der einen Seite wird konkret für die sozialwissenschaftliche Energieforschung die institutionell-organisatorische Ausgestaltungsfrage thematisiert (*siehe F2.2*). Auf der anderen Seite werden Querbezüge zu anderen Forschungsfeldern skizziert, in die Erkenntnisse aus der vorliegenden Arbeit einfließen sollten (*siehe F2.3*).

B Nachhaltigkeitstransformationen

1 Überblick: Inhaltliche und methodische Implikationen von Nachhaltigkeitstransformationen

In diesem Kapitel wird zunächst die methodisch-theoretische Vorgehensweise in der Arbeit begründet, die sich aus dem Untersuchungsgegenstand ableitet – Nachhaltigkeitstransformationen im Allgemeinen und der Transformation des Energiesystems im Besonderen als „grand challenges". Grin, Rotmans und Schot definieren eine Nachhaltigkeitstransformation als „a radical transformation towards a sustainable society as a response to a number of persistent problems confronting contemporary societies" (Grin et al., 2010, S. 1). Dabei gilt es zu beachten, dass ein solcher Wandel, gerade im Energiesystem, nicht in kurzer Frist zu erwarten ist. Zugleich ist hervorzuheben, dass es sich um eine Vielzahl von simultan existierenden Problemen handelt, für die eine Lösung gefunden werden muss.

Im folgenden Abschnitt werden zunächst die Eigenschaften von „grand challeges" beschrieben. Ausgehend von den Zielstellungen und ökonomischen Eigenschaften (B2.2) und der historischen Entwicklung (B2.2.3) der Energie-, insbesondere der Stromversorgung, wird sodann gezeigt, dass es sich bei den hier betrachteten Transformationen tatsächlich um solche „großen Herausforderungen" handelt. Vor diesem Hintergrund sind sowohl in der energie- und klimaökonomischen Analyse als auch allgemein im Forschungsfeld der Nachhaltigkeitstransformationen Theorien mittlerer Reichweite und konzeptionelle Rahmen (*frameworks*) entwickelt worden, die Elemente verschiedener Disziplinen zusammenführen. Auf die Eigenschaften und Herangehensweisen wird im Anschluss eingegangen (B3). Diese Ausführungen leiten zu den allgemeinen methodischen Reflektionen in Abschnitt B4 über.

2 Nachhaltigkeitstransformation des Energiesystems als „große Herausforderung"

2.1 <u>„Grand Challenges" – „wicked problems": Eigenschaften und Implikationen</u>

Im Zusammenhang mit Nachhaltigkeitstransformationen wird in der Literatur von „grand challenges" (Ferraro, Etzion & Gehman, 2015; George, Howard-Grenville, Joshi & Tihanyi, 2016), „wicked problems" (Batie, 2008; Frame, 2008; Head, 2008; Termeer, Dewulf, Breeman & Stiller, 2015) oder „große[n] Probleme[n]" (Sturn, 2011) gesprochen. Diese sind durch die folgenden Eigenschaften gekennzeichnet:

- Das Problem ist schlecht, d. h. nicht klar strukturiert. Es besteht kein Konsens über das Problem. Die Problemdefinition verändert sich zudem mit der Zeit.
- Die Bewertungen und Zielstellungen unterscheiden sich zwischen den Beteiligten. Es handelt sich um „moving targets".

- Das Problem ist schwer zu fassen und nicht eindeutig lösbar bzw. unlösbar, weil viele soziale und biophysikalische Faktoren einwirken. Es besteht ein begrenztes Wissen über die Zusammenhänge. Ursachen und Wirkungen können nicht eindeutig identfiziert werden.
- Das Anwendungsfeld ist von hohen Unsicherheiten und Ambiguitäten geprägt.
- Das Problem weist nichtlineare Dynamiken und Rückkopplungen auf. Es ist von Ungleichgewichten und Pfadabhängigkeiten gekennzeichnet.
- Transformationsprozesse erstrecken sich gemeinhin über lange Zeithorizonte. Dies verstärkt die beiden zuvor genannten Aspekte, also sowohl das Problem der Unsicherheiten als auch die Relevanz der Dynamiken.

Daraus ergeben sich besondere Herausforderungen für Theorie, Modellbildung und Methodik (Sturn, 2011): Ausgangspunkt der Analyse sind Werte und Ziele, über die eine Verständigung stattfindet. Werte und Ziele können auch strittig sein bzw. bestritten werden (*contestation*).
Gemeinhin werden unterschiedliche Disziplinen in komplexen Modellen integriert, statt Partialanalysen wohl definierter Teilaspekte vorzunehmen. Batie formuliert dies folgendermaßen: „By their nature, wicked problems cannot be easily categorized into separate disciplinary boxes nor can they be divided into more manageable parts under the assumption that there are clear and known casual paths" (Batie, 2008, S. 1179). Die Schwierigkeiten bei der Dekomposition des Gesamtkomplexes legen im Regelfall nahe, dass konzeptionelle Rahmen (*frameworks*) als Heuristiken zur Strukturierung des Problems genutzt werden.
Die dynamischen Charakteristika, die mit komplexen Systemen verbunden sind (Nichtlinearität, Rückkopplungen, Pfadabhängigkeiten), führen dazu, dass historische Entwicklungen für die Analyse relevant werden („history matters"; Arthur, 1989; David, 1985; Nunn, 2009). Folglich müssen der spezifische historische Kontext und die Entwicklungen über eine längere Zeitspanne bei der Analyse Berücksichtigung finden.
Die genannten Phänomene sind nicht gänzlich neu. Zugleich sind die Forschungsansätze zur Berücksichtigung all der Implikationen „großer Herausforderungen" insgesamt noch in Entwicklung (Batie, 2008). Ein Ziel der vorliegenden Arbeit ist es daher, zu dieser Entwicklung beizutragen.

2.2 Problemkontext: Herausforderungen nachhaltiger Energieversorgung

2.2.1 Nachhaltige Energie – nationale, supranationale und globale Zielstellungen

Die Energieversorgung stellt ein Anwendungsfeld dar, das durch eine solche Konstellation an Herausforderungen geprägt ist. Weltweit befinden sich die Energiemärkte infolge von Liberalisierung, Privatisierung und zunehmender Nutzung (dezentraler) erneuerbarer Energien, die als Reaktion auf Abhängigkeiten beim Import bzw. bei der Nutzung fossiler Energieträger und auf die Gefahren des Klimawandels eingesetzt werden, in einem grundlegenden Transformationsprozess. In Deutschland wird diese Dekarbonisierung bei gleichzeitigem Ausstieg aus der Atomenergie und stärker dezentraler Versorgung als „Energiewende“ bezeichnet (Hockenos, 2012; Krause, Bossel & Müller-Reißmann, 1980; Morris & Jungjohann, 2016, S. 3–5).

Mit der Transformation des Energiesystems verbundene Zielsetzungen und die Vorstellungen von den Transformationspfaden variieren zwischen einzelnen Ländern und Ebenen. Was als „nachhaltige Energie“ angesehen werden kann, ist höchst umstritten. Verwiesen sei nur auf die Diskussionen um die „Renaissance der Atomenergie“ zur Eindämmung des anthropogenen Klimawandels (Sovacool, 2012), um große Wasserkraftwerke (World Commission on Dams, 2001) oder die energetische Biomassenutzung (Tomei & Helliwell, 2016). Die unterschiedlichen Zielsetzungen und Ebenen, die dabei eine Rolle spielen, seien beispielhaft illustriert:

- Nationale energiepolitische Ziele in Deutschland finden sich im Energiewirtschaftsgesetz (EnWG) und im Erneuerbare-Energien-Gesetz (EEG): Gemäß EnWG geht es um „eine möglichst sichere, preisgünstige, verbraucherfreundliche, effiziente und umweltverträgliche leitungsgebundene Versorgung der Allgemeinheit mit Elektrizität und Gas, die zunehmend auf erneuerbaren Energien beruht“ (§ 1 EnWG). Das EEG, in dem seit 2000 konkrete Ausbauziele benannt sind, soll „im Interesse des Klima- und Umweltschutzes eine nachhaltige Entwicklung der Energieversorgung [.] ermöglichen, die volkswirtschaftlichen Kosten der Energieversorgung auch durch die Einbeziehung langfristiger externer Effekte [.] verringern, fossile Energieressourcen [.] schonen und die Weiterentwicklung von Technologien zur Erzeugung von Strom aus erneuerbaren Energien [.] fördern“ (§ 1 Abs. 1 EEG 2017). Dieser Ausbau soll „stetig, kosteneffizient und netzverträglich“ (§ 1 Abs. 2 Satz 2 EEG 2017) erfolgen. Zudem sieht § 2 Abs. 3 Satz 2 den Erhalt der Akteursvielfalt als Zielstellung vor.
- Auf europäischer Ebene wurden Zielsetzungen im Klima- und Energiepaket 2020 (Europäische Kommission, KOM(2008) 30 final) bzw. im Rahmen für die Klima- und Energiepolitik bis 2030 (Europäische Kommission, KOM(2014) 15 final) festgelegt. Die darin formulierten supranationalen Ziele werden in den einzelnen Mitgliedsstaaten gemäß Governance-Verordnung im Rahmen von Nationalen Energie- und Klimaplänen (*National Energy and Climate Plans*, NECPs) auf die nationale Ebene heruntergebrochen.
- Auf globaler Ebene schließlich sind das Pariser Klimaabkommen (Pariser Übereinkommen vom 12.12.2015) mit seinem 2-Grad-Ziel und die Nachhaltigkeitsziele (*Sustainable Development Goals*, SDGs) der globalen Agenda 2030 (Vereinte Nationen, A/RES/70/1) zu nennen. Zur Energieversorgung ist SDG 7 formuliert worden. Die Weltgemeinschaft hat sich darin zum Ziel gesetzt, bis 2030 (1) den allgemeinen Zugang zu bezahlbaren, verlässlichen und modernen Energiedienstleistungen zu sichern,

(2) den Anteil erneuerbarer Energien am globalen Energiemix deutlich zu erhöhen und

(3) die weltweite Steigerungsrate der Energieeffizienz zu verdoppeln.

Diese kursorischen Ausführungen deuten an, dass sich die Problemdefinition je nach Ebene (EU vs. national) und Politikfeld (z. B. Klima- vs. Entwicklungspolitik) unterscheidet. Die Zielkataloge entwickeln sich mit der Zeit (z. B. von 20-20-20 zu Rahmen 2030). Teilweise werden unscharfe Begriffe genutzt (z. B. „preisgünstig“ oder „Akteursvielfalt“). Widerstreitende Zielsetzungen erschweren eine Lösung (z. B. Ausbau erneuerbarer Energien, zugleich „preisgünstig“ und „sicher“). Die politische Steuerung erstreckt über mehrere Ebenen, die miteinander interagieren (Sturn, 2016, 27, 29).

2.2.2 Ökonomische Besonderheiten des Energiesystems

Aus ökonomischer Perspektive sind darüber hinaus verschiedene Merkmale des Stromsektors hervorzuheben, die Implikationen für die institutionelle Ausgestaltung haben:

- Netzgebundenheit und regulatorische Unsicherheiten

Es handelt sich beim Strom, aber auch im Fall der Fernwärmeversorgung oder beim Gas um eine netzgebundene Infrastruktur. Das Netz stellt grundsätzlich ein natürliches Monopol (Künneke, 1999) bzw. einen monopolistischen Flaschenhals (*monopolistic bottleneck*, Knieps, 2006) dar. Es befindet sich daher im Allgemeinen entweder im staatlichen Eigentum, oder der Betrieb untersteht staatlicher Regulierung. Bei Eigentum durch die Konsumentinnen und Konsumenten könnte man theoretisch auf staatliche Regulierung verzichten (Lüke, 2001; Meade, 2005). In diesen Fällen ist aber ggf. eine Aufsicht bzw. Kontrolle der Netzgenossenschaften zur Sicherstellung eines ökonomischen Betriebs notwendig.

Investitionen weisen in der Regel einen langen Zeithorizont auf (Madlener & Zweifel, 2006). Natürliches Monopol, darin begründete Regulierung und lange Investitionshorizonte führen dazu, dass regulatorische Unsicherheiten eine große Rolle spielen (Buckland & Fraser, 2001; Hoffmann, Trautmann & Hamprecht, 2009).

- Externalitäten

Mit der Stromerzeugung sind regelmäßig externe Effekte verbunden, insbesondere Treibhausgasemissionen und damit zusammenhängende volkswirtschaftliche Kosten, die bislang nur partiell durch Emissionshandelssysteme oder CO_2-Steuern internalisiert werden. Weitere Externalitäten betreffen etwa Luftschadstoffe und Gesundheitswirkungen (Bickel & Friedrich, 2005; Kim, 2007). Zur Bestimmung der Kosten müssen Wirkungspfade spezifiziert werden; wegen der teilweise langen Zeiträume, z. B. bei den Klimawirkungen, spielen Fragen der Diskontierung (Nordhaus, 2007; Stern, 2008; Weitzman, 2007) und die Berücksichtigung von Unsicherheiten (Dasgupta, 2008; Pindyck, 2007) eine zentrale Rolle. In umweltökonomischen Untersuchungen werden oft Partialanalysen vorgenommen. Bei solchen Ansätzen läuft man dann in Probleme mit zweitbesten Lösungen (Mishan, 1971), wenn alle anderen Faktoren nicht

(Pareto-)optimal und Externalitäten allgegenwärtig sind, anstatt – wie von vielen neoklassischen Umweltökonomen angenommen (Ayres & Kneese, 1969) – Ausnahmen darzustellen. Im Falle von „widespread externalities“ (Hammond, 2001; Kaneko & Wooders, 1986), also solchen externen Effekten, die von vielen Personen ausgehen und viele Personen betreffen, weisen die Externalitäten Charakteristika öffentlicher Güter auf (Baumol & Oates, 1988, S. 18–20). Eine vollständige Internalisierung ist, nicht zuletzt wegen Nichtkonvexitäten (Starrett, 1972) und Trittbrettfahrerproblemen, nicht zu erwarten (Hammond, 2001). Darüber hinaus bestehen Bedenken bei der Monetarisierung zwecks Abwägung geeigneter Instrumente zur Internalisierung externer Effekte (Söderholm & Sundqvist, 2003), woraus sich die Bedeutung von Operationalisierungen ethischer Konzepte wie *energy justice* (*siehe E4 und E5*) ergibt.
Zur Beschreibung der mit dem Energiesektor verbundenen Umwelt- und sozialen Probleme sind auch andere Konzepte genutzt worden wie Kapps „social costs“ (Berger, 2008; Kapp, 1950) oder die Kuppelproduktion (Baumgärtner, Dyckhoff, Faber, Proops & Schiller, 2001). In allen Fällen führt die beschriebene Problematik dazu, dass in der Realität eher ein *policy mix* denn eine global optimale First-Best-Lösung umgesetzt wird. Dafür sprechen auch politökonomische Gründe (Gawel, Strunz & Lehmann, 2014). Diese institutionelle Seite erhöht die Komplexität weiter.

- Verschränkungen mit anderen Sektoren (Nexus)

Zur Steigerung der Komplexität tragen auch die Verschränkungen der Energieversorgung mit anderen Sektoren bei. Ökonomisch werden diese Beziehungen zumeist als Externalitäten, seltener als Kuppelprodukte modelliert. Wasser wird beispielsweise für die Energieerzeugung genutzt, und bei der (Ab-)Wasserbehandlung und dem Transport von Wasser wird Energie benötigt (*water-energy nexus*; Hamiche, Stambouli & Flazi, 2016; Scott et al., 2011). Auswirkungen von Dürren auf die Verfügbarkeit in Wasserkraftwerken oder als Kühlwasser und die Verschmutzung von Wasser bei der Gewinnung von Energierohstoffen oder der Stromproduktion sind zwei Beispiele für diese Verschränkungen. Die Analyse lässt sich auf weitere Felder, namentlich Ernährung (*water-energy-food nexus*; Bazilian et al., 2011) und Landnutzung (*water-energy-land-food nexus*; Ringler, Bhaduri & Lawford, 2013), ausweiten.
Politökonomisch relevant ist in diesem Kontext die Beobachtung, dass hier verschiedene Politikfelder interagieren und damit Instrumente in dem einen Feld intendierte oder unbeabsichtigte Auswirkungen auf das andere Feld haben. Energie-, Klima- und Entwicklungspolitik sowie Energiepolitik und Finanzmarktregulierung werden als zwei Beispiele, die in der Literatur nach Ansicht des Verfassers noch nicht hinreichend Aufmerksamkeit bekommen haben, in den Fachartikeln wieder aufgegriffen. Zielkonflikte zwischen den Politikfeldern und die Frage nach einem geeigneten Maß an Koordination (und, wie in E2 ausgeführt, *contestation*) führen zu institutionellen Herausforderungen (Scott et al., 2011).

- Essentielles Gut

Da eine sichere Stromversorgung für das Funktionieren moderner Gesellschaften essentiell ist, stellt sie ein politisch sensibles Gut dar (Marques, 2017). Bezogen auf individuelle Konsumentinnen und Konsumentinnen wird die Versorgung mit modernen Formen von Strom und Wärme gelegentlich als meritorisches Gut klassifiziert (Dilnot & Helm, 1987; Hoberg & Strunz, 2018; zur Meritorik allgemein: Andel, 1984; Musgrave, 1956). Damit lassen sich dann staatliche Eingriffe und Anreize zu nachhaltigem Verhalten (*nudges*; Hoberg & Strunz, 2018) begründen. Zugleich macht dieses Charakteristikum deutlich, warum regulierende staatliche Eingriffe im Energiesektor allgegenwärtig sind und die Interaktion zwischen staatlichen und nichtstaatlichen Akteuren einer besonderen Aufmerksamkeit bedarf.

- Hohe Unsicherheiten bei geringen Renditen im Fall von (ländlicher) Elektrifizierung

Elektrifizierungsprojekte, v. a. solche in ländlichen Räumen, sind durch hohe Unsicherheiten bzgl. der Abnahmemengen im Zeitverlauf und i. d. R. eher niedrige Profite charakterisiert. Sie sind damit üblicherweise wenig attraktiv für private gewinnorientierte Investoren. Zugleich lässt sich daraus eine Rolle für Non-Profit-Organisationen (NPO) oder Sozialunternehmen ableiten, sofern der Staat eine Lücke bei der Versorgung lässt (Kingma, 2003; Weisbrod, 1977).

- Geringe variable und relativ hohe Fixkosten fluktuierender erneuerbarer Energietechnologien

Windenergie und Photovoltaik haben nur geringe Betriebs- und insgesamt variable Kosten bei relativ hohen Anfangsinvestitionen. Die marginalen Kosten gehen folglich gegen Null, damit theoretisch auch der entsprechende Spotmarktpreis im *energy-only market*. Es ist fraglich, ob die Marktanreize durch Preisspitzen ausreichen (*missing money problem*, Edenhofer et al., 2013; Newbery, 2016) oder hinreichend alternative institutionelle Arrangements wie langfristige Abnahmeverträge (*power purchase agreements*, PPAs; Nelson, Reid & McNeill, 2015) entwickelt werden, um für den notwendigen Ausbau zu sorgen. Die Fragen der Gestaltung von Märkten weisen wiederum auf die Bedeutung der institutionellen Umwelt hin.
Zugleich stellt die Aufbringung der hohen Investitionssummen in weniger entwickelten Finanzmärkten ein Problem dar. Unvollkommenheiten der Finanzmärkte führen damit zu Problemen bei der Finanzierung von Erneuerbare-Energien-Vorhaben – ein Beispiel für die oben erwähnten Verschränkungen von Energie- und Finanzsektor.

2.2.3 Wandel sozio-technischer Systeme

Neben die zuvor dargestellten Probleme treten Herausforderungen des langfristigen Wandels der in soziale Zusammenhänge eingebetteten technischen Systeme der Energieversorgung, die die Komplexität der Herausforderungen wie der Analysen erhöhen. Die Untersuchungen historischer Entwicklungen großtechnischer Systeme haben gezeigt, dass hier nicht allein technisch-naturwissenschaftliche und ökonomische Gesetzmäßigkeiten zum Tragen kommen, sondern vielmehr Interaktionen mit den sozialen Systemen relevant sind. So stellt etwa Stier in seinen Analysen zur Energiepolitik in Württemberg fest, dass das dortige System kommunaler, stärker dezentral organisierter Stromversorgung keineswegs zwangsläufig aufgrund fehlender Nutzung von Größenvorteilen weniger effizient operierte als ein zentral (und staatlich) organisiertes System in anderen deutschen Ländern (Stier, 1999, S. 165–166).

Die Arbeiten zu historischen Transformationen von Energiesystemen zeigen überwiegend, dass globale Transformationen im Allgemeinen längere Zeiten benötigen, während sie national schneller ablaufen können (Grubler, Wilson & Nemet, 2016; Smil, 2010, 2016). Die Veränderung der Marktanteile einer Technologie nimmt einen S-förmigen Verlauf, der aus der Innovationsliteratur bekannt ist (Grubler, 2012; Grubler et al., 2016). Die Geschwindigkeit ist dabei abhängig von

(a) dem Diffusionslebenszyklus – Innovatoren brauchen länger als Nachfolger und diese länger als späte Anwender;
(b) der Marktgröße – je größer der Markt, desto komplexer und langsamer die Transformation;
(c) der Technologieebene – Veränderungen von Technologiesystemen vollziehen sich langsamer als jene einzelner Technologien, die auf bestehende Infrastrukturen zurückgreifen können.

Technologien und Infrastrukturen (Artefakte) stehen in Beziehung zu den Institutionen und Organisationen, die sie steuern. Unruh hat dies als „techno-institutional complexes“ (Seto et al., 2016; Unruh, 2000, 2002; Unruh & Carrillo-Hermosilla, 2006) beschrieben und die dadurch bestehenden Pfadabhängigkeiten und *lock-in effects* herausgestellt, die es bei einer Nachhaltigkeitstransformation zu überwinden gilt (del Río & Unruh, 2007). Ein einmal eingeschlagener Pfad wird nicht unmittelbar wieder verlassen, weil ein solcher Wechsel hohe Kosten mit sich brächte. Diese Befunde decken sich mit den Forschungen zur Geschichte des Wandels großer technischer Systeme (Hughes, 1983; Mayntz & Hughes, 1988).

Die starke Pfadabhängigkeit moderner Energiesysteme hat die Annahme neuer Technologien verlangsamt (Fouquet, 2016a, 2016b). Damit wird „un-locking“ (Fouquet, 2016a) – im Prinzip „path creation“ (Garud & Karnøe, 2012) – zu einem wichtigen Faktor für Nachhaltigkeitstransformationen im Energiesystem. Dabei kommt es mit Blick auf etablierte Unternehmen – in Schumpeterscher Terminologie – zu Prozessen „kreativer Zerstörung“ (Kivimaa & Kern, 2016): Etablierte Unternehmen werden verdrängt (Fouquet, 2016a). Andere Autorinnen und Autoren sprechen hier von „Exnovation“ (Arnold, David, Hanke & Sonnberger, 2015). Insgesamt wird in der Literatur zu historischen Energietransformationen herausgestellt, dass der institutionelle Kontext entscheidend für die Geschwindigkeit und Richtung der Transformation ist (Geels et al., 2016; Kern, Verhees, Raven & Smith, 2015).

Während die Forschung zu historischen Energietransformationen damit sehr wohl die institutionelle Dimension und ihre Wechselwirkungen mit den technischen Artefakten in den Blick genommen hat, bleibt die Frage nach der Organisation jenseits ordnungspolitischer Fragen weitgehend unbearbeitet. Letztere sind zwar an vielen Stellen und schon mit Beginn der Elektrizitätswirtschaft erörtert worden, wobei die Grundpositionen in der Diskussion bereits früh abgesteckt worden sind (Gilson, 1994; Stier, 1999, S. 58). Zumeist fokussiert sich die Auseinandersetzung aber auf die Abwägung privater vs. öffentlicher Bereitstellung von Gütern und die regulatorische Ausgestaltung der Elektrizitätswirtschaft. Optionen jenseits der Dichotomie privat vs. staatlich sind allerdings schon recht früh in den Blick geraten. So hat sich beispielsweise in Deutschland die gemischtwirtschaftliche Organisation als Standard herausgebildet (Stier, 1999, S. 67–68). Trotz ihrer Bedeutung für einige ländliche Regionen ist der genossenschaftlichen Option bislang auch in der historischen Forschung wenig Aufmerksamkeit gewidmet worden. Eine Ausnahme stellt beispielsweise die Arbeit von Koch (1997) zu den Organisationsformen in der Elektrizitätswirtschaft Nordostniedersachsens dar. Darüber hinaus bleibt aber die detaillierte und vergleichende Analyse der Organisationsformen in historischer Perspektive eine überwiegend noch zu füllende Forschungslücke (Holstenkamp & Stier, 2018; Holstenkamp, 2018b).

Die vorstehenden Überlegungen werfen grundsätzliche theoretische Fragen nach der Validität gleichgewichstheoretischer neoklassischer Modelle auf. Koevolution ließe sich beispielsweise in spieltheoretischem Rahmen als Änderung der Spielstrukturen interpretieren (Sturn, 2016). Ist die Zeit irreversibel (Foster, 1993) bzw. die Welt nichtergodisch (North, 2005), so müssen historische Entwicklungspfade bei der Analyse berücksichtigt werden. Dies geschieht im Folgenden überwiegend historisch-deskriptiv, was angesichts des Forschungsstandes angemessen erscheint. Eine noch stärkere theoretische Durchdringung und ggf. modellmäßige Abbildung in Auseinandersetzung mit dem ökonomischen Mainstream bleibt ein Forschungsdesiderat, das es in nachfolgenden Arbeiten zu schließen gilt.

Für die Rolle genossenschaftlicher Ansätze in der Transformation des Energiesystems bedeuten diese Überlegungen, dass Situationen in verschiedenen Ländern und zu verschiedenen Zeiten nicht 1:1 übertragbar sind: Die genossenschaftlichen Lösungen im Bereich ländlicher Elektrifizierung im Globalen Norden in der ersten Hälfte des 20. Jahrhunderts sind nicht direkt vergleichbar mit der Situation im Globalen Süden heute – sowohl die technologischen Lösungen als auch die institutionellen Formen sind in ihren jeweiligen historischen Kontext eingebunden. Aus diesem Problem der Kontextualität folgt unmittelbar, dass die jeweiligen historischen Besonderheiten bei der Analyse mitberücksichtigt werden müssen und eine isolierte Untersuchung zu falschen Schlussfolgerungen verleiten kann. Geschichtstheoretisch gesprochen: „Lernen aus der Geschichte“ ist nur insoweit möglich, als dass die historische Analyse

ein Denken in Szenarien ermöglicht und „spezifische[.] Konstellationen von Interessen, Erfahrungen und Machtstrukturen" (Holstenkamp & Stier, 2018, S. 391) sichtbar macht. Vor diesem Hintergrund werden in den Fachartikeln dieser Dissertation überwiegend historische Entwicklungspfade mitberücksichtigt. Pfadabhängigkeiten können sich dabei nicht nur auf Technologien und physische Artefakte beziehen, sondern auch auf Institutionen und Organisationen (Woerdman, 2004).
Schließlich lassen sich aus dem historischen Vergleich früherer und aktueller Transformationsprozesse im Energiesektor Unterschiede herausarbeiten, die auch für die vorliegende institutionell-organisatorische Analyse von Bedeutung sind: So zeichnen sich aktuelle Transformationsprozesse durch koordinierte politische Aktivitäten und globale Wechselwirkungen und eine Vielzahl an beteiligten Akteuren über verschiedene Governanceebenen hinweg aus. Diese soziale Mobilisierung schaffe Akzeptanz und Legitimität (Kern & Rogge, 2016, S. 14). Demgegenüber ist eine Delegitimierung von Technologien im öffentlichen Diskurs möglich (Geels & Verhees, 2011). Dieser Aspekt von Akzeptanz und Legitimität ist bei der Analyse zu berücksichtigen. Absolute Knappheit/Mangel (*scarcity*) statt Überfluss (*abundance*) und dadurch bedingte Preisschocks können technisch-ökonomische Kipppunkte hervorbringen (Sovacool & Geels, 2016; Sturn, 2016). Sozio-institutioneller Wandel bringt technisch-ökonomischen Wandel hervor. Diese Wechselwirkungen zwischen Technologie und Infrastruktur auf der einen sowie institutionell-organisatorischen Faktoren auf der anderen Seite müssen von einem Analyserahmen abgebildet werden. Zudem lassen sich einige Hypothesen für eine mögliche Rolle genossenschaftlicher Ansätze ableiten, sofern Bottom-Up-Ansätze und dezentrale Strukturen wegen ihrer Nähe zu Konsumentinnen und Konsumenten eine Beschleunigung von Transformationsprozessen bewirken können (Grubler, 2012). Dann liegt es nahe, genossenschaftlichen Ansätzen eine katalytische Rolle zuzusprechen.

2.3 *Frameworks* und Modelle im Energiebereich

Die beschriebenen Charakteristika der Energie-, insbesondere der Stromversorgung, und der Energietransformationen konkretisieren die zuvor für große Herausforderungen skizzierten Merkmale. Daraus lassen sich einige inhaltliche und methodische Implikationen für die institutionell-organisatorische Analyse ableiten: Da die benötigten Investitionsbeträge zur Umsetzung der Transformation im Energiesystem sehr hoch sind und nicht allein von der öffentlichen Hand aufgebracht werden können, allein von privaten Investoren aus den genannten Gründen aber ebenso wenig aufgebracht werden, ergibt sich ein Spielraum für vielfältige institutionelle Arrangements zur Sicherung der notwendigen finanziellen Ressourcen. Staatliche Steuerung ist weltweit im Energiesektor zu beobachten. Dabei werden partiell Märkte geschaffen und Preismechanismen genutzt (Sturn, 2016). Daraus folgt die Notwendigkeit, bei der Institutionenanalyse im Energiebereich die Komplexität adäquat abzubilden und ein besonderes Augenmerk auf die Wechselwirkungen mit dem politischen System und den regulatorischen Rahmen zu legen. Eine Partialanayse reicht zum wirklichen Verständnis der Zusammenhänge nicht aus. Schließlich müssen gegenseitige Beeinflussungen von Technologie und natürlicher Umwelt auf der einen Seite sowie Institutionen und Organisationen auf der anderen berücksichtigt werden.

Die Integration technisch-naturwissenschaftlicher und ökonomischer Faktoren erfolgt in der Energiesystemmodellierung (Bhattacharyya & Timilsina, 2010; Pfenninger, Hawkes & Keirstead, 2014) und in der Klimaökonomik über integrierte technisch-ökonomische Modelle. So bilden *Integrated Assessment Models* (IAMs; Kelly & Kolstad, 1999; Nordhaus, 1994; Weyant, 2017) auf der einen Seite die technisch-naturwissenschaftlichen Zusammenhänge des Klimawandels (oder eines anderen Umweltprobems) ab. Auf der anderen Seite beinhalten sie ein ökonomisches Modell, das Informationen zu den externen Kosten und den Kosten der Anpassungs- bzw. Minderungsmaßnahmen enthält. IAMs sind damit ein Beispiel für die Integration unterschiedlicher Disziplinen (Ravetz, 1999; Rothman & Robinson, 1997; Rotmans & Asselt, 1996; Vellinga, 2000).

Derzeit wird in vielen Modellen an der Integration sozialer Prozesse und Aspekte gearbeitet (Li, Trutnevyte & Strachan, 2015; Trutnevyte et al., 2014). Vielfach greifen Autoren dabei auf unterschiedliche Modelle zurück, die miteinander integriert werden (Sluisveld et al., 2018; Turnheim et al., 2015). Generell wird an den formellen Modellen – neben der Frage nach der Qualität der Inputdaten (Pindyck, 2017; Weyant, 2017) – kritisiert, dass sie kontextuelle Differenzen zugunsten der (mathematischen) Handhabbarkeit außer Acht lassen. In der Berücksichtigung dieser Kontextualität wird die Stärke qualitativer Studien gesehen (Rotmans, 1998). Dabei werden verstärkt Aspekte wie die *social license to operate* (Boutilier, 2014), also Fragen der Legitimität und Akzeptanz von Unternehmen und ihrer Tätigkeiten, und Gerechtigkeitsfragen (Mahmoudi, Renn, Vanclay, Hoffmann & Karami, 2013) adressiert.

3 Organisation von Nachhaltigkeitstransformationen

3.1 Organisation von Nachhaltigkeitstransformationen als Forschungslücke

Einige sich aus den vorstehenden Ausführungen ergebende inhaltliche und methodische Implikationen werden in diesem und im folgenden Abschnitt erläutert. Zunächst wird im Zusammenhang mit einigen Betrachtungen zum Stand der Forschung zur Organisation von Nachhaltigkeitstransformationen auf die inhaltlichen Fragen abgestellt. Hiernach werden im Abschnitt B4 die methodischen Implikationen diskutiert. Ziel ist es zunächst, einige Forschungslücken herauszustellen, die in der vorliegenden Arbeit adressiert werden, und die theoretische Herangehensweise, die im nachfolgenden Kapitel expliziert wird, einzuordnen und zu begründen.

Dabei wird zunächst gezeigt, dass organisatorische Fragen innerhalb der Literatur zu Nachhaltigkeitstransformationen zwar bearbeitet werden, insbesondere in Arbeiten zur Governance von Nachhaltigkeitstransformationen. Insgesamt werden die handelnden Akteure aber zumeist eher implizit behandelt (Fischer & Newig, 2016). Die ausführlichere Beschäftigung mit der Akteursdimension ist eher jüngeren Datums (Avelino & Wittmayer, 2016; Farla, Markard, Raven & Coenen, 2012; Haan & Rotmans, 2018; Pesch, 2015). So stellen Avelino und Wittmeyer fest, „to date, the field [i.e. sustainability transition research, LH] lacks a structured understanding of actors“ (Avelino & Wittmayer, 2016, S. 629).
Die Analyse von Organisationen und ihres Beitrags zu Nachhaltigkeitstransformationen würde man am ehesten von den Wirtschaftswissenschaften erwarten. Dabei fällt zunächst auf (Markard, 2017), dass es innerhalb des Nachhaltigkeitsmanagements einen Forschungsschwerpunkt eher im Bereich von *Corporate Social Responsibility* (CSR; Dahlsrud, 2008; A. Schneider & Schmidpeter, 2012), den Performancewirkungen nachhaltigen Investierens (*Socially Responsible Investment*, SRI; Ambec & Lanoie, 2008; Sparkes, 2008) und in der Beschäftigung mit nachhaltigen Geschäftsmodellen (Schaltegger, Lüdeke-Freund & Hansen, 2016; Schaltegger, Hansen & Lüdeke-Freund, 2016) gibt. Organisationsfragen bleiben eher unterbelichtet, weshalb sie Markard (2017) etwa auch explizit als ein Feld für zukünftige Forschung hervorhebt. Aus einer volkswirtschaftlichen Perspektive haben sich verschiedene Autorinnen und Autoren vor allem mit der Steuerung von Nachhaltigkeitstransformationen und wirtschaftspolitischen Fragen beschäftigt. In Abschnitt B3.3 wird der Ansatz von Gawel und Bedtke (2016) knapp skizziert. Schließlich gibt es eine zunehmende Zahl an Arbeiten, die die Rolle von NPOs und Sozialunternehmen bzw. allgemeiner hybriden Organisationsformen in Nachhaltigkeitstransformationen untersuchen. Genossenschaftliche Ansätze stellen eine solche hybride Form der Organisation dar (*siehe dazu C3.3*).

3.2 Akteure in der Forschung zu Nachhaltigkeitstransformationen

Mit Blick auf die Nachhaltigkeitsforschung geben Fischer und Newig (2016) eine Übersicht über die Behandlung von Akteuren. Sie ordnen ihre Literaturauswertung anhand von vier Akteurstypologien: (1) eine systemische Unterscheidung unter Rückgriff auf die *Multi-Level Perspective* (MLP) in *landscape*, *regime* und *niche*; (2) die aus der Governanceforschung bekannte Typologie in Staat, Markt und Zivilgesellschaft; (3) die Unterscheidung von Governanceebenen – lokal, regional, national und global – sowie (4) gesondert hervorgehoben Intermediäre als Akteure (Hargreaves, Hielscher, Seyfang & Smith, 2013). Als „Regimeakteure“ finden in der Literatur insbesondere die etablierten Unternehmen (*incumbents*) Beachtung (Farla et al., 2012; Jacobsson & Johnson, 2000; Kocyba, 2018; Mossel, Rijnsoever & Hekkert, 2018; Wesseling, Niesten, Faber & Hekkert, 2015). Der Zivilgesellschaft wird eine besondere Bedeutung insbesondere in der Literatur zu sozialen Innovationen beigemessen, zumeist in Verbindung mit der Entwicklung von Nischen (Seyfang & Smith, 2007; Seyfang & Haxeltine, 2012). Hierauf wird im Abschnitt B3.4 noch zurückzukommen sein. Mit Blick auf die unterschiedlichen Governanceebenen stellen Fischer und Newig (2016) fest, Akteure würden überwiegend auf der nationalen Ebene behandelt; seltener werde die globale Ebene betrachtet oder das Wechselspiel im Mehrebenensystem von *global governance* (Hooghe & Marks, 2003) – obwohl grundsätzlich von einer Verlagerung der Steuerungskapazitäten von der nationalstaatlichen auf die globale oder regionale Ebene ausgegangen wird (Hillman, Nilsson, Rickne & Magnusson, 2011; Kates & Parris, 2003).

Der Ansatz von Avelino und Wittmayer (2016) ist dem zweiten Zweig bei Fischer und Newig zuzuordnen. Anders als die Letztgenannten greifen Avelino und Wittmayer bei ihrer *Multi-actor Perspective* (MaP) auf eine um den Dritten Sektor erweiterte Typologie zurück, die aus der Literatur zum *welfare mix* bekannt ist (Evers & Laville, 2004; Pestoff, 1992) und u. a. in der Forschung zu Sozialunternehmen Anwendung findet (Defourny & Nyssens, 2017). Zudem unterscheiden sie drei verschiedene Aggregationsebenen (Individuen, Organisationen, Sektoren) sowie konkrete Akteure von den Rollen, die diese einnehmen. Dieses Rollenkonzept wird an anderer Stelle weiter verfeinert (Wittmayer, Avelino, Steenbergen & Loorbach, 2017).

Diese Systematisierungsfragen werden weiter unten wieder aufgegriffen (*siehe Abschnitte C3.2, C3.4*), im Kontext genossenschaftlicher Ansätze ländlicher Elektrifizierung im Globalen Süden analysiert (*siehe E1*) und schließlich in Abschnitt F1.1 diskutiert. Zwei andere Punkte sollen hier hervorgehoben werden: Zum einen greifen Avelino und Wittmayer (2016) bei ihrer Konzeptentwicklung, einem Vorschlag von Brown, Farrelly und Loorbach (2013) sowie Farla et al. (2012) folgend, auf institutionalistische Arbeiten zurück – ein Weg, der in der vorliegenden Arbeit ebenfalls beschritten wird. Zum anderen fokussieren die beiden Autorinnen zwar auf Machtkonstellationen und deren Veränderungen, während in der vorliegenden Arbeit die Formen der Organisation in den Mittelpunkt gerückt werden. Sie machen aber nach Ansicht des Verfassers zurecht auf die Dynamiken im Verhältnis der Akteure zueinander und mit Blick auf die Rollen, die sie einnehmen, aufmerksam, wenn sie bezüglich der Bürgerenergieinitiativen feststellen, diese zeigten „shifting power relations and contestations between state, market, community and Third Sector“ (Avelino & Wittmayer, 2016, S. 629).

3.3 Steuerung von Nachhaltigkeitstransformationen: ein institutionenökonomischer Ansatz

Auf institutionalistische Ansätze greifen auch Gawel und Bedtke (2016) zurück, auf die hier beispielhaft für eine (überwiegend) ökonomische Institutionenanalyse von Nachhaltigkeitstransformationen eingegangen wird. Gawel und Bedtke stellen zunächst ebenso wie Markard (2017) oder Avelino und Wittmayer (2016) fest, dass Institutionen in der Nachhaltigkeitstransformationsliteratur oft nur unzureichend adressiert würden (Gawel & Bedtke, 2016, S. 288). Sie nehmen die Ordnungsfrage als Ausgangspunkt und üben Kritik an der Staatszentriertheit u. a. des WBGU (Gawel & Bedtke, 2016, S. 290), die aber etwa auch bei Cherp, Vinichenko, Jewell, Brutschin und Sovacool (2018) anklingt, wenn sie ihre „political perspective“ auf Nachhaltigkeitstransformationen diskutieren. Gawel und Bedtke greifen verschiedene Erkenntnisse aus dem Bereich der (Neuen) Institutionenökonomik und Neuen Politischen Ökonomie auf. Sie verweisen auf die Erforderlichkeit institutioneller Kohärenz, auf Pfadabhängigkeiten und die Bedeutung mentaler Modelle und Ideologien und diskutieren mögliche wirtschaftspolitische Implikationen.

Eine Überlegung in den Ausführungen von Gawel und Bedtke sei hier hervorgehoben: Sie greifen die Idee der Anpassungseffizienz (*adaptive efficiency*) bei North (1990) auf (ausführlich: Richter & Furubotn, 2010, S. 579–581). Demnach müssten Regeln so ausgestaltet werden, dass sie Akteuren möglichst viele Freiheiten böten, um unterschiedliche Lösungen auszuprobieren (Gawel & Bedtke, 2016, S. 294). Sie weisen wohl zurecht darauf hin, dass das Konzept bei North relativ vage bleibt. Insofern nutzen sie es als Prinzip, um wirtschaftspolitische Maßnahmen vor dem Hintergrund ihrer institutionellen Umwelt zu beurteilen. Dafür müssen der konkrete Kontext und die historische Entwicklung von Institutionen in den Blick genommen werden. Diese Überlegungen werden in der zusammenfassenden Betrachtung der Rolle genossenschafticher Ansätze bei der Nachhaltigkeitstransformation des Energiesystems wieder aufgegriffen (*siehe F2.2*).

Die Autoren zeigen mit ihren Ausführungen, dass ein Rückgriff auf institutionenökonomische Erkenntnisse für die Analyse von Nachhaltigkeitstransformationen fruchtbar sein kann. Sie machen deutlich, dass es bei der Ordnungsfrage um eine detailliertere Analyse institutioneller Arrangements und Umwelten geht. Fragen zu konkreten Organisationsformen stehen dabei nicht im Fokus ihrer Ausführungen, sondern eher die nach dem Umfang und Timing staatlicher Eingriffe und der genutzten Instrumente.

3.4 Hybride und Nachhaltigkeit

Die Frage nach dem Beitrag, den bestimmte Organisationsformen zu einer nachhaltigen Entwicklung leisten können, wird insbesondere in der Literatur zu NPOs und Sozialunternehmen gestellt (Defourny, 2009; Spraul, 2017; Zeyen et al., 2013). Definitionsgemäß verfolgen Sozialunternehmen neben oder anstelle von der Gewinnerzielung auch soziale Ziele; integrieren sie alle drei Dimensionen von Nachhaltigkeit, wird auch von „sustainable enterprises“ (Schaltegger, 2013) gesprochen. Solche nachhaltige(re)n Unternehmen können Akteure der Transformation sein (Schaltegger, Hansen & Lüdeke-Freund, 2015). Vielfach steht in der Praxis beim Nachhaltigkeitsmanagement nicht der Unternehmenserfolg, sondern Risikomanagement in Form von Legitimitätssicherung im Fokus (Schaltegger & Hörisch, 2013). In der Forschung werden regelmäßig nicht die Organisationsformen, sondern stärker Fragen des Unternehmertums (*sustainable entrepreneurship*; Schaltegger, Beckmann & Hockerts, 2018b) oder der Wirkungsmessung (Epstein, Elkington & Leonard, 2018; Schaltegger & Wagner, 2006; Schaltegger, Bennett & Burritt, 2006) in den Mittelpunkt gerückt. Eine Brücke zwischen diesen

Literatursträngen und der Institutionenanalyse einschließlich Untersuchung von Organisationsformen muss noch geschlagen werden (*siehe F2.3*).

Die Organisationsfrage nehmen Alexius und Furusten in den Blick, wenn sie hybriden Organisationen die Rolle zuschreiben, bei der Entstehung eines neuen, nachhaltigeren Pfades mitzuwirken. Alexius und Furusten (2019) präsentieren eine Fallstudie, in der sie zeigen, dass es einem Sozialunternehmen gelingen kann, Spannungen abzubauen und durch das zugeschriebene Vertrauen und die Autorität einen Dialog und Austausch zwischen unterschiedlichen Gruppen zu erzeugen. Als Mittler ermöglicht das Sozialunternehmen damit, dass sich nachhaltige Praktiken ausbreiten. Ähnlich sieht Jay (2013) in den unterschiedlichen Motiven und Logiken hybrider Organisationen und den Auseinandersetzungen mit konfligierenden Zielstellungen das Innovationspotenzial begründet.

Die Position hybrider Organisationen beschreiben Alexius und Furusten (2019) allerdings als fragil und temporär. Dies mag als Hinweis auf die Bedeutung unterschiedlicher Phasen der Markt- und Unternehmensentwicklung dienen. Valentinov weist noch auf einen anderen Punkt hin, nämlich das Verhältnis von For-Profit-Unternehmen und NPOs, wobei Letzteren eine ausgleichende Rolle zukomme (Valentinov, 2015, S. 82). Daraus lässt sich umgekehrt schließen, dass sich eine Ausbreitung nachhaltiger Unternehmenspraktiken auch auf die Geschäftsmodelle von NPOs auswirken, wenn also ein Ausgleich nicht mehr notwendig ist.

Soll eine Aussage über die Rolle hybrider Organisationsformen in Nachhaltigkeitstransformationen und die Entwicklung dieser Organisationen getroffen werden, wird daher ein vertieftes Wissen über konkrete institutionelle Arrangements benötigt. Aus diesem Grund wird mit genossenschaftlichen Ansätzen in der vorliegenden Arbeit ein Typus hybrider Organisationen ausgewählt und hinsichtlich seiner Binnendifferenzierung in unterschiedlichen Kontexten näher analysiert. Die dabei erzielten Erkenntnisse gilt es sodann in weiterführenden Arbeiten mit solchen zu anderen hybriden Organisationsformen zu vergleichen (*siehe F2.2*).

4 Diskussion methodischer Implikationen

4.1 Überblick

Die bisherigen Ausführungen in Kapitel B dienten der Darstellung des (praktischen) Ausgangsproblems – der Nachhaltigkeitstransformation des Energiesystems – und der damit verbundenen Herausforderungen, der Herleitung der Forschungslücken, die im Bereich der institutionell-organisatorischen Fragen – insbesondere mit Blick auf genossenschaftliche Ansätze und deren Rolle(n) – gesehen werden, sowie der Hervorhebung einzelner Aspekte, die in diesem Kontext einer vertieften Analyse bedürfen, insbesondere das Zusammenspiel mit dem politischen System über die unterschiedlichen Ebenen, die kontextuelle Einbettung und Entwicklung genossenschaftlicher Organisationen sowie Fragen von Gerechtigkeit, Legitimität und Akzeptanz. Aus den praktischen Herausforderungen können sich darüber hinaus methodische

Implikationen für die Analyse ableiten; dies geschieht im Folgenden. In den Charakteristika von Nachhaltigkeitstransformationen als große Herausforderungen liegt ein besonderes Vorgehen begründet, das die Nachhaltigkeitsforschung insgesamt auszeichnet. Es lässt sich pointiert wie folgt umreißen (Bergmann et al., 2010; Defila & Di Giulio, 2016; D. Lang et al., 2012; Schaltegger, Beckmann & Hansen, 2013; Schneidewind & Singer-Brodowski, 2013):

- Inter- und Transdisziplinarität: Das Verständnis verschiedener Elemente der Systeme wird durch komplementäre disziplinäre Perspektiven erhöht. Die Generierung unterschiedlicher Formen von Wissen und Handlungsorientierung werden durch Integration von Praxisakteuren in den Forschungsprozess abgesichert.
- Methodenpluralismus: Aus der Integration unterschiedlicher disziplinärer Perspektiven folgt mittelbar der Einsatz verschiedener methodischer Herangehensweisen, mittels derer im Sinne einer Methodentriangulation (auch: *mixed methods*) verschiedene Aspekte eines Untersuchungsgegenstandes komplementär ausgeleuchtet oder die gleichen Forschungsgegenstände zwecks Validierung analysiert werden.
- Nutzung theoretischer/konzeptioneller Rahmen (*frameworks*): Die Integration von Erkenntnissen aus unterschiedlichen disziplinären Perspektiven erfolgt im Regelfall unter Nutzung von theoretischen bzw. konzeptionellen Rahmen.

Die einzelnen Punkte werden in den nachfolgenden Abschnitten ausführlicher erläutert. Ziel ist es bei einer solchen Heransgehensweise, die Mensch-Umwelt-Systeme adäquater zu modellieren und zu konzeptualisieren (Kates et al., 2001; Pohl, Wülser & Hirsch Hadorn, 2010).

4.2 Interdisziplinarität und disziplinäre *cross-overs*

Die Notwendigkeit für interdisziplinäres Arbeiten wurde in den voranstehenden Abschnitten extern begründet: Die Komplexität des Problems macht eine solche Herangehensweise erforderlich, um die Problemlösungskapazität der Wissenschaft zu erhöhen und – sozial robustes – Wissen für die Praxis, u. a. die Politik (interdisziplinäre Politikberatung), bereitzustellen. Ein solcher Ansatz wird seit langem eingefordert (Bora, 2010), ist etwa aus den Science & Technology Studies (STS) bekannt (Weingart & Stehr, 2000) und wurde und wird unter verschiedenen Schlagwörtern wie „post-normal science“ (Funtowicz & Ravetz, 1990, 1993), „Modus 2-Wissenschaft“ (Gibbons et al., 1994) und „transformative Wissenschaft“ (Schneidewind & Singer-Brodowski, 2013) diskutiert. Neben die externe Kritik tritt dabei die interne an den negativen Folgen der disziplinären und subdisziplinären Spezialisierung, die dazu führe, dass Systemzusammenhänge und -dynamiken nicht hinreichend verstanden würden und die Forschung an praktischer Relevanz verliere (Bogner, Kastenhofer & Torgersen, 2010). Die Reintegration spezialisierter Disziplinen erfolgt durch Multi- bzw. Pluridisziplinarität mittels Herunterbrechen von Komplexität und parallele Bearbeitung durch unterschiedliche disziplinäre Ansätze, durch Interdisziplinarität mittels Kombination verschiedener Wissensbestände und durch Transdisziplinarität mittels umfassender Einbindung der Perspektive von Praxisakteuren (Klein, 2017; Schaltegger et al., 2013). Interdisziplinarität ist insofern dem Anspruch nach mehr als nur ein Nebeneinander unterschiedlicher disziplinärer Perspektiven, sondern vielmehr die integrative Erfassung des sozialen Gegenstandes (Groeben, 1999). In diesem Sinne bemüht sich ein Zweig der Institutionenökonomik um Brücken zu verwandten Sozialwissenschaften und die Entwicklung einer interdisziplinären Institutionenanalyse (Zweynert & Boldyrev, 2018), der auch der hier verfolgte Ansatz zuzurechnen ist (*siehe auch C2*).

Die Schwierigkeiten inter- und transdisziplinärer Forschung, angefangen bei der uneinheitlichen Terminologie, sind hinlänglich bekannt und ausführlich diskutiert worden (Bogner, Torgersen & Kastenhofer, 2010; Klein, 2008; Kocka, 1987; Wehrden et al., 2018). Dessen ungeachtet erscheint es notwendig für das Verständnis der institutionell-organisatorischen Seite von Nachhaltigkeitstransformationen des Energiesektors, unterschiedliche Ansätze aus verschiedenen Disziplinen zu integrieren, nicht zuletzt, um die unterschiedlichen Ebenen adäquat zu erfassen (Wittneben et al., 2012). Markard (2017) hebt solche Grenzüberschreitungen (*cross-overs*) als Innovationen für eine produktive Weiterentwicklung theoretischer Ansätze im Bereich von Nachhaltigkeitstransformationen hevor. Die vorstehenden Ausführungen legen zwei „cross-overs" nahe: zur Soziologie (und/oder Sozialpsychologie) mit Blick auf die angesprochenen „sozialen Aspekte" wie Akzeptanz, Legitimität und Gerechtigkeit (*energy justice*) sowie zur Politikwissenschaft angesichts der Bedeutung, die das politische Subsystem für den Energiesektor besitzt – hier sowohl mit Blick auf die Interaktion von institutioneller Umwelt und Organisation des Energiesektors (*varieties of capitalism*) als auch hinsichtlich der Wechselwirkungen über unterschiedliche Governanceebenen hinweg (*global governance*). Darüber hinaus wird auf Erkenntnisse der politikwissenschaftlichen Partizipationsforschung zurückgegriffen. Das hier verfolgte Ziel ist dabei in gewisser Weise eine Integration (*bridging*) als partielle Loslösung von disziplinären Grenzen im Sinne der Transdisziplinarität nach Mittelstraß (1998, S. 44) bzw. „echter" Interdisziplinarität, perspektivisch die Herausbildung einer sozialwissenschaftlichen Institutionenanalyse des Energiesektors, die man mit Bora (2010, S. 35) als neue Subdiszplin betrachten könnte.

Der weitere Schritt, die Einbeziehung wissenschaftsexterner Akteure in das Design und die Durchführung der Forschung, wird hier nicht vollzogen; er bleibt nachfolgenden Forschungsarbeiten vorbehalten. Vielmehr geht es primär um die Generierung von (sozialwissenschaftichem) Systemwissen durch verbesserte analytisch-deskriptive Werkzeuge – dem ersten Modus von Nachhaltigkeitswissenschaften bei Wiek, Ness, Schweizer-Ries, Brand und Farioli (2012). Hieraus lassen sich allerdings Implikationen für handlungsleitende Fragestellungen im Sinne „vernünftigen Gestaltens" (D. Schneider, 2001) generieren, worauf im Fazit (*siehe F2.2*) näher eingegangen wird.

4.3 Methodenvielfalt

Der Rückgriff auf unterschiedliche disziplinäre Zugänge impliziert im Regelfall auch die Nutzung verschiedener Methoden oder wenigstens die Analyse von Ergebnissen, die mit unterschiedlichen Methoden gewonnen wurden. Ähnlich wie bei der Frage nach der Interdisziplinarität können mit einer solchen Methodentriangulation verschiedene Zielsetzungen verbunden sein, insbesondere die Analyse verschiedener (Unter-)Fragestellungen mithilfe jeweils passender Methoden oder die Validierung von Erkenntnissen durch die Anwendung verschiedener Methoden zur Beantwortung der gleichen Fragestellung. Methodenpluralismus zeichnet die Nachhaltigkeitswissenschaften ebenso wie andere inter- und transdisziplinäre Forschungsfelder aus, wird aber auch für einzelne Subdisziplinen wie die Organisationstheorie (Delbridge & Fiss, 2013) gefordert.

In der vorliegenden Arbeit wird, entsprechend der Idee des „methodological fit" (Edmondson & Mcmanus, 2007), auf unterschiedliche qualitative und quantitative Methoden zurückgegriffen. Dabei ist zunächst zu konstatieren, dass quantitative Forschung zu genossenschaftlichen Ansätzen im Energiebereich mangels verlässlicher standardisiert erhobener Daten, diverser Abgrenzungsprobleme (Kahla, Holstenkamp, Müller & Degenhart, 2017) und forschungspraktischer Probleme, etwa der Rekrutierung von Befragungsteilnehmern, erschwert wird. Experimentelle Ansätze zur Beantwortung der Frage nach der Rolle genossenschaftlicher Ansätze im Energiebereich erscheinen wenig vielversprechend, soweit eine Variation institutioneller Arrangements bei konstanter institutioneller Umwelt schwer vorzufinden, geschweige denn zu erzeugen ist. Teilfragen können allerdings auch mit quantitativen Ansätzen beantwortet werden, in der vorliegenden Arbeit etwa die Frage nach den Motiven der Bürgerinnen und Bürger, die sich an Bürgerenergiegesellschaften in Deutschland finanziell beteiligen (*siehe E6*). Dabei wird für die Bestimmung der Grundgesamtheit auf eine im Rahmen der vorliegenden Arbeit und an der Professur für Finanzierung und Finanzwirtschaft entwickelte Datenbank von Energiegenossenschaften (gemeinsam mit Jakob Müller, Universität Erfurt) und Bürgerenergiegesellschaften zurückgegriffen (Kahla et al., 2017).

In E5 werden die Ergebnisse aus dieser Befragung, einer ähnlichen Umfrage unter Mitgliedern zweier weiterer Energiegenossenschaften sowie einer umfangreicheren standardisierten Befragung von Radtke (2016) mit Ergebnissen einer qualitativen Befragung unter australischen Bürgerenergieakteuren kombiniert, um ergänzende Informationen zu den sozialen Mechanismen der Mitgliederselektion zu gewinnen. Neben diesem Mixed-Methods-Design kommen in den anderen beiden empirischen Arbeiten (*siehe E3*, *E4*) qualitative, leitfadengestützte Interviews zur Anwendung. Die übrigen zwei Fachartikel basieren bezüglich der empirischen Daten auf einer systematischen Literaturauswertung (*siehe E1*) – eine narrative Metaanalyse (Poteete, E. Ostrom & Janssen, 2010) mit Kodierung der vorhandenen Informationen zu einzelnen Fällen – bzw. rekurrieren zur Illustration der konzeptionellen Überlegungen auf vorhandene Fallbeschreibungen in der Literatur (*siehe E2*). Es handelt sich mithin nicht um eigene empirische Arbeiten, sondern solche zur konzeptionell-theoretischen Weiterentwicklung und Typologisierung.

4.4 Funktion und Einsatz von *frameworks*

Die Forschung zu Nachhaltigkeitstransformationen arbeitet mit vielen sehr unterschiedlichen *frameworks*, die das dritte hier diskutierte methodische Charakteristikum darstellen. Zu den viel genutzten *frameworks* zählen beispielsweise die *Multi-Level Perspective* (MLP) oder *Technological Innovation Systems* (TIS) (für eine Übersicht: Li et al., 2015). Vielfach stehen dabei Technologien und technologischer Wandel im Mittelpunkt, weniger die organisatorische Seite (Markard, 2017). Aus diesem Grund sind verschiedene Überlegungen zur Erweiterung und Kombination mit anderen *frameworks* entwickelt worden (Cherp et al., 2018).
Bereits der Zusatz – zumeist *analytical* oder *theoretical*, *conceptual, ontological* oder *explanatory* – deutet den nicht immer eindeutigen methodologischen Status solcher *frameworks* an. Ostrom unterscheidet, ähnlich wie Rapoport (1985), *frameworks*, Theorien und Modelle: *Frameworks* stellen das Basisvokabular an Konzepten und Begriffen zur Verfügung, mit deren Hilfe Theorien gebildet werden. Diese konstruieren einen kausalen Zusammenhang zwischen einer ausgewählten Zahl an Variablen. Dagegen bildet ein Modell eine Auswahl solcher kausalen Zusammenhänge in konkreten Anwendungsfällen ab (McGinnis & E. Ostrom, 2014; E. Ostrom, 2008). Nach dieser Lesart handelt es sich bei *frameworks* nicht um Theorien, sondern um eine Liste von Variablen, die einen Einfluss auf die relevanten Prozesse haben können (Poteete et al., 2010, S. 236). Demgegenüber betont Hagedorn, dass eine theoriefreie Auswahl der Variablen nicht möglich sei (Hagedorn, 2011, 2013). *Analytical frameworks* entstünden in einem iterativen Prozess von theoretischen Überlegungen, empirischer Exploration und zielgerichteter Analyse vor einem bestimmten Problemhintergrund auf der einen sowie Entwicklung bzw. Weiterentwicklung des *frameworks* auf der anderen Seite (ähnlich: Dopfer & Potts, 2004). Die oben benannten *frameworks* aus dem Bereich von Nachhaltigkeitstransformationen wurden beispielsweise überwiegend unter Rückgriff auf mehrere Theorien entwickelt. So sind in die MLP Erkenntnisse aus STS und evolutionärer Ökonomik eingegangen (Cherp et al., 2018; Geels, 2010; Smith, Voß & Grin, 2010). Cherp et al. (2018) sprechen in diesem Zusammenhang von „multi-theory frameworks“. Ein *framework* bildet damit nicht einfach eine „metatheoretische“ Sprache zum Vergleich von Theorien (contra Binder, Hinkel, Bots & Pahl-Wostl, 2013; McGinnis & E. Ostrom, 2014). Eine klare Unterscheidung und Trennung von Theorie, Modell und *framework*, wie sie McGinnis und E. Ostrom (2014) vornehmen, ist praktisch nicht möglich. Insofern beinhalten *frameworks* bereits einige theoretische Vorüberlegungen, allein durch die Auswahl und Ordnung der Elemente.

Frameworks nehmen unterschiedliche Funktionen wahr (Coral & Bokelmann, 2017; Hagedorn, 2011; E. Ostrom, 2005, 2008):

- Es werden möglichst vollständig alle (potenziell) relevanten Ebenen und Elemente für die gewählte theoretische Fragestellung abgebildet, d. h. geordnet. Die Abbildung beschränkt sich nicht allein auf ökonomische bzw. soziale Variablen, sondern umfasst auch technische Elemente und solche der natürlichen Umwelt.
- Sie bilden eine einheitliche Heuristik („Sprache“) zur Beschreibung von Vorgängen über disziplinäre Grenzen hinweg und ermöglichen die Kommunikation untereinander. Dadurch sorgen *frameworks* für Kohärenz und ebnen den Weg für die Akkumulation von Erkenntnissen aus unterschiedlichen Disziplinen.
- *Frameworks* bilden eine Plattform für die Entwicklung theoretischer Erklärungen und Modelle, indem sie Material ordnen und Muster kenntlich machen.

Die Weiterentwicklung solcher *frameworks* geschieht üblicherweise durch den beschriebenen iterativen Theoriebildungsprozess und durch Ausweitung des Anwendungsbereichs (*bonding*) oder durch den Austausch mit und Einbezug von anderen *frameworks* (*bridging*). Eine solche Brücke wird hier zu Theorien von *global governance* zwecks Erfassung der unterschiedlichen Governanceebenen, zu *varieties of capitalism* als Ansatz zur Typologisierung institutioneller Umwelten sowie zu den Konzepten von *energy justice* und *social license to operate* geschlagen. Die Erkenntnisse aus den Arbeiten und deren Umsetzung innerhalb des *SES framework* werden in Abschnitt F1.1 diskutiert.

5 Zwischenfazit

Die vorstehenden Ausführungen zeigen, dass die unterschiedlichen, sich teils widersprechenden bzw. strittigen und unscharf formulierten Zielsetzungen, „unvollkommene“, aber notwendige regulatorische Eingriffe und *widespread externalities* in einer *second-best world* und die Verschränkungen mit anderen Sektoren die Nachhaltigkeitstransformation des Energiesektors aufgrund der resultierenden Komplexität zu einem „grand challenge“ bzw. „wicked problem“ machen. Vor diesem Hintergrund ist ein Ansatz zu entwickeln, der (mindestens) interdisziplinär ist, verschiedene Methoden zur Anwendung bringt und ein *framework* bzw. *frameworks* als Heuristik(en) nutzt. Dabei müssen die folgenden Aspekte Berücksichtigung finden:

- die Relevanz technologischer wie institutioneller Pfadabhängigkeiten,
- die Bedeutung von *contestation* – sowohl mit Blick auf die Ziele als auch hinsichtlich der Organisationsformen,
- die (historische) Kontextualität von Organisationslösungen,
- die Operationalisierung und Integration von ethischen Konzepten wie *energy justice*, Legitimität und Akzeptanz,

- die Berücksichtigung der unterschiedlichen Governanceebenen und Wechselwirkungen mit anderen Sektoren, u. a. mit dem Finanzsektor,
- die Abbildung sowohl der technischen als auch der sozialen Seite sowie deren Interaktionen.

Zur Erforschung der institutionell-organisatorischen Seite von Nachhaltigkeitstransformationen haben sich Rückgriffe auf institutionenanalytische Werkzeuge und Erkenntnisse als fruchtbar erwiesen, weshalb diese in der vorliegenden Arbeit in den Mittelpunkt gerückt werden, anstatt soziale Aspekte in bestehende technisch-ökonomische Modelle oder ein institutionenanalytisches *framework* in ein bestehendes *framework* zur Analyse von Nachhaltigkeitstransformationen zu integrieren. Ein solcher institutionenanalytischer Zugang sollte möglichst interdisiplinär sein.

Neben diesen Hinweisen auf im *framework* abzubildende Elemente und auf die Wahl des theoretischen und methodischen Instrumentariums legen die obigen Ausführungen, hier die Erläuterungen zu den ökonomischen Besonderheiten des Energiesektors (*siehe B2.2.2*), zwei potenzielle Rollen genossenschaftlicher Ansätze bei der Nachhaltigkeitstransformation des Energiesystems nahe:

- Sie könnten die von Staat und gewinnorientierten Unternehmen in armen Regionen hinterlassene Lücke in der Versorgung mit modernen Formen der Energie schließen. Wegen der Kontextualität solcher institutionellen Lösungen ist damit zu rechnen, dass genossenschaftliche Lösungen in anderen Ländern und zu anderen Zeiten davon verschiedene Rollen eingenommen haben bzw. aktuell einnehmen.
- Durch die Nähe zu Konsumentinnen und Konsumenten können genossenschaftliche Ansätze eine katalytische Wirkung auf Innovationsprozesse ausüben. Dabei ist diese Nähe sowohl als Hinweis auf den sozialen Mechanismus als auch als Bedingung zu verstehen.

Schließlich sind vorstehend einige offene Fragen aufgeworfen worden, die in Kapitel F wieder aufgegriffen werden: (1) die Brücke zwischen der Institutionenanalyse bzw. Analyse der Organisation von Nachhaltigkeitstransformationen und der Literatur zu *social enterprises* und *social entrepreneurship*, (2) die Operationalisierung des Kriteriums der Anpassungseffizienz für die Analyse von Organisationen im vorliegenden Kontext sowie (3) die Frage nach „vernünftigem Gestalten“ der Organisationen bzw. Evaluation von Organisationslösungen, die ein transdisziplinäres Forschungsdesign adäquat erscheinen lassen.

C Institutionenanalyse

1 Institutionenanalyse genossenschaftlicher Ansätze nachhaltiger Energieversorgung

Die vorstehenden Ausführungen haben deutlich gemacht, dass für die hier verfolgten Fragestellungen ein institutionentheoretischer Ansatz naheliegt. Dabei kann grundsätzlich auf sehr unterschiedliche theoretische Stränge zurückgegriffen werden. Über die verschiedenen Institutionalismen – Alter vs. Neuer (Rutherford, 1995; Zweynert & Boldyrev, 2018), *rational choice*, historischer, soziologischer und diskursiver/ideeller/konstruktivistischer (Andrews-Speed, 2016; Cherp et al., 2018) – ist an anderen Stellen ausführlich geschrieben worden, sodass hier entsprechende Verweise reichen mögen. Die Entscheidung für einen bestimmten institutionentheoretischen Ansatz, nämlich den von Ostrom und Kolleginnen/Kollegen („Bloomington School"; Aligică & Boettke, 2009), wird im Folgenden begründet und der Ansatz mit dem in der vorliegenden Arbeit verwendeten SES *framework* genauer vorgestellt (*siehe C2*). Die vorliegende Arbeit verfolgt einen – ähnlich eklektischen wie bei Gawel und Bedtke (2016) – interdisziplinären sozialwissenschaftlichen Ansatz. Insofern wird hier von Institutionenanalyse gesprochen.

Mit der Beschreibung der einzelnen Komponenten des *framework* und damit zusammenhängenden Begriffsklärungen wird der Gegenstand der Untersuchung präzisiert (*siehe C3*). Der Schwerpunkt liegt dabei auf den sozialen, insbesondere den Governancesystemen. Hier werden einzelne der im vorstehenden Kapitel hervorgehobenen und in den Fachartikeln vertieften Aspekte aufgegriffen und konzeptionell zugeordnet. Implikationen für die Gestalt des *framework* werden demgegenüber in Abschnitt F1.1 diskutiert.

Schließlich ist es Ziel des vorliegenden Kapitels, die einzelnen Teile der vorliegenden Arbeit in den Stand der Literatur einzuordnen und von Arbeiten an anderer Stelle abzugrenzen (*siehe C4*). Dazu wird angesichts der Vielzahl an Arbeiten zu genossenschaftlichen Ansätzen im Energiesektor, die in den letzten Jahren parallel zu den Fachartikeln dieser Dissertation erschienen sind, eine Auswahl getroffen.

2 Institutionell-organisatorische Seite von Infrastrukturen und sozial-ökologische Systeme

2.1 <u>Infrastrukturen und Institutionen – der Ansatz der „Bloomington School"</u>

Zunächst wird die Auswahl des hier gewählten Ansatzes begründet, und es werden einige Implikationen bzw. weitergehende Fragestellungen skizziert, die an folgenden Stellen wieder aufgegriffen werden. Selbst wenn man sich auf ökonomische Ansätze zur Analyse von Institutionen und Infrastrukturen beschränkt, verbleibt eine größere Zahl an Anknüpfungspunkten.

So unterscheidet Estache (2016) insgesamt acht verschiedene Zugänge, die er mit „Laffont view“ (*agency theory*, *incomplete contract theory*), „Spiller or transaction costs cum politics view“, „legalistic or Shleifer view“, „broad public choice view“, „anthropological or Ostrom view“, „dynamic political, more historical, or Acemoglu-Robinson-Rodrik view“, „emerging behavioral view“ und „empiricist(s) view“ bezeichnet. Das Label „anthropological“ für den Ostromschen Ansatz ist dabei, wenigstens mit Blick auf die disziplinäre Zuordnung, leicht irreführend, auch wenn Ostrom zahlreiche Erkenntnisse aus ethnologischen Studien zu Allmendegütern weltweit aufgenommen hat. Die Bezeichnung erklärt sich wohl aus der Betonung der Bedeutung von Kultur und Normen, die Estache (2016, S. 11) hervorhebt und mit den Namen Bardhan, Ostrom und Platteau verbindet, sowie mit der Offenheit für andere disziplinäre, auch ethnologische, Zugänge bzw. Betonung der Notwendigkeit interdisziplinären Lernens (Estache, 2016, S. 38).

Ostrom geht grundsätzlich von einem Rational-Choice-Ansatz aus, reichert ihn aber um Elemente an, die sie u. a. aus der verhaltensökonomischen Forschung entnimmt (E. Ostrom, 1990, 2005). Dies zeigt sich am handlungstheoretischen Kern des *framework*, auf den in Abschnitt C3.5 näher eingegangen wird. Während das *framework* damit prinzipiell im Rational-Choice-Institutionalismus verwurzelt ist, bleibt es offen für Erweiterungen auch aus unterschiedlichen Disziplinen und Zugängen. Dabei muss aber mit Bedacht vorgegangen werden (Ollivier, Magda, Mazé, Plumecocq & Lamine, 2018), weshalb dieser Punkt in der Diskussion der Erkenntnisse aus den Fachartikeln noch einmal aufgegriffen wird (*siehe F1.1*).

Anders als die Zuordnung der Bloomington School zur Neuen Politischen Ökonomie (*public choice*) suggerieren könnte, lehnen aber beide, Elinor und Vincent Ostrom, eindeutige politische Schlussfolgerungen und vereinfachte Varianten von *public choice* ab (McGinnis & E. Ostrom, 2012), insbesondere die Idee, es gebe ein Allheilmittel zur Lösung von Problemen kollektiven Handelns (E. Ostrom, Janssen & Anderies, 2007). Vielmehr wollen sie die institutionelle Vielfalt in der Praxis erfassen und untersuchen (E. Ostrom, 2005). Ziel von Elinor Ostrom ist es zu zeigen, dass unter bestimmten Voraussetzungen Selbstorganisation von Allmendegütern (*common pool resources*, CPR, kurz auch: *commons*) funktionieren kann. Von Vincent Ostrom stammt das Konzept der Polyzentrizität (Aligică & Boettke, 2009; Aligică & Tarko, 2012; V. Ostrom, Tiebout & Warren, 1961), auf das auch Elinor Ostrom zurückgreift (E. Ostrom, 2010a).

Unter beiden Gesichtspunkten – Erfassung und Analyse institutioneller Vielfalt sowie der Voraussetzungen für erfolgreiche Selbstorganisation – bestehen Ähnlichkeiten zu den Forschungszielen der vorliegenden Arbeit, weshalb der Rückgriff auf das Ostromsche SES *framework* angemessen erscheint. So zielt die Arbeit u. a. auf eine differenzierte Erfassung dessen, was als genossenschaftlicher Ansatz subsumiert werden kann. Ob dies etwa mit Hilfe der Transaktionskostenökonomik gelingen kann, mit ihrer Dreiteilung in Märkte, Hierarchien und

Hybriden, erscheint fraglich. Von der Grundidee her geht es zudem bei genossenschaftlichen Ansätzen um die Selbstorganisation von Verbraucherinnen und Verbrauchern. Vor diesem Hintergrund ist eine Nähe von Genossenschaften und CPR postuliert worden (Acosta, Ortega, Bunsen, Koirala & Ghorbani, 2018; Hanisch, 2010).

2.2 Sozial-ökologische Systeme

Zur Analyse der Bewirtschaftung von Allmendegütern, einschließlich der dafür installierten Infrastrukturen, haben Ostrom und Kolleginnen/Kollegen zunächst das *Institutional Analysis and Development* (IAD) *framework* entwickelt (E. Ostrom, 2005), das später zum SES *framework* erweitert wurde (E. Ostrom, 2007), dabei auf verschiedene Vorarbeiten (Anderies, Janssen & Ostrom, 2004; Berkes & Folke, 1998) aufbauend. Für die Analyse von Mensch-Umwelt-Beziehungen in sozial-ökologischen Systemen sind verschiedene *frameworks* entworfen worden, auf die hier nicht näher eingegangen werden soll (Binder et al., 2013; Hagedorn, 2011). Das SES *framework* wird in der vorliegenden Arbeit wegen seiner anthropozentrischen Perspektive, d. h. dem Fokus auf die sozialen Systeme, seiner umfassenden Liste an Variablen, die eine Anwendung auf sehr viele unterschiedliche Systeme erlaubt, und seiner Analyseorientierung ausgewählt (Binder et al., 2013).
Der Begriff des sozial-ökologischen Systems (auch: sozio-ökologischen Systems) soll zunächst verdeutlichen, dass soziale und ökologische Systeme miteinander verbunden sind. So definieren Anderies et al. (2004) sozial-ökologische Systeme als

> *„an ecological system intricately linked with and affected by one or more social systems. An ecological system can loosely be defined as an interdependent system of organisms or biological units. 'Social' simply means 'tending to form cooperative and interdependent relationships with others of one's kinds'".*

Da auch technische Systeme eine Rolle spielen, wäre es präziser, von „sozio-ökologisch-technischen Systemen" (*Socio-Ecological-Technical Systems*, SETS) zu sprechen. Weil sich aber SES als Terminus etabliert hat und man die technischen Artefakte auch als Teil der Ressourcensysteme betrachten kann, werden die Begriffe hier synonym verwendet. SETS steht stets dann, wenn das Technische besonders hervorgehoben werden soll.
Das *framework* ist in verschiedene Ebenen (*tiers*) aufgeteilt, um die Variablen, die in verschiedenen empirischen Untersuchungen als relevante Einflussfaktoren identifiziert worden sind, zu strukturieren (Colding & Barthel, 2019). Dahinter steht die Idee, dass ein SES stets aus bestimmten Elementen aufgebaut ist, die die Oberkategorien bzw. -konzepte darstellen (*first tier*; *siehe Abb. 2*). Dies sind beim SES *framework* im Zentrum die *focal action situations* mit Interaktionen (*interactions*, I) und Ergebnissen (*outcomes*, O). Gemeinsam mit den Akteuren (*actors*, A; in vorherigen, auf Allmendegüter fokussierten, Versionen: *users*, U; E. Ostrom, 2009) bilden die *focal action situations* den handlungstheoretischen Kern – Akteure agieren

miteinander und erzielen dabei bestimmte Ergebnisse. Dabei sind die Akteure und die Verhaltensannahmen näher zu spezifizieren (*siehe C3.5*). Hinzu treten Ressourcensysteme (*resource systems*, RS), einschließlich oder ergänzt um die technischen Systeme, die Ressourceneinheiten (*resource units*, RU) und mit dem betrachteten SES verbundene Ökosysteme (*related ecosystems*, ECO). Alle drei Elemente zusammen bilden die natürliche Umwelt und die Artefakte ab (*siehe grüne Felder in Abb. 3*), deren Funktionieren überwiegend naturwissenschaftlich-technisch untersucht wird. Insofern tritt der linke Teil der Abbildung – das ökologisch-technische System – in den vorliegenden, sozialwissenschaftlichen Analysen gegenüber dem rechten Teil – dem sozialen System – eher in den Hintergrund (so auch: Poteete et al., 2010, S. 235). Es sei aber darauf verwiesen, dass die Art der Transaktionen und der Ergebnisse wesentlich von den Merkmalen der ökologisch-technischen Elemente bestimmt werden.

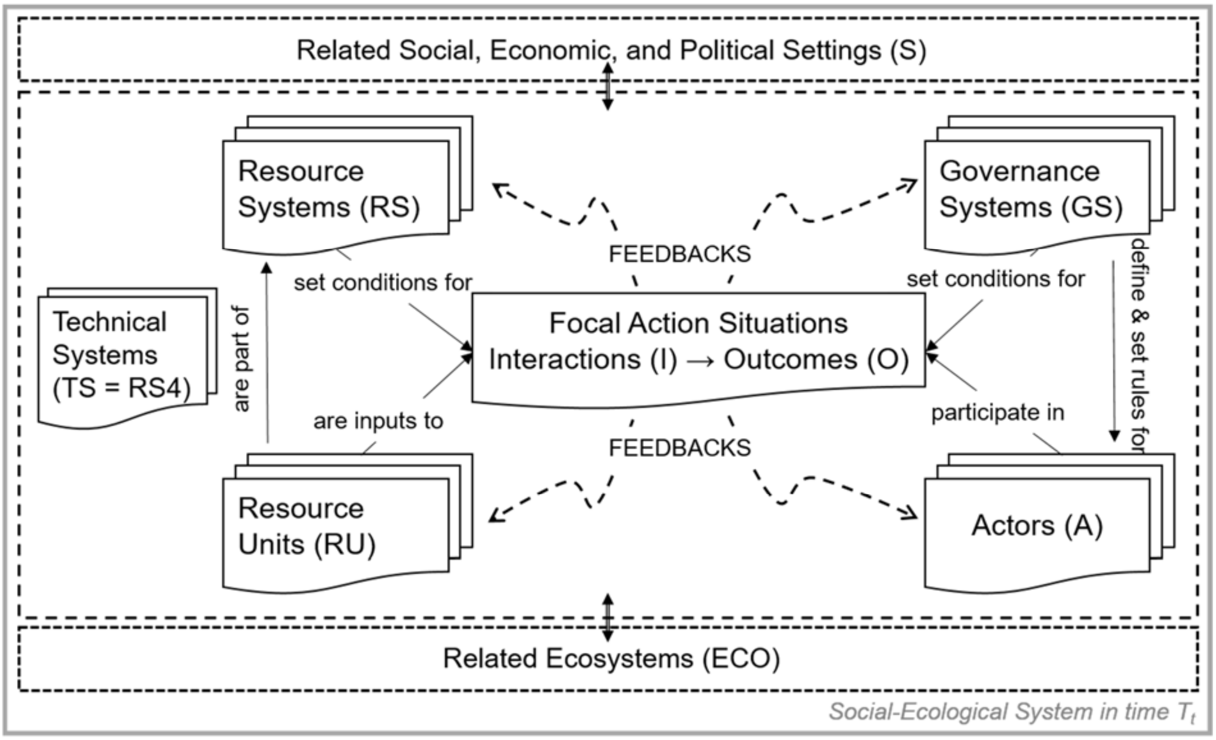

Abb. 2: ***Darstellung des SES framework – Zusammenhänge der Elemente auf der ersten Ebene***

Quelle: McGinnis und E. Ostrom (2014), mit eigenen Modifikationen.

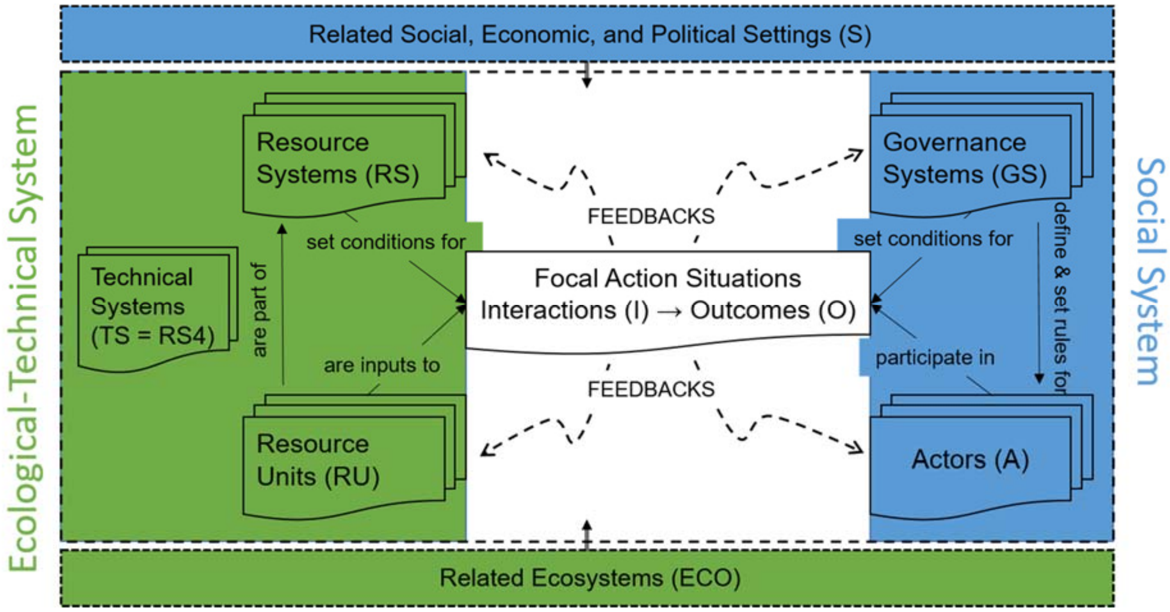

Abb. 3: ***Ökologisch-technisches und soziales System im SES framework***

Quelle: Eigene Darstellung auf Basis von McGinnis und E. Ostrom (2014).

Das „soziale System“ (*siehe Abb. 4*) umfasst im SES *framework* neben bereits genannten *focal action situations* und *actors* zentral die Governancesysteme (GS) und die verbundenen sozialen, ökonomischen und politischen Rahmenbedingungen (*related social, economic, and political settings*, S). Wie die nachstehenden Ausführungen zeigen, sind Institutionen unter diesen beiden Elementen auf der ersten Ebene – GS und S – zu subsumieren.

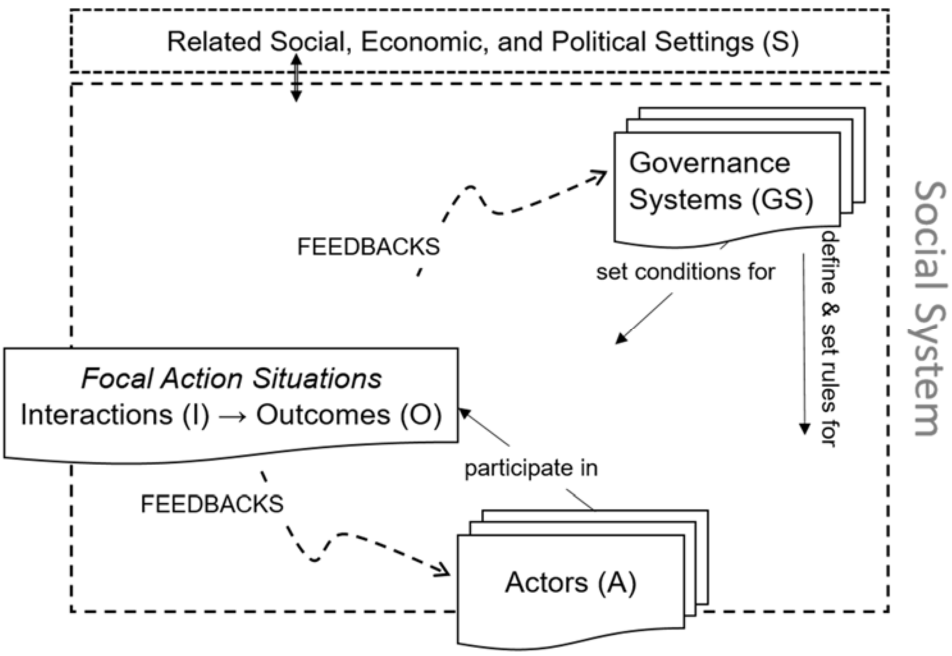

Abb. 4: ***Elemente des sozialen Systems innerhalb des SES framework***

Quelle: Eigene Darstellung auf Basis von McGinnis und E. Ostrom (2014).

Unterhalb dieser ersten Ebene mit *focal action situations* (einschließlich I und O), ökologisch-technischem (RS/TS, RU, ECO) und sozialem System (A, GS, S) werden verschiedene weitere Ebenen (*second tier, third tier* etc.) angesiedelt, die für die sozialen Systeme im folgenden Abschnitt C3 im Zusammenhang mit der Klärung zentraler Begriffe teilweise detailliert werden.

3 Begriffliche Grundlagen

3.1 Institutionen, institutionelle Arrangements und institutionelle Umwelten

Zu den Begriffen und Konzepten, die im Folgenden definiert und beschrieben sowie hinsichtlich ihrer Verortung innerhalb des *framework* diskutiert werden, zählt jener der **Institution**. Über die Definition dieses grundlegenden Begriffs herrscht in der Institutionenanalyse keine Einigkeit. Grundsätzlich lassen sich zwei verschiedene Positionen unterscheiden, die kurz mit „Institutionen als Spielregeln" und „Institutionen als Gleichgewicht eines Spiels" umschrieben werden können (Richter & Furubotn, 2010, S. 9). Ostrom hat sich in ihren Arbeiten der erstgenannten Auffassung angeschlossen und definiert Institutionen mit North als „humanly devised constraints that shape human interactions" (North, 1990, S. 3–4). Dabei sei allerdings darauf hingewiesen, dass Institutionen nicht nur Handlungsmöglichkeiten beschränken, sondern auch Akteure befähigen zu handeln (Hodgson, 2006, S. 2; Orban, Sauermann & Trampusch, 2018, S. 115). Um diese Strukturierungsleistung vollbringen zu können, müssen Institutionen von den Akteuren anerkannt werden (legitim sein) und sanktionsbewährt, zudem dauerhaft sein. Unter **institutionellen Arrangements** werden Bündel einzelner Vereinbarungen verstanden, die durch das Handeln der direkt Beteiligten modifiziert werden können. Sie bestimmen die Art, in der die betrachteten ökonomischen Einheiten kooperieren oder konkurrieren können. Demgegenüber werden alle für diese Individuen exogenen Institutionen als **institutionelle Umwelt** bezeichnet (Davis & North, 1970, S. 135; Erlei, 2010, S. 76). Die genaue Abgrenzung der institutionellen Arrangements von ihrer institutionellen Umwelt hängt von der konkreten Fragestellung und den Grenzen des betrachteten Systems ab (Küssner, 1995, S. 10).

Organisationen sind eine besondere Form von Institutionen mit Regeln zur Abgrenzung von Mitgliedern und Nichtmitgliedern sowie Regeln zum Prozess der Entscheidungsfindung bzw. Klärung von Verantwortlichkeiten (Hodgson, 2006, S. 8). North hat sie auch als „Spieler eines Spiels" gekennzeichnet (North, 1990, 2005). Eine solche Definition wirft die Frage nach der Handlungsfähigkeit (*agency*) einer Gruppe von Personen auf (*siehe C3.5*). Wird in Organisationen „die persönliche Seite der Institution" (Schmoller, 1900; auch: Richter & Furubotn, 2010, S. 10) gesehen, so sind sie eher den Akteuren (A) zuzuordnen.

Es sind in der Literatur verschiedene Klassifikationen von Institutionen entwickelt worden, zuvorderst die Unterscheidung zwischen formellen und informellen Institutionen – wobei formelle

Institutionen üblicherweise rechtlich fixierte und gerichtlich einklagbare soziale Regeln bezeichnen (Hodgson, 2006, S. 11–13). Institutionen können zudem in verschiedene Ebenen unterteilt werden. So unterscheidet etwa Williamson (2000, S. 597) die vier Ebenen „embeddedness“, „institutional environment“, „governance“ und „resource allocation and employment“. Bei North, Wallis und Weingast (2009) findet sich demgegenüber die Unterteilung in „institution“ (Institution), „organization“ (Organisation) und „social order” (Gesellschaftsformation). Auch das SES *framework* weist eine Differenzierung von Institutionen auf, die dem Rahmen oder dem Governancesystem zugeordnet werden (*siehe Abb. 5*) – allerdings quer zu Williamson oder North u. a. und ohne offensichtliche Hierarchie. Auf die Binnendifferenzierung von GS wird nachfolgend eingegangen, sodass hier zunächst eine Konzentration auf den Rahmen (S) und die Abgrenzung zwischen S und GS erfolgen kann.

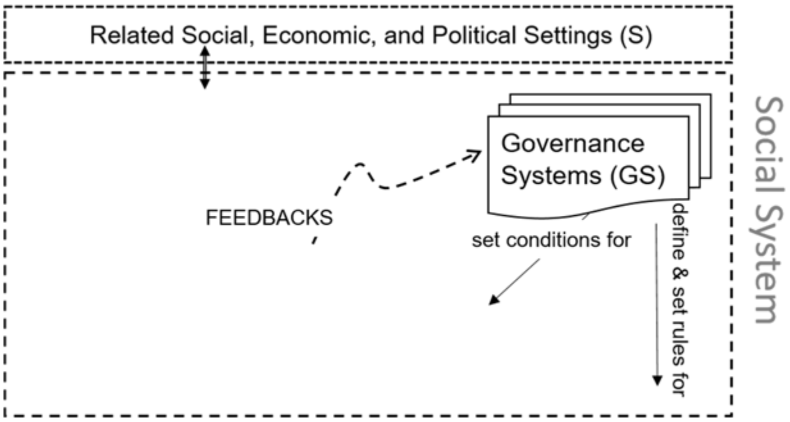

Abb. 5: Institutionelle Elemente im SES framework

Quelle: Eigene Darstellung auf Basis von McGinnis und E. Ostrom (2014).

Tab. 1: Liste an Eigenschaften der verbundenen sozialen, wirtschaftlichen und politischen Rahmen (S), zweite Ebene

Second-tier variable		
S1	Economic development	☐
S2	Demographic trends	☐
S3	Political stability	●
S4	Other governance systems	●
S5	Markets	●/☐
S6	Media organization	●
S7	Technology	☐

☐: Rahmendaten, ●: Institutionen

Quelle: McGinnis und E. Ostrom (2014, S. 9)

Die sieben Elemente auf der zweiten Ebene im *multi-tier framework* beinhalten sowohl allgemeine Rahmendaten als auch institutionelle Elemente (*siehe Tab. 1*). Unter Letzteren ist die politische Stabilität (S3) zu nennen, die dann ein institutionelles Element darstellt, wenn und soweit Fragen der politischen Kultur hinzugezählt werden. Bei den „anderen Governancesystemen“ (S4) ist die Zuordnung ebenso offensichtlich wie bei der Organisation der Medien (S6).

Märkte (S5) schließlich stellen spezifische institutionelle Arrangements dar, wobei unter S5 auch nicht-institutionelle Charakteristika von Märkten wie die Konkurrenzsituation subsumiert werden.

Die Abgrenzung von Governancesystemen innerhalb des betrachteten SES und den Rahmenbedingungen ist nicht immer offenkundig (del Mar Delgado-Serrano & Ramos, 2015). Es liegt nahe, GS mit den institutionellen Arrangements und die institutionellen Elemente von S mit der institutionellen Umwelt gleichzusetzen – wobei auch diese Unterscheidung, wie erwähnt, bei der Problematik der fehlenden Trennschärfe in der praktischen Anwendung nicht weiterführt. Letztendlich ist es eine Frage, wo bei der Analyse die Systemgrenze gesetzt wird. Dies ist insbesondere dann von Relevanz, wenn politische Prozesse betrachtet werden, wo unterschiedliche Ebenen miteinander interagieren (*siehe C3.2, F1.1*).

3.2 Governancesysteme

Das SES *framework* weist mit Governancesystemen und Akteuren eine Trennung in Struktur (hier: GS) und Handlungsfähigkeit (*agency*; hier: A) auf (McGinnis & E. Ostrom, 2014, S. 8). Dabei geht der Governancebegriff über das hinaus, was in den Wirtschaftswissenschaften als „economic governance“ (Dixit, 2009; Williamson, 2005) oder – gelegentlich normativ gewendet und in der Finanzwirtschaft üblich – als „corporate governance“ (Shleifer & Vishny, 1997) bezeichnet wird, ensprechend der dritten, bei Williamson (2000) schlicht „governance“ genannten Ebene. Der Governancebegriff wurde zuerst in der Transaktionskostenökonomik geprägt, später dann in den Internationalen Beziehungen und der Policy-Forschung aufgegriffen und erweitert (Benz, 2004). **Governance** bezeichnet Prozesse (*politics*) der externen Regelung oder Selbststeuerung in komplexen Strukturen bzw. die Merkmale dieser Strukturen (*polity*). Der letztgenannte institutionelle und damit strukturelle Aspekt steht hier im Vordergrund. Das prozessuale Element wird im SES *framework* durch die *focal action situations* beschrieben (*siehe auch C3.5, F1.1*).

Der interdisziplinäre Governancediskurs verdankt sich der Beobachtung, dass sich die Steuerung politischer, wirtschaftlicher und gesellschaftlicher Prozesse verändert: So fungieren nicht mehr nur Regierungen (*governments*) als zentrale Steuerungsinstanzen. Vielmehr sind verstärkt auch andere Akteure in zunehmend netzwerkartige Strukturen eingebunden. Daraus ergeben sich steuerungspolitische Herausforderungen und ein Formwandel des Regierens (Bogner, Kastenhofer et al., 2010). Diese Perspektive auf komplexe, netzwerkartige Strukturen ist unmittelbar mit dem Governancebegriff verbunden (Mayntz, 2004) – ein Beispiel dafür, dass *frameworks* nicht „theorieneutral“ sein können.

Im SES *framework* werden verschiedene Eigenschaften von Governancesystemen hervorgehoben, nach McGinnis und E. Ostrom (2014) mit GS1 bis GS7 nummeriert (*siehe Tab. 2*). Die Übertragung der einzelnen Komponenten auf den Anwendungsfall wird im ersten Fachartikel (*siehe E1*) diskutiert. Insofern kann hier eine Konzentration auf die regelsetzenden Organisationen (GS5) erfolgen – wegen der Einbindung genossenschaftlicher Ansätze der Energieversorgung in lokale Netzwerke ergänzt um entsprechende Netzwerkstrukturen (GS9). Diese beiden Elemente sind daher in Abb. 6 besonders hervorgehoben. Aus der Liste an regelsetzenden Organisationen auf der dritten Ebene des *framework* werden die hybriden Organisationen, von diesen wiederum genossenschaftliche Ansätze, fokussiert und in den nachstehenden beiden Abschnitten definiert. Die hier aufgeführte Differenzierung, die das Ergebnis einer Umstrukturierung durch McGinnis und E. Ostrom (2014) darstellt, wird in Kapitel E1 als Ausgangspunkt der Analyse gewählt, dabei zugleich geprüft, ausdifferenziert und modifiziert.

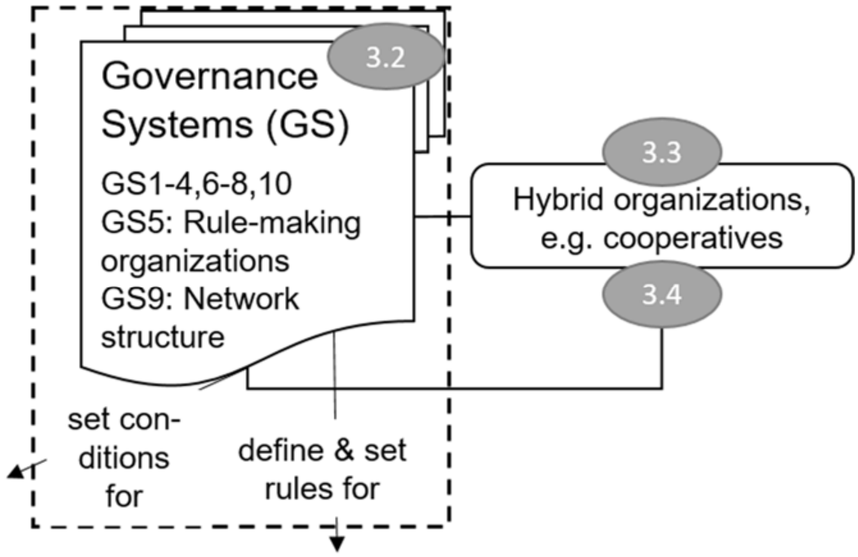

Abb. 6: ***Governancesysteme, hybride Organisationen und genossenschaftliche Ansätze innerhalb des SES framework***

Quelle: Eigene Darstellung auf Basis von McGinnis und E. Ostrom (2014).

Tab. 2: ***Liste an Eigenschaften des Governancesystems (GS), zweite Ebene***

Second-tier variable		Third-tier variable
GS1	Policy area	
GS2	Geographic scale of GS	
GS3	Population	
GS4	Regime type	
GS5	**Rule-making organizations**	Public sector organizations Private sector organizations (for-profit) Nongovernmental, nonprofit organizations Community-based organizations Hybrid organizations
GS6	Rules in use	
GS7	Property-rights systems	
GS8	Repertoire of norms and strategies	
GS9	**Network structure**	
GS10	Historical continuity	

Quelle: McGinnis und E. Ostrom (2014, S. 9)

Wie andere Elemente auf der ersten Ebene können auch mehrere Governancesysteme in ihrer Interaktion analysiert werden. Eine solche Wechselwirkung zwischen zwei Governancesystemen wurde im vorherigen Kapitel für das Energie- und das Finanzsystem als bedeutsam herausgestellt (*siehe B2.2.2*). Je nach Fokus der Analyse können Finanzsysteme und Finanzierungsverträge entweder der institutionellen Umwelt, damit den „anderen Governancesystemen" (S4), zugerechnet oder aber als eigenständiges Governancesystem GS^2 neben dem Governancesystem für die Energieversorgung im betrachteten geografischen und technischen Ausschnitt (GS^1) angesehen werden. Während die Finanzierung selbst eine Interaktion zwischen verschiedenen Akteuren darstellt, handelt es sich bei den geschlossenen Verträgen oder informellen Absprachen um „rules in use" (GS6) und Spezifikationen zu den Eigentumsrechten (GS7); darüber hinaus sind regelsetzende Organisationen involviert. Mit Blick auf Finanzierungs- und Investitionsvorgänge wird hier von **finanziellen Arrangements** gesprochen; damit wird folglich die skizzierte institutionell-organisatorische Seite von Finanzbeziehungen zwischen den betrachteten Akteuren bezeichnet.

Während damit sowohl unterschiedliche, interagierende Governancesysteme im SES *framework* nebeneinander abgebildet werden können als auch die jeweiligen institutionellen Umwelten als Spezifikationen bzw. Ausprägungen anderer Governancesysteme (S4), verbleibt zu klären, wie die unterschiedlichen Ebenen von Governancesystemen – lokal, regional, national(, supranational) und global – und ihr Zusammenwirken (**multilevel governance**) konzpetualisiert werden sollen. Die Ausführungen dazu bleiben bei E. Ostrom (2007) oder McGinnis und E. Ostrom (2014) eher vage. Diese Frage wird im Abschnitt F1.1 wieder aufgegriffen.

3.3 Hybridität

Da die in der vorliegenden Arbeit adressierten Fragestellungen auf die institutionell-organisatorische Ausgestaltung von Nachhaltigkeitstransformationen fokussieren, werden hier die Organisationsformen (GS5, einschließlich Netzwerkstrukturen, GS9) in den Mittelpunkt gerückt. Standen bei E. Ostrom (2007) die unterschiedlichen Organisationsformen noch auf der zweiten Ebene des *framework*, werden sie bei McGinnis und E. Ostrom (2014) auf die dritte Ebene verschoben und erweitert. Hier taucht auch explizit der Begriff der hybriden Organisationen auf.

Als **Hybrid** wird allgemein eine Zwischenform zwischen oder Mischform aus mehreren – oft zwei – Idealtypen gekennzeichnet. In der Finanzwirtschaft wird der Hybriditätsbegriff üblicherweise für Finanzierungsformen genutzt, die Eigenschaften sowohl von Eigen- als auch Fremdkapital aufweisen. „Hybride Finanzierungsinstrumente" wie stille Beteiligungen, Genussscheine oder Nachrangdarlehen werden daher als Mezzaninkapital bezeichnet (Banik, Ogg & Pedergnana, 2008; Hopkins, 1996).

Davon abweichend wird in dieser Arbeit dem Sprachgebrauch innerhalb der Institutionenanalyse gefolgt. In Williamsons Transaktionskostentheorie stellen Hierarchie und (Spot-)Markt die

beiden Pole dar; hybride Governanceformen sind all diejenigen, die zwischen diesen beiden Idealtypen liegen (Ménard, 1996). Hybridität kann sich neben den Formen der Governance im Sinne Williamsons auch auf organisatorische bzw. institutionelle Logiken beziehen, wobei beide Typologien einander ergänzen (Quélin, Kivleniece & Lazzarini, 2017).
In der Literatur zu Non-Profit-Organisationen (NPO) bilden Markt, Staat und Gemeinschaft oder NPO- bzw. Dritter Sektor drei Enden eines Dreiecks, in deren Mitte sich unterschiedliche Hybride wie Sozialunternehmen, kollaborative Governanceformen, Netzwerke und öffentlich-private Partnerschaften (p*ublic-private partnerships*, PPP) finden (Brandsen, Donk & Putters, 2005; Dees, 1998; Doherty, Haugh & Lyon, 2014). Auf diese Systematisierung von Organisationsformen stellen beispielsweise auch Avelino und Wittmayer (2016) ab. Wie sich zeigen lässt (*siehe Abb. 7*), unterliegt sie implizit auch der angepassten Systematik der Variablen bei McGinnis und E. Ostrom (2014). Die Systematisierungsdimensionen sind die Profitorientierung, Formalität und öffentlicher vs. privater Sektor, damit eine Kombination institutioneller Logiken. Die Governanceformen wären hier noch zu integrieren bzw. als weitere Dimension in den Blick zu nehmen (*siehe F1.1*).

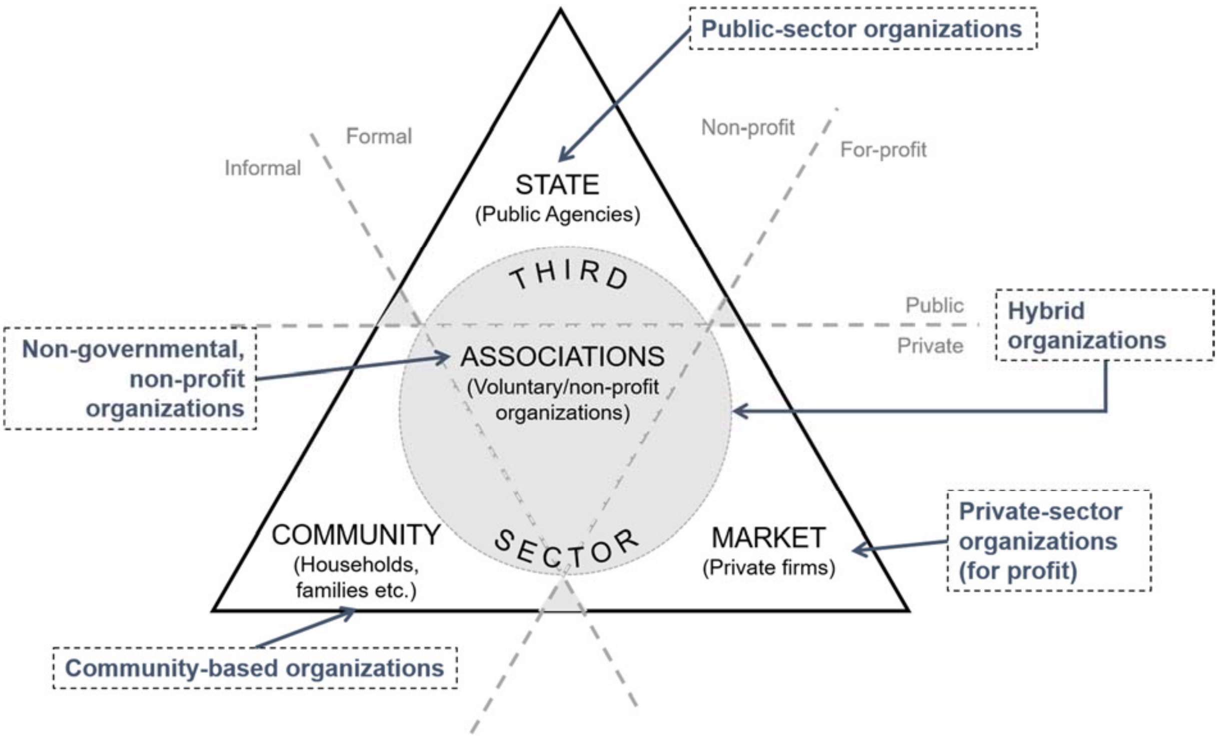

Abb. 7: ***Einordnung der Formen regelsetzender Organisationen (GS5) in den „welfare mix"***

Quelle: *Welfare mix*: Evers und Laville (2004); Avelino und Wittmayer (2016); Organisationsformen (GS5): McGinnis und E. Ostrom (2014).

In der Literatur wurde umfassend dargelegt, dass Dichotomien oder Trichotomien die Realität nur unzureichend abbilden; realiter ist eine Vielfalt an institutionellen Arrangements anzutreffen (E. Ostrom, 2010b). Zudem sind Reinformen eher selten zu beobachten. Wenn es aber in der Realität nur Hybride gibt, verliert der Begriff an Erklärungskraft (Skelcher & Smith, 2015). Insofern erscheint die Verwendung des Hybriditätsbegriffs zunächst als problematisch. Adäquater wäre eine begriffliche Ausdifferenzierung. Mindestens ist eine differenzierte Betrachtung, detailliertere Charakterisierung und Analyse unterschiedlicher Formen hybrider institutioneller Arrangements notwendig (Defourny & Nyssens, 2017). Dieses Ziel verfolgt die vorliegende Arbeit mit Blick auf ausgewählte Anwendungsfelder. Der Hybriditätsbegriff wird daher hier als begriffliche Klammer verwendet, unter der unterschiedliche Formen finanzieller Arrangements subsumiert werden. Als ein solcher Oberbegriff erscheint er für die Analyse nützlich, auch um einen Vergleich innerhalb der hybriden sowie hybrider mit anderen Organisationsforrmen durchzuführen (*siehe F2.2*).

3.4 Genossenschaftliche Ansätze und Bürgerenergie

Da es sehr viele verschiedene Formen hybrider Organisationen im Sinne des *welfare mix* gibt, erfolgt im Rahmen dieser Arbeit eine Konzentration auf genossenschaftliche Ansätze. Dahinter steht grundsätzlich die Idee der Selbstorganisation von Konsumentinnen und Konsumenten bei der Bereitstellung öffentlicher Infrastrukturen, wobei die konkreten Erscheinungsformen sehr unterschiedlich ausfallen können (Mori, 2013).

Genossenschaftlich meint hier mehr als **Genossenschaften** im rechtlichen Sinne, zumal es in einigen Ländern keine expliziten genossenschaftlichen Rechtsformen gibt. Dies ist der Grund, warum sich internationale Organisationen auf verschiedene genossenschaftliche Prinzipien stützen, wenn sie Genossenschaften definieren (International Co-operative Alliance [ICA], 2018). Da sich mit der Veränderung der institutionellen Umwelten auch Genossenschaften anpassen und Prinzipien weiterentwickeln bzw. verändern (Chaddad & Cook, 2004; Cook & Iliopoulos, 1999; Mori, 2014), stellen solche Kalatoge an Prinzipien oder Merkmalen allenfalls Hilfskonstruktionen dar. Hier wird daher bewusst ein offener Begriff genossenschaftlicher Ansätze verwendet, da es darum geht, genau diese historische und gegenwärtige Vielfalt abzublden. Als Abgrenzung zu anderen Organisationsformen wird allerdings auf ein (Mit-)Eigentum der – oft lokal bzw. regional begrenzten – Gemeinschaft an Bürgerinnen und Bürgern abgestellt (*siehe auch E1*).

Im Energiesektor werden solche genossenschaftlichen Organisationen im deutschsprachigen Raum zumeist als Bürgerenergiegesellschaften, im englischsprachigen Raum – nicht zwingend völlig deckungsgleich – als *community energy* bezeichnet. Mit dem EEG 2017 wurde in § 3 Nr. 15 eine Legaldefinition des Begriffs der Bürgerenergiegesellschaft vorgelegt, der allerdings in einigen Punkten von der Definition in der wissenschaftlichen Literatur abweicht. Daneben liegen auf europäischer Ebene mit dem Legislativpaket „Clean Energy for all Europeans“ zwei unterschiedliche Legaldefinitionen vor: in der überarbeiteten Erneuerbare-Energien-Richtlinie (*revised Renewable Energy Directive*, RED II) für „renewable energy communities“ (Erneuerbare-Energien-Gemeinschaften; Art. 2, 22 RED II) und in der Elektrizitätsbinnenmarkt-Richtlinie (*Electricity Directive*, ED) für „citizen energy communities“ (Bürgerenergiegemeinschaften; Art. 16 ED), wobei die Regelungen bis 2020 bzw. 2021 in nationales Recht umgesetzt werden müssen. Insofern ist in der nahen Zukunft auf der rechtlichen Seite mit Anpassungen in den nationalen Gesetzgebungen zu rechnen, die zu unterschiedlichen Ausgestaltungen für und ggf. Definitionen von „energy communities“ führen könnten.

Definitionen von Bürgerenergie bzw. *community energy* im nationalen und internationalen Kontext stellen überwiegend auf drei Merkmale ab (Grashof et al., 2019; Holstenkamp & Degenhart, 2013; Holstenkamp, 2018c; Kahla et al., 2017; Yildiz et al., 2019; auch: Brummer, 2018a; grundlegend: Walker & Devine-Wright, 2008):

- Regionalität: Die beteiligten Bürgerinnen und Bürger stammen überwiegend aus einem geografisch abgegrenzten (subnationalen) Raum. In der Literatur wird auch von „communities of locality“ (Hicks & Ison, 2018) gesprochen.
- Offenheit: Die Beteiligung ist grundsätzlich für alle Interessierten offen. Einer vollständigen Offenheit stehen regelmäßig finanzielle Hürden in Form eines Mindestinvestitionsbetrags, oft auch (Finanzmarkt-)regulatorische Rahmensetzungen entgegen.
- Mitbestimmung: Die natürlichen Personen aus der Region können über ihre Stimmrechte einen wesentlichen Einfluss auf die Auswahl und Gestalt der Projekte ausüben.

Oft werden diese Kriterien ergänzt durch:

- Regionale Wertschöpfung: Ein wesentlicher Teil der Wertschöpfung verbleibt in der Region.

Mitunter wird weiter präzisiert, dass bei den Bürgerenergiegesellschaften nicht das Profitmotiv im Vordergrund stehe, sondern soziale und ökologische Zielsetzungen. In welchem Maß dies tatsächlich der Fall ist, muss aber Gegenstand empirischer Untersuchungen sein (*siehe E6*). Eine definitorische Eingrenzung auf Sozialunternehmen erscheint schon forschungspragmatisch schwierig, weil die für die Einordnung notwendigen Daten im Allgemeinen nicht vorliegen, sondern aufwendig erhoben werden müssten.

Zusammenfassend können genossenschaftliche Ansätze im Energiesektor als hybride Organisationen im Sinne von McGinnis und E. Ostrom (2014) klassifiziert werden. Im Regelfall sind sie, gerade auf kommunaler Ebene, in unterschiedliche Netzwerke (GS9) eingebunden, die ökonomisch und sozial eine wesentliche Rolle spielen und ebenfalls mit in den Blick genommen werden müssen (Hargreaves et al., 2013). Die konkrete Einordnung gemäß den Dimenisionen des *welfare mix* und der Governanceformen hängt dabei stark von der konkreten Ausgestaltung ab und ist Gegenstand der Untersuchungen in der vorliegenden Arbeit.

3.5 Akteure und Aktivitäten

Neben die zuvor erörterten strukturellen Elemente treten im SES *framework* auf der sozialen Seite die Akteure (A), die in sogenannten „focal action situations“ Handlungen vollziehen. Insofern stellt Abb. 8 den handlungstheoretischen Kern des *framework* dar. In diesem Kontext sollen hier nach einer Übersicht über die Liste der Akteurseigenschaften zwei Fragen kurz erörtert werden: wer als Akteur im Sinne des SES *framework* in Frage kommt (*agency*) und wie sich Normen/Sozialkapital (A6) und mentale Modelle (A7) in den prinzipiell individualistischen Ansatz einordnen.

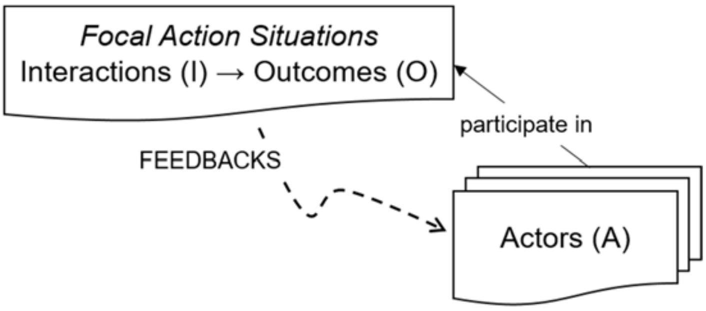

Abb. 8: Akteure und Aktivitäten im SES framework

Quelle: Eigene Darstellung auf Basis von McGinnis und E. Ostrom (2014).

In Tab. 3 sind die Akteurseigenschaften gemäß McGinnis und E. Ostrom (2014) aufgelistet, unterteilt in einzelne Faktoren, die Rahmendaten zu den Akteuren angeben oder die Gruppenstruktur beschreiben (Anzahl, A1; sozioökonomische Attribute, A2; Erfahrung, A3; Ort, A4; Führung, A5; Bedeutung der/Abhängigkeit von der Ressource, A8; verfügbare Technologien, A9), und kognitiven bzw. sozialen Faktoren (Normen/Sozialkapital, A6; mentale Modelle, A7), auf die hier kurz näher eingegangen wird, weil mit Blick auf A6 und A7 Konkretisierungen auf unteren Ebenen vorgeschlagen werden (*siehe F1.1*).

Tab. 3: Liste an Eigenschaften der Akteure, zweite Ebene

Second-tier variable		
A1	Number of relevant actors	☐
A2	Socioeconomic attributes	☐
A3	History or past experiences	☐
A4	Location	☐
A5	Leadership/entrepreneurship	☐
A6	Norms (trust-reciprocity)/social capital	●
A7	Knowledge of SES/mental models	●
A8	Importance of resource (dependence)	☐
A9	Technologies available	☐

☐: Rahmendaten/Gruppenstruktur, ●: kognitive/soziale Faktoren

Quelle: McGinnis & E. Ostrom, 2014, S. 5.

Ostrom greift mit der Aufnahme von A6/7 auf Forschungen zur Kooperation von Menschen zurück, in der Aspekte wie Vertrauen und Reziprozität (Bolton & Ockenfels, 2000; J. Cox, 2004;

Fehr & Gächter, 1998, 2000), auch mit dem Begriff des Sozialkapitals umschrieben (Sobel, 2002), als für das Handeln zentral herausgearbeitet werden (E. Ostrom, 2005, S. 121–133). Zu den Normen können auch die im vorherigen Kapitel als wichtige Aspekte herausgestellten Gerechtigkeitsvorstellungen und Ansichten zu Legitimität gezählt werden. Neben die Normen stellt E. Ostrom (2007) mentale Modelle, d. h. Repräsentationen von Gegenständen oder Prozessen im Bewusstsein eines Akteurs (Poteete et al., 2010, S. 190). Damit wird das Rational-Choice-Gerüst um kulturelle Faktoren erweitert, ähnlich wie beispielsweise in den neueren Arbeiten von North, der die Bedeutung von Ideologie und geteilten mentalen Modellen herausstellt (Denzau & North, 1994; North, 2005; kritisch: Pies, 2009, S. 28).
Grundlegende Fragen betrifft auch das Problem des Status kollektiver Akteure, die McGinnis und E. Ostrom (2014) als solche benennen, ihnen allerdings keinen vollen Akteursstatus zubilligen mögen bzw. das Problem umgehen: Sie verweisen darauf, dass zumeist ein einzelner Agent stellvertretend für die gesamte Einheit agiere (McGinnis & E. Ostrom, 2014, S. 8). Demgegenüber stellen etwa Avelino und Wittmayer (2016) in ihrem Ansatz zu Nachhaltigkeitstransformationen, dem MaP *framework*, Organisationen neben Individuen als mögliche Akteure. Werden Zusammenhänge zwischen höheren institutionellen Ebenen im Sinne von North u. a. oder Williamson in den Blick genommen, erscheint dies für die Analyse aus Sicht des Verfassers durchaus zweckmäßig. Insofern werden bei den Untersuchungen auf Meso- und Makroebene im Rahmen der vorliegenden Arbeit etwa genossenschaftliche Organisationen als Analyseeinheit behandelt.
Die vorstehenden Ausführungen berühren insgesamt grundlegende Fragen, die hier nicht näher behandelt werden können, denen bei der Weiterentwicklung des *framework* aber grundsätzlich Beachtung geschenkt werden sollte. Verwiesen sei auf die Diskussionen zu kollektiver Intentionalität (Schmid & Schweikard, 2009), Implikationen der Erkenntnisse der Kognitionswissenschaften (Ross, 2007) und zu den Grenzen bzw. einer möglichen Ergänzungsbedürftigkeit des methodologischen Individualismus (Groeben, 1999). Für die Anwendung des SES *framework* unmittelbar knüpft sich an die Überlegungen die Frage nach der Zuordnung der benannten kulturellen und sozialen Faktoren zum Rahmen (S4), Governancesystem (GS8) oder den Akteurseigenschaften (A6/7). Nach McGinnis und E. Ostrom (2014, S. 8) liegt hier die Unterscheidung darin, ob der Akteur die Normen als unmittelbar relevant für seine Handlungen ansieht (A6) oder sie zum generellen Repertoire an Normen gehören (GS8). Zugleich entstehen Normen und mentale Modelle durch die Interaktion von Personen und werden tradiert (E. Ostrom, 2007), insofern verweisen sie auf eine Verbindung zwischen Akteuren und Governancesystemen. Dieses Spannungsfeld aufzulösen dürfte in konkreten Fällen Spielraum für unterschiedliche Auslegungen bieten.

4 *Die Rolle genossenschaftlicher Ansätze im Transformationsprozess: Stand der Literatur*

4.1 Anmerkungen zum Stand der Forschung

In den letzten Jahren ist eine Reihe von Arbeiten zu Bürgerenergiegesellschaften und *community energy* entstanden; sieht man von früheren vergleichenden Arbeiten ab (Bolinger, 2001, 2005; Langniß & Helby, 1999; Toke, 2005), zunächst mit starkem Fokus auf das Vereinigte Königreich (*United Kingdom*, UK; Bomberg & McEwen, 2012; Hargreaves et al., 2013; Walker, Hunter, Devine-Wright, Evans & Fay, 2007; Walker & Devine-Wright, 2008). Inzwischen ist die Zahl an Publikationen in sehr starkem Maße angestiegen (Brummer, 2018a; Holstenkamp, 2018c; Schreuer & Weismeier-Sammer, 2010; Tarhan, 2015). Dabei sind die Erkenntnisse zu genossenschaftlichen Ansätzen im Energiesektor im Globalen Süden zahlenmäßig deutlich geringer, zudem über sehr viele unterschiedliche Quellen verstreut; eine Synthese fehlt. Der erste Fachartikel (*siehe E1*) greift diese Lücke auf.
Im Folgenden wird auf ausgewählte Literaturstränge kurz eingegangen. Das Ziel ist es dabei, ausgewählte Forschungslücken hervorzuheben, die in der vorliegenden Arbeit adressiert werden. Zum einen werden einzelne Erkenntnisse zu Bürgerenergiegesellschaften und Energiegenossenschaften in Deutschland zusammengefasst, da sich vier Fachartikel – drei davon im Rahmen von Ländervergleichen – mit der Situation in Deutschland befassen und zur Situation deutscher Bürgerenergiegesellschaften inzwischen eine ähnliche große Zahl an Arbeiten vorliegen dürfte wie zur Situation in UK. Zum anderen wird auf drei Analysen von Bürgerenergie bzw. *community energy* eingegangen, die den Ansatz von Ostrom (Rave, 2016), das SES *framework* (Acosta et al., 2018) bzw. die aus den Arbeiten zu SES abgeleiteten Designprinzipien auf genossenschaftliche Ansätze im Energiesektor (Gollwitzer, Ockwell, Muok, Ely & Ahlborg, 2018) anwenden.

4.2 Bürgerenergiegesellschaften, insbesondere Energiegenossenschaften, in Deutschland

Die überwiegende Zahl der Forschungsarbeiten zu Bürgerenergiegesellschaften, insbesondere Energiegenossenschaften, in Deutschland ist eher jüngeren Datums und damit parallel zur vorliegenden Arbeit entstanden. Bei den Energiegenossenschaften im rechtlichen Sinn, also Organisationen im Energiesektor in der Rechtsform der eingetragenen Genossenschaft (eG), liegt dies vermutlich daran, dass ab ca. 2008/9 ein Gründungsboom eingesetzt hat (Holstenkamp, 2012; Müller & Holstenkamp, 2015). Zuvor waren Energiegenossenschaften ein schrumpfendes Segment mit, von wenigen lokalen und regionalen Ausnahmen abgesehen, geringer Bedeutung für den Energiesektor (Holstenkamp, 2018b). In den 1970er Jahren und Ende der 1980er/Anfang der 1990er Jahre sowie mit der Liberalisierung der Energiemärkte wurden jeweils nur relativ wenige Energiegenossenschaften gegründet (Holstenkamp, 2012).

Der Anstieg der Neugründungszahlen fiel dann mit der Novelle des Genossenschaftsgesetzes, günstigen Rahmenbedingungen für Photovoltaikprojekte und der Finanz- und Wirtschaftskrise zusammen. Das verbesserte Image der Rechtsform und die Attraktivität von Photovoltaikgemeinschaftsanlagen als Geldanlage dürften die Gründungszahlen positiv beeinflusst haben. Zugleich wurden in größerer Zahl Nahwärmegenossenschaften gegründet (Degenhart, 2010). Die Pioniere im Bereich der erneuerbaren Energien wählten überwiegend andere Rechtsformen – für kleine und mittelgroße Solaranlagen die Gesellschaft bürgerlichen Rechts (GbR) und für große Anlagen, v. a. Windenergieprojekte, die Gesellschaft mit beschränkter Haftung und Compagnie Kommanditgesellschaft (GmbH & Co. KG) (Holstenkamp, 2014; Kahla et al., 2017).

Mautz, Byzio und Rosenbaum (2008) haben umfassend die institutionellen und organisatorischen Veränderungen der Märkte für erneuerbare Energien in Deutschland, mit Fokus auf die Strommärkte, analysiert. Dabei haben sie u. a. die Entstehung kollektiver Investitionsformen untersucht, die Anschlussfähigkeit der rechtlichen und organisatorischen Konstruktion an Modelle geschlossener Fonds (auch: Enzensberger, Fichtner & Rentz, 2003a, 2003b) herausgearbeitet und die Entwicklungen in Richtung Professionalisierung des Erneuerbare-Energien-Sektors skizziert. Sie betonen insgesamt die Bedeutung von *change agents* und zeigen Pfadabhängigkeiten und -brüche auf. Damit leuchten sie die Rolle von Bürgerenergiegesellschaften als Formen kollektiven Investments in frühen Phasen der Erneuerbaren-Energien-Märkte in Deutschland aus. Die Analysen legen eine nachlassende Bedeutung in Wachstumsphasen nahe, was mit Beobachtungen zur Marktentwicklung in Dänemark korrespondiert, aber in gewissem Widerspruch zur oben dargestellten Entwicklung bei den Energiegenossenschaften steht. Diese Frage wird im Fachartikel E3 und im Fazit (*siehe F1.2*) wieder aufgegriffen. Zudem fehlt beispielsweise eine quantitative Analyse der Beteiligungsmotive (*siehe E6*), auch um eine Differenzierung innerhalb des Bürgerenergiesektors vornehmen zu können.

Kleene (2018) konzentriert sich auf Fragen von *corporate governance*. Sie greift in diesem Kontext auf den MemberValue-Ansatz zurück und leitet Implikationen für die strategische Ausrichtung von Energiegenossenschaften ab (auch: Theurl & Kleene, 2018). Ausgehend von den Untersuchungen zu den Motiven der Mitglieder von Bürgerenergiegesellschaften diskutiert auch Kahla (2017) Fragen des strategischen Managements. Hierzu entwickelt sie einen Balanced-Scorecard-Ansatz weiter. In gleicher Weise auf die internen Prozesse konzentrieren sich die Arbeiten von Brummer, Herbes und Gericke (2017) zu Konflikten und deren Bearbeitung in Energiegenossenschaften sowie zu aktuellen Herausforderungen bei der Entwicklung neuer Geschäftsmodelle derselbigen (Herbes, Brummer, Rognli, Blazejewski & Gericke, 2017). Brummer (2018b) wählt in diesem Zusammenhang einen transaktionskostenökonomischen Ansatz zur Erklärung der Veränderungen durch den äußeren Druck auf Energiegenossenschaften. Demgegenüber werden in der vorliegenden Arbeit die institutionellen Umwelten

stärker in den Mittelpunkt gerückt (*siehe z. B. E3*; dazu auch: Oteman, Wiering & Helderman, 2014).
Yildiz (2014) greift, genauso wie Kahla (2019), Finanzierungsfragen auf, wobei er den Fokus hinsichtlich der Organisationen etwas anders setzt (Energiegenossenschaften und geschlossene Fonds gegenüber Bürgerenergiegesellschaften unabhängig von der Rechtsform). In seiner Institutionenanalyse beschränkt er sich dann auf einen ökonomischen Ansatz (Yildiz, 2013). Debor (2018) bearbeitet eine ähnliche Fragestellung wie in der vorliegenden Arbeit, konzentriert sich dabei allerdings auf Bürgerenergiegenossenschaften in der Rechtsform der eG und auf Kooperationsstrategien. Sie wählt zudem mit MLP, Strategic Niche Management (SNM) und – unter Rückgriff auf die Arbeit von Schneidewind (1998) – Giddens‘ Strukturationstheorie (Giddens, 1986; Ortmann & Sydow, 2001) ebenfalls einen anderen theoretischen Ansatzpunkt, aus dem sie ein eigenes framework (*Interrelations Between Agency and Structure in Transitions*, IBAST) ableitet.

4.3 Analyse von *community energy* mittels SES *framework*

Auf den institutionenanalytischen Ansatz der Bloomington School greifen drei andere Arbeiten zurück. Rave (2016) legt eine Effizienzanalyse unterschiedlicher Ausgestaltungsformen dezentraler Energieversorgung vor. Dabei stellt u. a. auf Basis einer Literaturstudie unterschiedliche Vor- und Nachteile von Energiegenossenschaften als Organisationsform nebeneinander. Es kommt ihm offenbar v. a. auf einen Vergleich des Ostromschen Ansatzes mit neoklassischen Argumenten an. Eine Differenzierung von Energiegenossenschaften erfolgt nicht; die Skizzen zu dieser Organisationsform sind insgesamt eher knapp.
Demgegenüber stellen Acosta et al. (2018) eine Einzelfallstudie einer Energiegenossenschaften in den Niederlanden vor. In der Arbeit wird das SES *framework* genutzt, relevante Variablen vor dem Hintergrund der nationalen Rahmenbedingungen identifiziert und das *framework* für das Design der Genossenschaft im konkreten Anwendungsfall genutzt. Insgesamt wird nur ein kleiner Systemausschnitt abgebildet.
Einen evaluativen Ansatz, in diesem Fall aber einen politikorientierten und nicht einen auf ein Unternehmen bezogenen, wählen auch Gollwitzer et al. (2018). Sie greifen dabei auf die von Agrawal (2001), Baland und Platteau (1996), E. Ostrom (2005) und Wade (1988) herausgearbeiteten Prinzipien der Gestaltung von gemeinschaftlichem CPR-Management zurück. Die Liste von 33 Prinzipien bei Agrawal (2001) reduzieren sie auf insgesamt 17 und untersuchen die Anwendbarkeit auf zwei Fälle von *community ownership* von Inselnetzen in Kenia. Insofern geht es ihnen nicht um eine Abbildung des SES bzw. SETS in den konkreten Fällen, sondern um die Analyse der Erfolgsbedingungen gemeinschaftlichen Eigentums an den Anlagen, die sie für die beiden Fälle illustrieren. Explizit ausgeklammert bleiben Fragen sozialer Inklusion (Gollwitzer et al., 2018, S. 159).

5 Zwischenfazit

Das SES *framework* wird auch an anderer Stelle für die Analyse von Bürgerenergiegesellschaften bereits genutzt, bedarf aber der weiteren Ausarbeitung mit Blick auf eine Differenzierung des genossenschaftlichen Energiesektors und der Abbildung der institutionellen Umwelten. Insofern werden mit der vorliegenden Arbeit Aspekte vertieft, die an anderen Stellen bis dahin nicht ausführlich behandelt worden sind (v. a. die Ausdifferenzierung genossenschaftlicher Ansätze, die Analyse der institutionellen Umwelten und der Überblick über genossenschaftliche ländliche Elektrifizierung im Globalen Süden) oder die komplementäre Perspektiven auf die genannten Fragestellungen werfen und damit wesentliche neue Erkenntnisse liefern.

Neben der Identifizierung von Forschungslücken zielte dieses Kapitel darauf, die Wahl des SES *framework* zu begründen, zentrale Begriffe zu klären und dabei die einzelnen Elemente des *framework* zu beschreiben. Das von der Bloomington School entwickelte SES *framework* wird für die vorliegenden Untersuchungen als Basis gewählt

(1) wegen der Nähe in den Zielen der Analyse zwischen CPR-Forschung von Ostrom und Kolleginnen/Kollegen, d. h. dem Forschungsziel, institutionelle Vielfalt zu erfassen und zu analysieren, und dem Fokus auf Selbstorganisation bzw. der Ähnlichkeiten zwischen CPR und genossenschaftlichen Ansätzen;

(2) weil das konkrete *framework* für die interdisziplinäre Analyse angelegt ist, prinzipiell auf soziale Systeme fokussiert, auch wenn es die ökologisch-technischen Systeme integriert, durch die umfassende Abbildung der Systemelemente ein breites Anwendungsspektrum bietet und auf die Analyse orientiert ist.

Die Abbildung des sozialen Systems wiederum lässt sich in einen handlungstheoretischen Kern, in dem sich neben den Akteuren mit den *(focal) action situations* ein wesentliches Element des IAD framework wiederfindet, und eine strukturelle Seite, die die institutionellen Elemente enthält, unterteilen. Die Abgrenzung zwischen Rahmen (S) und Governancesystem (GS), die diese strukturelle Seite bilden, ist dabei nicht immer eindeutig. Zu klären ist auch die Konkretisierung von *multilevel governance* im *framework*.

Mit GS5 (*rule-making organizations*) enthält das *framework* Variablen, die die Organisationsformen umfassen. Hier orientieren sich McGinnis und Ostrom in ihrer Überarbeitung der GS-Variablen offenbar an der Literatur zum *welfare mix*; die Ausprägungen der GS5-Variablen auf der dritten Ebene des framework korrespondieren jedenfalls mit Staat (McGinnis & Ostrom: *public-sector organizations*), Markt (*private-sector organizations*), Gemeinschaft (*community-based organizations*), Vereinigungen (*non-governmental, non-profit organizations*) und Drittem Sektor (*hybrid organizations*). Genossenschaftliche Ansätze sind demnach Ausprägungen hybrider Organisationen. Zu klären ist hier, inwieweit die Systematik zur Erfassung genossenschaftlicher Ansätze hinreichend und zielführend ist (*siehe F1.1*).

Schließlich weisen die Ausführungen zu Normen/Sozialkapital (A6) und mentalen Modellen (A7) auf einen Klärungsbedarf mit Blick auf die Konzeptualisierung von in Kapitel B als bedeutsam eingestuften Normen (*energy justice*) und resultierender Legitimität hin.

D Überblick über die Fachartikel

1 Übersicht zu den Fachartikeln

1.1 Kriterien zur Einordnung der Fachartikel

In den beiden voranstehenden Kapiteln sind verschiedene Aspekte hervorgehoben worden, die bei einer Analyse genossenschaftlicher Ansätze in Transformationsprozessen des Energiesystems in Richtung Nachhaltigkeit berücksichtigt werden sollten. Im Folgenden geht es zunächst darum zu verdeutlichen, welche dieser Aspekte in welcher Weise in den einzelnen Fachartikeln aufgegriffen und welche Forschungslücken adressiert werden. Hierzu enthält Tab. 4 eine Übersicht über die einzelnen Aspekte bzw. Dimensionen:

- Interdisziplinarität: Hierzu werden *cross-overs* in andere Disziplinen benannt.
- Methodenvielfalt: Es werden die verwendeten Methoden aufgezählt. Dabei wird deutlich, dass in der vorliegenden Arbeit unterschiedliche Methoden, in einem Fachartikel explizit auch ein *mixed-methods design*, zur Anwendung kommen.
- *Frameworks*: Mit Blick auf das SES *framework* wird das jeweilige fokussierte SES-Element auf erster und/oder zweiter Ebene benannt, die Akteursebene (Individuen vs. Organisationen) und damit die Ebene bzw. Perspektive (Makro-, Meso- und Mikroperspektive). Schließlich wird angegeben, inwieweit das SES *framework* erweitert wird, und es werden andere *frameworks* und Konzepte aufgezählt, auf die zwecks Erweiterung des SES *framework* zurückgegriffen wird.
- Kontext: In beiden vorherigen Kapiteln wurden verschiedene Kontextfaktoren, die Unterschiede in der organisatorischen Umsetzung von Nachhaltigkeitstransformationen erklären konnen, bzw. Dimensionen, die bei der Analyse bedacht werden müssen, identifiziert. Hierzu zählt das Transformationsziel (Zugang zu modernen Formen der Energieversorgung und/oder ökologisch nachhaltige Versorgung/erneuerbare Energien), das Land bzw. die (Welt-)Region („Geographie“), Zeit/Geschichte und Technologie.
- Genossenschaftliche Ansätze: In vier Artikeln werden unterschiedliche Formen genossenschaftlicher Ansätze analysiert, in zwei Artikeln nicht die genossenschaftlichen Ansätze direkt, sondern der Entstehungskontext (von Hybriden allgemein) bzw. die Finanzierung von Bürgerenergie/von erneuerbaren Energien durch Bürgerenergie.
- Forschungslücken: Zuletzt werden die Themen genannt, zu denen in den vorstehenden beiden Kapiteln Lücken in der Forschung bzw. die als wichtige Forschungsgegenstände im vorliegenden Kontext identifiziert wurden.

Tab. 4: Gegenstand und Methoden der Fachartikel in der Übersicht

Aspekt/ Dimension (*Kurztitel*)	**Fachartikel 1** ***CSE in the Global South***	**Fachartikel 2** ***Coordination and Contestation***	**Fachartikel 3** ***Wind Power Cooperatives***	**Fachartikel 4** ***Finance and Justice***	**Fachartikel 5** ***Who Benefits?***	**Fachartikel 6** ***Investment Motives***
Cross-overs	(Erkenntnisse unterschiedlicher Disziplinen)	Internationale Beziehungen (*global governance*)	Policy-Forschung	Soziologie der Finanzmärkte, Politökonomie	politikwissenschaftliche Partizipationsforschung, Soziologie	(Energierecht)
Methode	empirisch/Sekundärdaten: systematischer Literaturüberblick	theoretisch: konzeptionell	empirisch: leitfadengestützte Interviews, vergleichende Fallstudie (Länder)	empirisch: leitfadengestützte Interviews, vergleichende Fallstudie (Länder)	empirisch: mixed-methods (Interviews, Fallstudie, standardisierte Befragungen: deskriptive Statistik, χ^2-Test)	empirisch: standardisierte Befragung (χ^2-Test)
Fokus SES	gesamt	S3/4 + GS	GS + A7	S4 + GS + A6	GS + A, insbes. A6	A + I (+ GS/TS)
Akteure	Organisationen und Individuen	Organisationen auf unterschiedlichen Ebenen	Genossenschaften = Organisationen	Organisationen	Mitglieder & Management = Individuen	Mitglieder = Individuen
Ebene/ Perspektive	alle Ebenen: Entwicklungszusammenarbeit = Makro, Fokus: Meso + Mikro	Makro/*multilevel governance*	sektoral (Windenergie) = Meso	sektoral (Finanzsektor) = Meso	Mikro	Mikro
Erweiterung SES	Übertragung auf Elektrifizierung Differenzierung GS5, GS9 GS10/A7: Kongruenz mit traditionellen Institutionen A7: Image, *sense of ownership* S3: lokale politische Kultur, Funktionsweise des Staates S4: Gestalt des Finanzsektors	Mehrebenendynamik: *nodes*, Wechselspiel von *contestation* und *coordination*	Spezifizierungen: Gewichtung von regulatorischen Rahmenbedingungen (GS6/7), Einstellung zu Genossenschaften (A7), Umweltbewegung (GS8/A7); Interaktionen A7-GS8, A7-GS6/7	A6: Gerechtigkeitsdimensionen Ansätze der Verdichtung S4'/GS[2]: Finanzsektor	A6: Legitimität	Differenzierung GS5: Einordnung in *welfare mix*

[Forts. Tab. 4]

Aspekt/ Dimension (*Kurztitel*)	**Fachartikel 1** ***CSE in the Global South***	**Fachartikel 2** ***Coordination and Contestation***	**Fachartikel 3** ***Wind Power Cooperatives***	**Fachartikel 4** ***Finance and Justice***	**Fachartikel 5** ***Who Benefits?***	**Fachartikel 6** ***Investment Motives***
Frameworks/ Konzepte	SES	*nodal governance contestation*	SES *double movement*	*varieties of capitalism energy justice*	*energy justice social license to operate*	SETS
Transformationsziel	Zugang	Zugang	Ökologie	Ökologie	Ökologie	Ökologie
Geographie	Globaler Süden	Globaler Süden/ global	Belgien, Dänemark, Deutschland, UK	Deutschland, UK	Australien, Deutschland	Deutschland
Zeit	verschiedene Zeitpunkte und Entwicklungen in einzelnen Ländern Pfadabhängigkeiten Geschichte der Regulierung	Dynamisierung: Entwicklung von Organisationen und Netzwerken	Längsschnitt	Längsschnitt		Vergleich Förderphasen
Technologie	verschiedene (offen)	erneuerbare Energien allgemein	Wind	kein Fokus	kein Fokus	v.a. Wind, PV, Bioenergie (Nahwärme)
Genossenschaften/ Hybride	*cooperative approaches*	Entstehung von Hybriden durch/in Prozess von *contestation*	Windenergiegenossenschaften	Finanzierung von Bürgerenergie Netzwerk Banken bzw. alternative Finanzierung + Bürgerenergie	Bürgerenergieinitivien (Eigen- und Mezzaninkapital)	Bürgerenergiegesellschaften
Themen/ Forschungslücke	Kontextualität, Globaler Süden	*contestation* unterschiedliche Governanceebenen, v. a. Integration globale Ebene	Kontextualität	ethische Konzepte Finanzsektor	ethische Konzepte Relevanz Kapitalmarktregulierung für Mitgliederselektion und Ausgestaltung	Kontextualität

Abkürzungen: CSE: Cooperative Sustainable Electrification, PV: Photovoltaik, SES: Social-Ecological System, SETS: Social-Ecological-Technical System, UK: United Kingdom

Einzelne der genannten Punkte sind oben bereits aufgegriffen worden (*cross-overs*, Methode); sie werden im Folgenden teilweise vertieft. Zudem werden die Verbindungslinien zwischen den Fachartikeln skizziert. Dies erfolgt nachstehend für die Artikel im Einzelnen, die – beginnend mit der Darstellung des *framework* im Anwendungskontext, hier fokussiert auf den Entwicklungsländerkontext – nach Analyseebene angeordnet sind: von der Makro- über die Meso- bis zur Mikroperspektive. Zunächst werden jedoch die genutzten Forschungsmethoden im Zusammenhang dargestellt.

1.2 Forschungsmethoden im Detail

Insgesamt kommt in der vorliegenden Arbeit ein *mixed-methods design* zur Anwendung, d. h. es werden einzelne Aspekte mit unterschiedlichen Methoden adressiert, die komplementär eingesetzt werden (Baur, Kelle & Kuckartz, 2017; Kelle, 2017). Ein solches Vorgehen ist in den vorangehenden Kapiteln als für die Nachhaltigkeitsforschung, Forschung zur Transformationen im Energiesektor und die interdisziplinäre Institutionenanalyse typisch charakterisiert worden, sodass dem auch hier gefolgt wird.

Im ersten Fachartikel wird eine systematische Literaturauswertung vorgenommen; dazu werden die Erkenntnisse aus unterschiedlichen referierten und nicht-referierten wissenschaftlichen Publikationen, aber auch eher politikorientierten Berichten, zusammengefasst und entsprechend den Elementen des SES *framework* auf erster und zweiter Ebene kodiert. Das Vorgehen lässt sich insofern als qualitative Metaanalyse charakterisieren. Es handelt sich damit um eine Form der Sekundärdatenanalyse. Eine Beschränkung allein auf referierte Zeitschriftenartikel erfolgt bewusst nicht, um einen möglichst umfangreichen Literaturkorpus zu generieren, zumal einzelne nicht-referierte Beiträge wie diejenigen im Sammelband von Barnes (2007b) wesentliche Daten liefern und eine prominentere Stellung in der Forschung besitzen können als einzelne, wenig zitierte Zeitschriftenartikel.

Der zweite Fachartikel ist konzeptioneller Natur und damit eher der theoretischen Sozialforschung zuzuordnen (Gläser & Laudel, 2010, S. 34). Erkenntnisse zu den politischen Prozessen rund um die Nutzung erneuerbarer Energien im Globalen Süden werden aus der Literatur und Politikdokumenten entnommen. Damit werden die theoretischen Argumente illustriert; sie werden also eingesetzt, um ein Narrativ zu entfalten.

Die anderen vier Fachartikel enthalten dagegen Analysen eigener empirischer Daten. Dabei werden für beide auf der Mesoebene angesiedelte Arbeiten qualitative leitfadengestützte Interviews genutzt. Bei beiden Fachartikeln handelt es sich zudem um Ländervergleiche. Die Länderauswahl folgt dabei unterschiedlichen Logiken: Im dritten Fachartikel werden Windenergiegenossenschaften in vier Ländern mit unterschiedlichem Stand des genossenschaftlichen Windenergiesektors miteinander verglichen. Im vierten Fachartikel stehen die verschiedenen institutionellen Umwelten – gemessen an den Spielarten des Kapitalismus und korrespondierenden Bankensystemen – im Blickpunkt. Daraus erklärt sich die Auswahl von UK und

Deutschland. Während sich die Analyse im dritten Fachartikel an den institutionellen Rahmenbedingungen orientiert, werden die Interviews im vierten Fachartikel entsprechend den Dimensionen von *energy justice* kodiert.

Die Auswahl der Interviewpartner ist in den Ländern nicht identisch, was sich aus den Eigenheiten der betrachteten Sektoren in den jeweiligen Ländern und dem jeweiligen Blickwinkel erklärt; die Auswahl an Interviewpartnern ist Ergebnis eines theoretisch gesteuerten Auswahlprozesses (*theoretical sampling;* Dimbath, Ernst-Heidenreich & Roche, 2018) in den jeweiligen Ländern. Bei einzelnen Detailfragen ist allerdings trotz der Erhebung über einen gewissen Zeitraum und einer theoretischen Sättigung der Interviewaussagen nicht auszuschließen, dass die Einschätzungen und Aussagen, etwa in Bezug auf Aspekte von *energy justice* oder den Stand der Entwicklungen im genossenschaftlichen Windenergiesektor, zu anderen Zeitpunkten und bei zusätzlichen Kenntnissen über die relevante Grundgesamtheit anders ausfallen würden. Eine Validierung durch Analysen über längere Zeiträume und weitergehende Untersuchungen, auch mit anderen Methoden, bleibt ein Forschungsdesiderat.

Mit dem Wechsel auf die Mikroebene kann auch auf quantitative Methoden zurückgegriffen werden. Hierzu liegen unterschiedliche Befragungen unter Mitgliedern von Bürgerenergiegesellschaften in Deutschland vor, die als Basis für einen Teil des fünften und für den sechsten Fachartikel dienen. Im Fachartikel 5 wird auf eine Kombination verschiedener Methoden zwecks komplementärer Erfassung einzelner Zusammenhänge gesetzt:

- Für die Erfassung der soziodemografischen Zusammensetzung in Bürgerenergieinitiativen kann auf eine Befragung unter australischen Initiativen und auf unterschiedliche Befragungen unter Mitgliedern deutscher Initiativen zurückgegriffen werden. Daten werden deskriptiv ausgewertet und gegenübergestellt.
- In der Fallstudie zu Shoalhaven, Australien, wird qualitativ den sozialen Mechanismen nachgegangen, die bei der Mitgliederzusammensetzung wirken. Shoalhaven wurde als ein typischer australischer Fall bewusst ausgewählt. Eine solche Untersuchung wäre in weiteren Fällen zu wiederholen. Für die vorliegende Analyse liefert der Fall allerdings wertvolle Hinweise zur Interpretation und Erklärung der Befunde.
- Schließlich wird mithilfe des χ^2-Tests geprüft, ob statistisch signifikante Unterschiede in der soziodemografischen Zusammensetzung bestimmter Typen an Initiativen bestehen. Damit sollen mögliche Muster identifiziert werden, die dann in nachfolgenden Forschungsarbeiten vertiefend untersucht werden könnten.

Auch in Fachartikel 6 wird für ein strukturprüfendes Verfahren auf den χ^2-Test zurückgegriffen. Eine Cluster- oder Faktorenanalyse wird bewusst nicht gewählt, weil beide Methoden wenig robust mit Blick auf die Stichprobenziehung sind und zudem Probleme bei der Interpretation der identifizierten Gruppen aufwerfen können, die eine Korrektur der einbezogenen Attribute und gewählten Verfahren notwendig machen können (Schwaiger & Zimmermann, 2011,

S. 424; Wiedenbeck & Züll, 2010; H.-G. Wolff & Bacher, 2010). Ein Problem solcher Umfragen stellen im Allgemeinen Verzerrungen bei der Ermittlung der Stichprobe und geringe Rücklaufquoten dar (Diekmann, 2018). Systematische Verzerrungen sind nicht gänzlich auszuschließen. So ist beispielsweise der Anteil der Mitglieder mit Managementfunktion in Bürgerenergiegesellschaften in der Stichprobe bei Holstenkamp und Kahla (2016) relativ hoch, was sich aus der Art der Erhebung ergibt: Angefragt wurden Vorstände und/oder Aufsichtsräte bzw. Geschäftsführer einer geschichteten Zufallsauswahl an Bürgerenergiegesellschaften. Diese wurden gebeten, den Link zur Umfrage an ihre Mitglieder weiterzuleiten. Die Ergebnisse zeigen einen signifikanten Unterschied hinsichtlich der Bewertung der Stärke des Profitmotivs zwischen Managern und einfachen Mitgliedern von Bürgerenergiegesellschaften. Daraus können mehrere Implikationen für die Befragungsmethodik und Analyse abgeleitet werden:

- Es reicht für die Typisierung von Bürgerenergiegesellschaften nicht, nur die Vorstände und Aufsichtsräte anzusprechen und um eine Einschätzung zu den Motiven zu geben (so z. B. Volz, 2011, 2012). Vielmehr muss möglichst eine Zufallsauswahl der Mitglieder erreicht werden.
- Dies ist aber aus datenschutzrechtlichen Gründen nur über die Funktionsträger selbst möglich, die damit zu *gatekeepers (S. Wolff, 2017)* werden. Zudem können systematische Verzerrungen infolge fehlender E-Mail-Adressen oder unzureichender Datenpflege bei den Gesellschaften selbst nicht völlig ausgeschlossen werden.
- Es ist davon auszugehen, dass Funktionsträger tendenziell die engagierteren Mitglieder in den überwiegend ehrenamtlich geführten Initiativen sind und damit eine größere Neigung haben zu antworten. Dadurch ergibt sich eine Verzerrung, die durch Kontrolle des Mitgliedertyps wenigstens partiell adressiert werden kann.

Die Rücklaufquoten waren in allen verwendeten Datensätzen auf Gesellschaftsebene im üblichen Bereich. Auf Mitgliederebene ist eine Ermittlung der Rücklaufquote nicht in allen Fällen möglich gewesen. Um zu geringe Rücklaufquoten auszuschließen, wurde in Fachartikel 5 die Auswahl der Gesellschaften auf solche beschränkt, bei denen mehr als 30 Rückläufe zu verzeichnen waren. Dies erscheint hier notwendig, um mögliche Verzerrungen bei der Ermittlung der soziodemografischen Zusammensetzung von Bürgerenergiegesellschaften zu verringern. Bei den soziodemografischen Daten wurde in den beiden an der Leuphana durchgeführten Umfragen bewusst auf eine Frage zu den Einkommensverhältnissen verzichtet, weil aus der Umfrageforschung bekannt ist, dass es hier vielfach zu fehlerhaften Angaben oder fehlenden Angaben kommt (Engel & Schmidt, 2019; Hoffmeyer-Zlotnik & Warner, 1998). Nicht gänzlich ausschließen lässt sich insbesondere bei der Frage nach den Motiven das Problem der sozialen Erwünschtheit (Diekmann, 2018, S. 446; Taddicken, 2009). Sofern dieses Problem aber bei Genossenschaftsmitgliedern im Vergleich zu Mitgliedern von Bürgerenergiegesellschaften in der Rechtsform der GmbH & Co. KG und im Süden gegenüber dem Norden nicht ausgeprägter ist – und darauf deutet nichts hin –, so dürften keine relevanten Verzerrungen der Ergebnisse zu beobachten sein. Zuletzt sei darauf verwiesen, dass eine 5-skalige Abfrage grundsätzlich zu Problemen führen kann (Tendenz zur Mitte, Vermeidung von Extremwerten; Krosnick & Fabrigar, 2012, S. 147–148), die in den vorliegenden Befragungen aber nicht zu beobachten sind.

Die Auswertung der Daten erfolgt mit STATA IC 12 (Fachrtikel 5) bzw. STATA MP 13 (Fachartikel 6). Zu den ausgeführten Bereinigungen der Datensätze und Analysen liegen dieser Arbeit do-files bei (*siehe Anlagen zu den Artikeln 5 und 6*). Die Ergebnisse zeigen gerade hinsichtlich der soziodemgrafischen Unterschiede mit Blick auf viele Einflussfaktoren statistisch signifikante Zusammenhänge. Diese sind aber überwiegend nicht stark ausgeprägt. Gemessen wird die Stärke der Zusammenhänge hier mittels Cramérs V (Weins, 2010, S. 79–81).

2 Einordnung der Fachartikel im Einzelnen

2.1 Fachartikel 1: CSE in the Global South

Nach dieser Übersicht über die Methodik der einzelnen Fachartikel werden diese im Folgenden kurz einzeln inhaltlich vorgestellt. Im ersten Fachartikel wird das SES *framework* eingeführt und die Übertragung auf den Energiesektor diskutiert. Sodann wird das *framework* genutzt, um Erkenntnisse zu genossenschaftlichen Ansätzen im Globalen Süden auszuwerten. Dabei geht es primär um die Frage, wie Menschen ohne Zugang zu Elektrizität ein solcher verschafft werden kann und was in diesem Kontext über genossenschaftliche Ansätze bekannt ist. Es wird zwar auch die Frage nach der Stromerzeugung mit umweltverträglichen Technologien, insbesondere erneuerbaren Energien, gestellt. Dabei zeigt sich jedoch, dass die meisten der betrachteten Länder eher zu den Nachahmern zählen, was sich auch in der Technologiewahl genossenschaftlicher Organisationen widerspiegelt. Mit wenigen Ausnahmen, die in dieser Hinsicht in nachfolgenden Forschungsarbeiten näher zu analysieren wären, sind es eher wohlhabendere Regionen, in denen auch schon in früheren Technologiephasen auf erneuerbare Energien gesetzt wird, sieht man von explizit auf insbesondere die Förderung der Photovoltaik ausgerichtete Geberpolitiken ab.

Bei der Analyse werden nicht nur unterschiedliche Länder betrachtet, sondern auch verschiedene Zeitpunkte und Entwicklungen von genossenschaftlichen Organisationen in einzelnen Ländern über die Zeit. Die Untersuchungen zeigen zum einen bestimmte technologische (TS10) und institutionelle (GS10) Pfadabhängigkeiten, die durch mentale Modelle von Akteuren aus Politik und Verwaltung (A7) begründet werden können (z. B. in Thailand). Es wird die Hypothese aufgestellt, dass die Art der Initiierung einer genossenschaftlichen Organisation ebenfalls einen Einfluss darauf hat, ob einem durch staatliche Akteure etablierten Technologiepfad gefolgt wird (z. B. in Bangladesh). Zugleich wird am Beispiel der Philippinen illustriert,

dass eine Geberpolitik, genauer ein Wechsel bei den Gebern oder in der Geberpolitik, zu einem Bruch eines organisationalen Pfades führen kann. Darüber hinaus wird die Bedeutung der historischen Entwicklung der Energiemarktregulierung für die vorliegende Fragestellung betont. Ebenfalls als Konkretisierung einzelner SES-Variablen kann die im Artikel vorgenommene Differenzierung genossenschaftlicher Organisationsformen angesehen werden – ein Punkt, der im letzten Fachartikel wieder aufgegriffen und in Abschnitt F1.1 diskutiert wird.
Das auf diese Weise konkretisierte *framework* kann dazu genutzt werden, Designprinzipien abzuleiten. Dazu wären allerdings weitere und detailliertere Daten zum Output (O) und zu den Ausprägungen anderer relevanter Variablen zu erfassen, zu denen in der identifizierten Literatur keine oder nur unzureichende Informationen vorliegen. Insofern wird dies im Fachartikel als Forschungsdesiderat formuliert (*siehe auch F2.2*).
Der Artikel trägt damit insbesondere dazu bei, eine geografische Forschungslücke zu schließen: Er fasst in einer Synthese Erkenntnisse zu der von der Anzahl her zwar wachsenden, im Vergleich zum Globalen Norden aber immer noch relativ überschaubaren Literatur zu Ländern des Globalen Südens zusammen. Damit adressiert er das in den Kapiteln B und C skizzierte Problem der Kontextualität. Vor allem zeigt er den Bedarf an vertieften und systematischen vergleichenden Studien zu genossenschaftlichen Ansätzen in unterschiedlichen Ländern (unterschiedliche institutionelle Umwelten und Soziodemografie) und zu unterschiedlichen Zeiten (Stand Technologie, historische Entwicklungslinien) auf. Beide Aspekte werden mit Blick auf den Globalen Norden in den Fachartikeln 3-5 wieder aufgegriffen. Mit Blick auf die Energiepolitik in den Ländern des Globalen Südens zeigen die Ergebnisse, dass bei den Überlegungen zur institutionellen Ausgestaltung ländlicher Elektrifizierungsprogramme genossenschaftliche Ansätze – *bottom-up* – in die Auswahl einbezogen und geprüft werden sollten.

2.2 Fachartikel 2: Coordination and Contestation

Ebenfalls mit Blick auf den Globalen Süden werden im zweiten Fachartikel die politischen Prozesse auf unterschiedlichen Ebenen und deren Wechselspiel in den Mittelpunkt gerückt. Ein besonderer Fokus liegt auf der globalen Ebene. Deren Bedeutung ergibt sich für die Umsetzung von Erneuerbare-Energien-Projekten im Globalen Süden allein schon aufgrund der vielfach vorhandenen finanziellen Abhängigkeit von Geberländern. Im Artikel wird die oft geäußerte Forderung nach mehr Koordination als zu pauschal abgelehnt und aus theoretisch-konzeptionellen Überlegungen abgeleitet, dass es vielmehr ein Wechselspiel von *contestation* und Koordination gibt, wobei *contestation* nicht nur bedeutet, dass bestehende Strukturen infragegestellt werden, sondern auch durch die Entwicklung und Verbreitung von Alternativen Innovationen hervorbringen kann.
Die im Artikel betrachteten internationalen Organisationen und Prozesse von *coordination* und *contestation* können je nach Fokus im *framework* entweder auf der Ebene der *political settings*

(S4) oder den Governancesystemen (GS) zugeordnet werden. Dabei ergibt sich eine netzwerkartige Struktur (GS9) zwischen unterschiedlichen Organisationen auf verschiedenen Governanceebenen, die es zu beschreiben gilt. Dafür bietet sich, so die Argumentation im Beitrag, der Rückgriff auf die Literatur zu *nodal governance* an.
Damit berührt der Artikel eine für das SES *multi-tier framework* identifizierte Schwäche: die Abbildung dynamischer Prozesse, die noch im IAD *framework* im Mittelpunkt stand (McGinnis & E. Ostrom, 2014). Es wird vorgeschlagen, diese Dynamiken in der Mehrebenengovernance unter Rückgriff auf die Konzepte von *nodal governance* und *contestation* abzubilden.
Der Bezug zu genossenschaftlichen Ansätzen ergibt sich in zweierlei Hinsicht: Zum einen lassen sich aus den dargestellten Prozessen direkte Implikationen für das technische Projektdesign, die zur Verfügung stehenden Ressourcen und die Präferenzen für bestimmte Organisationsformen seitens Geber und nationaler Politik ableiten. Zum anderen wird die Hypothese formuliert, dass hybride Governance- und Finanzierungsstrukturen insbesondere in Zeiten von *contestation* entstehen.

2.3 Fachartikel 3: Wind Power Cooperatives

Der dritte Fachartikel fokussiert demgegenüber auf die Mesoebene: Im Artikel werden vier Länder mit unterschiedlich stark ausgeprägtem Bürgerwindsektor miteinander verglichen: Während es in Dänemark und Deutschland zahlreiche Bürgerwindparks gibt, sind diese in Belgien und UK weniger zahlreich. Geprüft wird der Einfuss von vier strukturellen Faktoren: Förderregime (GS7), Planungs- und Genehmigungsverfahren (GS6), der Einstellung zu Genossenschaften (A7) und der Stärke der Umwelt-, v. a. der Anti-Atomkraft-Bewegung (GS8/A7). Wie Tab. 5 zeigt, gibt es eine offensichtliche Korrelation zwischen Art der Förderung der Windenergie und Stärke des Bürgerwindsektors. Auch mit Blick auf Planungs- und Genehmigungsverfahren lassen sich gewisse Einflüsse identifizieren. Die Einstellung gegenüber dem Genossenschaftsmodell – in Deutschland einschließlich KG-Modell – scheint demgegenüber wenigstens mit Blick auf den belgischen Fall maximal die konkreten Organisationsformen zu beeinflussen, nicht aber als Hemmniss für Bürgerwindgenossenschaften zu wirken; sie kann damit kaum als Begründung für die geringe Größe des Bürgerwindsektors in diesem Land dienen. Dies ist eher der Fall für die Stärke der Anti-Atomkraft-Bewegung, aus der sich wenigstens in frühen Jahren in Dänemark und in Deutschland die Investoren in Bürgerwindparks speisen.
Die Ausführungen legen allerdings nahe, dass die aus der Literatur identifizierten Faktoren nicht unabhängig voneinander sind, sondern interagieren: Die günstigen Rahmenbedingungen bei der Förderung der Windenergie in frühen Jahren in Dänemark, später in Deutschland, dürften auch auf die Stärke der Anti-Atomkraft-Bewegung zurückzuführen sein. Die Variablen sind mithin nicht als isolierte Einflussfaktoren zu modellieren, und die Veränderungen über die Zeit müssen adäquat im *framework* abgebildet werden. Die Ausführungen machen zudem deutlich,

dass zwischen dem Repertoire an Normen und Strategien (GS8) und den Normen und mentalen Modellen der Akteure (A6/7) eine Verbindungslinie besteht, die bei McGinnis und E. Ostrom (2014), Ostrom (2007; 2009) oder Poteete et al. (2010) vage bleibt.

Tab. 5: Entwicklung des Windenergiesektors und Einflussfaktoren in Belgien, Dänemark, Deutschland und Vereinigtem Königreich

Strukturfaktor	**Belgien**	**Dänemark**	**Deutschland**	**UK**
Förderregime	Quotenmodell	Einspeisetarif Einspeiseprämie	Einspeisetarif Einspeiseprämie	Quotenmodell
Raumplanung/ Genehmigung	aufwendig verpflichtende Beteiligung in Wallonien	Privileg bis 1999 danach erschwert verpflichtende Beteiligung	etabliert	aufwendig
Einstellung ggü. Genossenschaften	positiv/starke Bewegung	Positiv/starke Bewegung	regional unterschiedlich	nicht etabliert von Finanzaufsicht kritisch gesehen
Kultur lokalen Engagements im Energiebereich	schwach, aber partiell Anti-Atomkraft-Bewegung	starke Anti-Atomkraft-Bewegung	starke Anti-Atomkraft-Bewegung; kann regionale Muster nicht erklären	starke Landschaftsschutzbewegung
Stärke Bürgerwindsektor	vorhanden, aber eher schwach	relativ stark, abnehmende Bedeutung	relativ stark, regional differenziert abnehmende Bedeutung	vorhanden, aber eher schwach
Organisation	*bottom-up* vs. *top-down* Kooperation Co-Investitionen Wallonien	Genossenschaften (I/S) Kooperation Co-Investitionen	GmbH & Co. KG, wenige eG Kooperationen	einzelne

Abkürzungen: eG: eingetragene Genossenschaft, GmbH & Co. KG: Gesellschaft mit beschränkter Haftung und Compagnie Kommanditgesellschaft, I/S: Interessentskab, UK: United Kingdom

Quelle: Eigene Zusammenstellung auf Basis der Ausführungen im Fachartikel.

Höhere Marktrisiken und steigende Anforderungen u. a. bei den Genehmigungen führen auch in Dänemark und Deutschland zu einem zunehmenden Druck auf den Bürgerwindsektor, auf den dieser – auch in Belgien – mit verstärkten Kooperationen, insbesondere auch untereinander, reagiert. Dies wird im Fachartikel in Anlehnung an Polanyi (1944) als „double movement“ bezeichnet. Der Begriff verweist auf Verschiebungen in den Machtstrukturen – u. a. mit Blick auf die Gestaltung der Regulierung –, die bei einer politökonomischen Betrachtung eine Rolle spielen. Solche Verschiebungen müssten sich in den energiepolitischen Diskursen der jeweiligen Länder widerspiegeln; insofern könnte eine Diskursanalyse weitere Hinweise liefern. Eine solche vergleichende Untersuchung für die vier betrachteten Länder steht bislang aus. Fragen von Machtverhältnissen in Transformationsprozessen steht bei Avelino und Wittmayer (2016) oder Avelino, Grin, Pel und Jhagroe (2016) im Mittelpunkt, an die angeknüpft werden könnte. Auch dies bleibt ein Forschungsdesiderat, auf das die Ausführungen im Fachartikel hinweisen. Zunächst wird in diesem auf Kooperationen als Reaktion von Bürgerwindgesellschaften auf veränderte Rahmenbedingungen und damit auf die veränderten Organisationsstrukturen verwiesen.

2.4 Fachartikel 4: Finance and Justice

Eine ländervergleichende Untersuchung auf sektoraler Ebene liegt auch im vierten Fachartikel vor. In diesem Fall werden die Interaktionen zwischen Energie- und Finanzsektor und die Frage nach einer Konkretisierung von Gerechtigkeitsnormen als Forschungslücken aufgegriffen. Es wird gezeigt, dass die Form der Finanzierung erneuerbarer Energien, einschließlich der Finanzierung durch Bürgerinnen und Bürger in Form von Bürgerenergie (v. a. in Deutschland) bzw. mittels alternativen Finanzierungsformen (v. a. in UK), Implikationen für unterschiedliche Dimensionen von *energy justice* hat. Ferner wird, wie bereits in Hall, Foxon und Bolton (2016), auf die Koevolution von Bürgerenergiesektor und Erneuerbare-Energien-Projektfinanzierung, auch durch lokale Banken, hingewiesen.

Ausgangspunkt für die empirische Untersuchung sind die acht Prinzipien von *energy justice* nach Sovacool und Dworkin (2015) sowie Sovacool, Heffron, McCauley und Goldthau (2016). Im SES *framework* stellen sie Normen (A6) dar – die soziale Dimension von Nachhaltigkeit. Sie lassen sich über ihre legitimatorische Funktion nicht nur rein normativ begründen. Vielmehr hat die Forschung gezeigt, dass Gerechtigkeitsvorstellungen für die soziale projektbezogene Akzeptanz bedeutsam sind (Holstenkamp, 2018a). Von den acht Prinzipien spielen gemäß Analyse der Interviews in Deutschland und UK ordentliche Verfahren (*due process*), Transparenz (*transparency*) und Gerechtigkeit innerhalb der aktuellen Generationen (*intra-generational equity*) bei der Finanzierung von Erneuerbare-Energien-Vorhaben und im alternativen Finanzsektor/bei Bürgerenergieprojekten eine Rolle. Hinzu tritt in UK das Kriterium der Bezahlbarkeit (*affordability*)[1] sowohl in Ergänzung zu den acht Prinzipien in Deutschland lokale ökonomische Entwicklung und in beiden Ländern die Resilienz des Finanzsektors.

Während sich die identifizierten Gerechtigkeitsprinzipien als Normen, damit Konkretisierungen auf einer dritten Ebene unter A6, in das SES *framework* integrieren lassen, ist die Verbindungslinie des Varieties-of-Capitalism-Konzepts zum SES *framework* nicht so offensichtlich. Allerdings liefern die Untersuchungen in Verbindung mit diesem Konzept Hinweise auf die für institutionenanalytische Untersuchungen relevanten Merkmale der institutionellen Umwelt (v. a. die „settings“, S). Die Typisierung dient dabei einer Vereinfachung. Während dies zunächst dem Ziel bei der Nutzung des *framework* widerspricht, institutionelle Arrangements und Umwelten möglichst detailliert abzubilden, kann es sich für die Analyse der Ergebnisse als

[1] Dass dies in den deutschen Interviews von den Interviewpartnern nicht dezidiert angesprochen wird, kann auch der Selektion der Interviewpartner geschuldet sein, wenngleich Fragen der Energiearmut in Deutschland nicht so intensiv diskutiert werden und gemäß Daten das Problem auch nicht so akut ist wie in Grobritannien und Nordirland (zu Energiearmut in Deutschland: Gawel, Geißler und Lehmann, 2017; Tews, 2014).

vorteihaft erweisen: Eine solche Verdichtung von Informationen kann Generalisierungen ermöglichen und verhindern, dass am Ende lediglich die Feststellung steht, dass jeder Fall einzigartig ist. Vor diesem Hintergrund kann die aus der finanzwirtschaftlichen Forschung bekannte Unterscheidung in banken- und kapitalmarktorientierte Finanzsysteme (Demirgüç-Kunt & Levine, 1999; Levine, 2002) als Merkmale – ohne normative Implikation der Vorzugswürdigkeit eines der beiden – auf der dritten Ebene des *framework* genutzt werden.

2.5 Fachartikel 5: Who benefits?

Die Überlegungen zu den Normen werden im fünften Fachartikel wieder aufgegriffen: Das Konzept von *energy justice* wird auch hier verwendet, aber auf den genossenschaftlichen Energiesektor übertragen. An diesen werden bestimmte Erwartungen geknüpft, die erfüllt werden müssen, um die Legitimität insbesondere von Unterstützungsmaßnahmen aufrechtzuerhalten. Die Erwartungen an die Partizipationsmöglichkeiten und Inklusivität stehen aber im Gegensatz zu den Erkenntnissen aus der politikwissenschaftlichen Beteiligungsforschung und den Ergebnissen der Forschung zum Investitionsverhalten privater Haushalte. Dieser Widerspruch wird als Ausgangspunkt für die Untersuchung der soziodemografischen Zusammensetzung im Artikel genutzt. Mit dem Fachartikel 5 findet damit ein Wechsel der Perspektive auf die Mikroebene statt: Zentraler Untersuchungsgegenstand sind die soziodemografischen Merkmale der Mitglieder unterschiedlicher Bürgerenergieinitiativen.

Die Analyse im Artikel zeigt, dass die Mitglieder der Initiativen sowohl in Australien als auch in Deutschland überwiegend höher gebildete Männer der oberen Mittelschicht sind. Die Ergebnisse stehen damit – absehen von der Geschlechterfrage – im Einklang mit der politikwissenschaftlichen Partizipationsforschung. Zugleich machen die quantitativen Untersuchungen deutlich, dass die soziodemografische Zusammensetzung der einzelnen Bürgerenergieinitiativen in Deutschland sehr heterogen ist. Dabei können allerdings keine Muster auf Basis der getesteten Faktoren Rechtsform bzw. Form der finanziellen Beteiligung, Projekttyp und Gründungsjahr identifiziert werden. Die Differenzen ergeben sich einzelfallbezogen. Hier ist weitere Forschung, zunächst wohl in Form von qualitativen (Einzel- und vergleichenden) Fallstudien, notwendig.

Die sozial inklusivere Gestaltung der Mitgliedschaft wird als Managementaufgabe für Bürgerenergiegesellschaften formuliert, um die Legitimität dieser Organisationsformen zu erhalten. Zugleich werden im fünften Fachartikel Versuche der Entwicklung sozial inklusiverer Formen der finanziellen Bürgerbeteiligung skizziert, die als Reaktion auf diese wahrgenommene Lücke erfolgen. Damit werden auch in diesem Fachartikel, wie im Artikel 4, die Normen (A6) diskutiert, in diesem Fall Legitimitätsfragen, die damit weiter ausdifferenziert werden.

2.6 Fachartikel 6: Investment Motives

Im letzten Fachartikel werden ebenfalls die Mikroebene adressiert und Rückschlüsse auf die Organisationsformen (GS5) gezogen. Untersucht werden die Investitionsmotive der Mitglieder von Bürgerenergiegesellschaften. Als Grundlage dient hierfür eine standardisierte Befragung aus dem Jahr 2013. Dabei werden verschiedene persönliche Merkmale (Investitionssumme, Rolle in der Bürgerenergiegesellschaft) und Unterschiede zwischen Gruppen von Bürgerenergiegesellschaften (Rechtsform, Projekttyp/Technologie, Region, Gründungsjahr/Registereintrag) als Einflussfaktoren getestet.

Die Ergebnisse der Analysen zeigen, dass sich die untersuchten Bürgerenergiegesellschaften grundsätzlich als soziale Investments klassifizieren lassen; insofern stellen sie Hybride im Sinne des *welfare mix* dar. Zugleich bestehen statistisch signifikante Unterschiede hinsichtlich der Stärke des Profitmotives zwischen Genossenschaften und GmbH & Co. KGs, zwischen Nahwärme, PV und Windenergie, zwischen Süd- und Norddeutschland sowie zwischen Bürgerenergiegesellschaften, die vor 2009 bzw. nach 2012 und solchen die während des „PV-Booms“ registriert worden sind. Insofern stellen Bürgerenergiegesellschaften keine homogene Gruppe dar; sie lassen sich mindestens hinsichtlich der Gewinnorientierung unterscheiden. Zusammen mit den Differenzierungen aus den anderen Fachartikeln ist vor diesem Hintergrund die Klassifikation von McGinnis und E. Ostrom (2014) kritisch zu evaluieren, was im Fazit (*siehe F1.1*) geschieht.

E Fachartikel

1 What do we know about cooperative sustainable electrification in the Global South? A synthesis of the literature and refined social-ecological systems framework

Abstract

It is widely acknowledged that access to modern energy services is linked to socio-economic development. There is growing evidence that it is a necessary though not sufficient condition for development. 95% of the population without access to modern forms of energy live in developing Asian and African countries. For these regions in particular, it is important to find suitable financial and organizational structures. Although the situation is better in Latin America, people in rural areas in some countries still face significant challenges. It is not clear what the right institutional structures to combat energy poverty and to improve energy development are. Even if there is no "one-size-fits-all solution" to the institutional question with respect to rural electrification, a better understanding of this issue is necessary to decide how and where contemporary models of ownership and governance could be used.

Based on a comprehensive literature review, this study summarizes findings on one of these models, cooperative ownership. It also identifies research gaps and adapts and refines the Social-Ecological Systems (SES) framework to describe institutional settings. This study proposes that this framework can be used as a diagnostic tool by both researchers and practitioners, e.g. to investigate policy options.

The literature reviewed shows a bias towards South and Southeast Asia and cases that have been successful in early years. Regarding research gaps, this study highlights the need for further comparative studies of several issues such as strategies to cope with lack of capacity, type and role of intermediaries, sense of ownership, and the role of cooperative approaches in energy transitions.

Keywords: electricity cooperatives; community ownership; rural electrification; institutional analysis; community energy

1.1 Introduction

It is widely acknowledged that access to modern energy services is linked to socio-economic development [1-4], even if the magnitude of the effects depends on the level of electricity consumption or electrification approach [5, 6]. Electrification must be accompanied by further (regional) development measures to have a significant impact [7]. Scholars have studied the effects of rural electrification or infrastructure in general on various outcome variables such as human well-being [8-11] and growth [12-14], regional integration [15], job creation [16, 17], education [18-20], rural-urban connectivity [21], health [18, 22], and household income [18], although distributional effects concerning the last issue are found be to uneven [13, 23]. Overall, there is growing evidence that access to modern forms of energy is a necessary, though not sufficient, condition for [18, 24-26] or "enabler" of development [27, 28]. For this reason, this aspect has been included in the catalogue of Sustainable Development Goals (SDGs) as SDG 7.

There is still some way to go for the global community to reach the goal of universal access to modern and sustainable forms of energy despite various national and international initiatives and platforms such as the Sustainable Energy for All (SE4All) [29-31] (for an overview of initiatives in Africa alone, see, e.g., [32-34]). As electrification rates in different world regions show (see Tables 6, 7), the challenge is considerable, especially in sub-Saharan Africa. Regional averages, however, cover cross-country differences within a region, as indicated by rural electrification rates for Haiti (8%), Yemen (32%), Myanmar (44%), Cambodia (50%), or Honduras (65%) [27].

Tab. 6: Electrification rates in different world regions and sub-regions

	Access to electrification (% of population)					
Region			Total			Rural
(- Sub-region)	1990	2000	2010	2012	2014	2014
Africa	38	38	43	45	47	27
- excl. North Africa	23	26	32	35	37	17
- North Africa	75	81	85	86	88	80
Arab region	76	82	88	89	90	81
- Arab LLDCs	32	40	48	49	55	41
- Arab North Africa	75	85	94	96	97	93
- GCC countries	100	100	100	100	100	100
- Mashreq	92	96	98	99	99	98
Asia-Pacific	70	79	88	90	90	83
- East & North-East Asia	89	94	99	99	99	100
- North & Central Asia	99	100	100	100	100	100
- South & South-West Asia	47	61	77	81	82	73
- South-East Asia	63	79	88	90	91	87
- The Pacific	83	82	83	83	83	44
Latin America & the Caribbean	85	92	96	97	97	89
- Caribbean	71	77	81	82	82	69
- Latin America	87	93	97	98	98	91
World	73	78	84	85	85	73

GCC: Gulf Cooperation Council, LLDC: Least Developed Country

Source: [27]

Tab. 7: Electrification rates in selected countries

Country	Total 2014	Rural 2014
Argentina	100	.
Bangladesh	62	51
Bolivia	90	71
Brazil	100	98
Burkina Faso	19	3
Chile	100	100
Colombia	98	90
Costa Rica	99	98
Dominican Republic	98	96
Ecuador	99	97
Ethiopia	27	12
Fiji	100	76
India	79	70
Indonesia	97	94
Liberia	9	2
Mali	27	12
Nepal	85	82
Philippines	89	83
Sri Lanka	92	91
Tanzania	16	4
Uganda	20	10
Vietnam	99	99

Source: [27]

Rural electrification projects in developing countries face a number of challenges that, taken together, push them to the lower right section of the risk-return diagram. Therefore, these kinds of projects are generally not attractive for private for-profit investors. It is not clear what the right institutional structures to combat energy poverty and to improve energy development are [35]. Even if there is no “one-size-fits-all solution” to the institutional question with respect to rural electrification [36], a better understanding of this issue is necessary to decide how and where contemporary models of ownership and governance could be used. This study also considers another important dimension, namely the need for a clean or, more broadly, sustainable energy supply.

Many initiatives focus on private sector participation, public-private partnerships (PPPs), and large investors or capital markets [37, 38]. There is, however, a growing recognition of community-based delivery models among practitioners, e.g. in the context of mini-grid programs [39], or among researchers [40]. The burgeoning literature on community energy and energy cooperatives focuses on countries in the North (e.g. [41-43] for overviews, [44-46] for comparative work, [47-49] on the UK, [50, 51] on cooperatives, [52] on acceptance, [53, 54] on motives, [55] on sustainability transitions), but also, albeit to a lesser extent, on community ownership in the Global South[2] [56]. However, this evidence is mostly scattered across case studies, journal articles, and reports of various kinds and is methodologically diverse. Overviews often lack a theoretical foundation. Many studies present country-specific cases: For historical accounts and as a role model, most scholars and practitioners refer to the case of the USA [57-59], despite earlier or equally important experiences elsewhere [60]. Among developing countries, Bangladesh, the Philippines, India, and Nepal have attracted the most attention (see 4.1).

Addressing these gaps in the literature, the present study is the first to systematically and comprehensively review research on cooperative electrification in the South. To synthesize findings and integrate results from various studies with different disciplinary and theoretical background, this study adapts and refines a conceptual framework, the Social-Ecological Systems (SES) framework (see 3.1). The framework can guide energy policy and the management of cooperative organizations, e.g. with regard to relevant issues and challenges over time. Besides synthesis of the literature and refinement of the conceptual framework, the third aim is to identify issues and avenues for further research.

The rest of the study is organized as follows: In the next section, search strategy and method of analysis are described. Thereafter, an overview of relevant theoretical and empirical works is provided, which form the basis of the framework that the author adapts to the context of rural electrification in the South and develops further through the narrative meta-analysis. The results are described and discussed in Section 4. The article concludes with a summary of findings and implications for both researchers and practitioners.

1.2 Material and methods

Considering the insights of different disciplines, this study is the result of an extensive search of studies and evaluations of cooperative electricity provision in the Global South [61]. “Cooperative” approaches to provide electricity differ from those that are driven by a single community organization or by a municipality, entities that are often included when the term “community energy” is used [56, 62, 63]. This study defines “cooperative approach” as a model where the (often local) community owns or co-owns the means of generation, transportation/distribution, or sale of electricity. Bakker [64] terms this approach “associative self-governance.” A group

[2] The terms South, Global South, and developing countries are used interchangeably in this article (opposite: North, Global North, or developed countries). While the theoretical framework used here does not suggest the use of a specific term, Global South or South – as in South-South cooperation – is considered to be more neutral and therefore takes precedence over terms such as developing countries. The use of terms does not imply any view regarding homogeneity or comparability of countries subsumed.

of local or regional inhabitants may, of course, interact in different ways and to different degrees with municipalities or other public agents. “Village organizations” may rely on different legal structures [65]. In many instances, village-level committees set up for electrification purposes are often identical with or closely related to local authorities. At the same time, representatives may belong to political bodies at the village level. Since boundaries are blurry in these cases, village committees, which appear under different names in the literature, were also included during the search process. In practice, boundaries between real types are fluid. The literature usually refers to “models”, i.e., “ideal types” in a Weberian sense [66, 67]. To give an example, most rural electrification scholars and practitioners regard “cooperative societies” and “community(-managed) models” as two distinct types [68], whereas some conceive of the former as a subgroup of the latter [69]. The implicit criterion behind this typology is the degree of formalization. As will be shown in 4.3, a more nuanced typology than this juxtaposition of two ideal types may be necessary to map institutional differences.

This study uses data provided by research in a qualitative, mostly narrative meta-analysis [70] rather than adding another case study. The text corpus was constructed in several iterative steps performing a search in (a) the Scopus and Web of Science databases using the term <cooperativ* AND "rural electrification"> and scholarly work cited in and citing the articles, (b) in Google Scholar resorting to these results, and (c) generally on the internet for information from or on donors and other stakeholders. Due to limited language ability, the research limited the corpus mainly to English language texts. Reports and other gray literature available on the internet were not excluded, i.e., the search was not restricted to peer-reviewed journal articles as, e.g., in [71].

Overall, the corpus included 287 publications of which one has no country-specific data, but reports regional experiences with cooperative models, and ten publications include evaluations of cooperative models in general. The corpus comprised 83 journal articles, 111 working papers and reports, 42 monographs or book chapters, 10 theses, 14 conference proceedings, reports, and presentations, and 27 internet texts/webpages, newsletters, or online media articles. Journals represented five or more times are Energy Policy (16), Energy for Sustainable Development (13), and Renewable and Sustainable Energy Reviews (8).

Due to the vast differences in methodology, scope, and level of analysis and detail of cases, this study first summarized and paraphrased the collected information. In a second step, the summary was coded using a refined version of the SES framework (3.1) adapted to the rural electrification context (3.2). The analytical framework guides the selection of variables, facilitates the integration of findings from various disciplines, and can be used as diagnostic tool once relevant elements and interconnections have been identified [72-74].

1.3 Theory

1.3.1 The Social-Ecological Systems (SES) framework as a tool to organize findings

In order to better understand the workings of cooperative ownership of energy assets in developing countries and the role this type of ownership can play in sustainable electrification compared with other models, a tool to describe the different influencing factors and a "diagnostic toolkit" are needed [37, 75]. As Estache [37] emphasizes, empirical research has to consider the interrelationships between the different components. Usually, this leads to the development or refinement of a conceptual framework, which is then used to depict a complex system and to integrate findings from different disciplines and sub-disciplines [72, 73, 76]. The SES is an established and commonly applied framework ([77, 78] for other frameworks and [79] for a comparison). Although it was originally designed for common-pool resources, various scholars have applied this framework to other areas such as infrastructures in general and energy systems in particular (for an overview: [70, 74, 80], on the development of the framework: [73], an application to climate politics: [81], and to community energy: [44]).

Elements of the framework and interrelationships of these elements are organized at different levels ("tiers"): On the first tier, we find Resource Systems (RS), Resource Units (RU), Governance Systems (GS), Actors (A), Focal Action Situations with Interactions (I) and Outcomes (O), related Social, Economic, and Political Systems (S), and related Ecosystems (ECO) (see Figure 9). Each element on the first tier is sub-divided into three to nine second tier elements. This study focuses on the GS variables because they play a major role in the context of rural electrification (see 3.2). The electricity governance system is organized on multiple levels. Therefore, the task of the next section (3.2) will be to identify relevant levels, elements, and specific action situations, which are important for sustainable electrification in the South.

1.3.2 Institutional dimensions of infrastructures and rural electrification

Since cooperative approaches are mostly found in rural areas, this section focuses on rural electrification. However, it is important to note here that there is no clear-cut division between rural and urban, but that it rather constitutes two opposite ends of a continuum [82, 83]. The process of rural electrification poses several challenges, also compared to peri-urban or urban electrification in the South [36, 82, 84]: lower incomes, fewer trained professionals, lower revenues due to low demand, at least at the beginning, and higher investment and operating costs because of lower population density and load factor. Taken together, this leads to high uncertainties and low expected returns. Only few projects are expected to be economically feasible within a short or medium term. Hence, donors have shifted their focus from pure cost recovery to meeting the needs of the poor [14] and "smart" subsidies [85, 86, 87]. The availability and type of subsidies are an essential element of rural electrification, a contested issue since willingness- and ability-to-pay is generally low, other development needs may be ranked higher, and subsidies tend to distort markets [88, 89]. Household demand is difficult to predict, as discussions around the "energy ladder" concept show [90-93]. Generally, low demand from private households means that developers of projects usually try to include larger organizations such as schools, government facilities, or larger non-governmental organizations (NGOs) with "assured demand" [85]. Accordingly, several authors emphasize the necessity to strengthen "productive use" and complimentary programs besides pure electrification [7, 14, 90, 94, 95]. In light of these findings, actors can be classified according to socioeconomic attributes into rich and middle class vs. poor private households, small vs. large businesses ("productive use"), and "assured demand users" vs. those with volatile demand.

The relevant resource units depend not only on the service provided, but also on the technology applied. There is a broad variety of options available to bring demanded services to people who do not have access to modern forms of energy yet [96]. Different technologies for generation, distribution, and/or use can be involved. Moreover, technology adoption not only depends on local factors or economic and technical feasibility, but also on the perception of these technologies by customers and politicians. National politicians often prefer large-scale projects to decentralized options, as illustrated by Sovacool [97] for the case of Malaysia.

In the context of technology, the question of sustainability emerges. "Clean" or "sustainable energy" primarily means renewable energies. These tend to have a different cash-flow profile than fossil fuel-based solutions, especially higher upfront costs, but lower operating costs [87]. Fossil fuel subsidies and a lack of internalization of external effects influence the competition between technologies. The adoption of a technology and/or type of the project also depends on the stage of development of the respective technology and its costs. In this context, donor policies have changed in the past from "technology diffusion" to "market creation," now including sustainability aspects [98, 99], with donor-specific preferences for technologies and/or approaches [100].

Different institutional options to implement these technological solutions in the South have been proposed, which can be characterized along five dimensions: level of coordination, delivery mechanism, subsidy scheme, type of regulation, and ownership. Coordination can be central or decentralized [101]. In the former case, either the rural electrification division of a national utility or a separate Rural Electrification Agency (REA) can take over the coordination. Alternatively, responsibility can be devolved to the community [35]. Rural electrification cooperatives often belong to the latter category [35]. In reality, combinations of these approaches exist. The US model is such a case, where cooperatives are combined with an REA as responsible and supporting entity. Where different entities co-exist, they may compete. National utilities tend to have low incentives to electrify remote rural areas quickly, since the goal of universal access is often at odds with financial targets [102]. Nevertheless, there may be strategic arguments such as preventing new actors from entering the market. Regarding delivery mechanisms, Williams et al. [103] distinguish between collection models (pre-paid, post-paid, sale to third party retailer) and tariff models (fee for service, fixed charge, consumption-based tariff, hybrid models). Many developing countries highly depend on donors for financing [87]. Regulation plays a major role in the energy sector worldwide. Scholars distinguish price and service quality regulation and different intensities [96, 104]. Lastly, along the ownership dimension, three ideal types exist: private for-profit, private non-profit or non-governmental, or public or state-owned. Cooperatives are commonly assigned to the second category, even though they may earn profits where cooperative regulations allow it, and public entities, especially municipalities, may be members of a cooperative. As Estache [37] stresses, many authors and organizations emphasize PPPs as a solution to the rural electrification and universal access challenges. Mostly, this involves international companies [105, 106]. Combining values for the five dimensions leads to a large set of models, even if not all possible combinations do exist. Scholars usually pick out typical combinations, which one can investigate empirically. As a result, typologies differ in terms of important details [85, 96], making it difficult to compare theoretical and empirical findings.

Most authors emphasize that there is no “one-size fits all” model [36]. In addition, models cannot be easily transferred from one context to the other [37]. Liberalization and privatization of the energy sector in many developing countries [107-109] have led to new political conditions and governance systems, e.g. the creation of regulatory bodies and/or rural electrification agencies. Therefore, the historical development of regulation has to be included in the framework.

This overview shows that electrification is linked to other policy areas, i.e., regional development, aid, environment, or climate change [110]. In all of these areas, there are diverse donors, networks, and initiatives. Thus, governance is characterized by multiple levels, although in most cases, the national level plays an important role. Dynamics of coordination and contestation on and between these multiple levels have to be acknowledged as well [110].

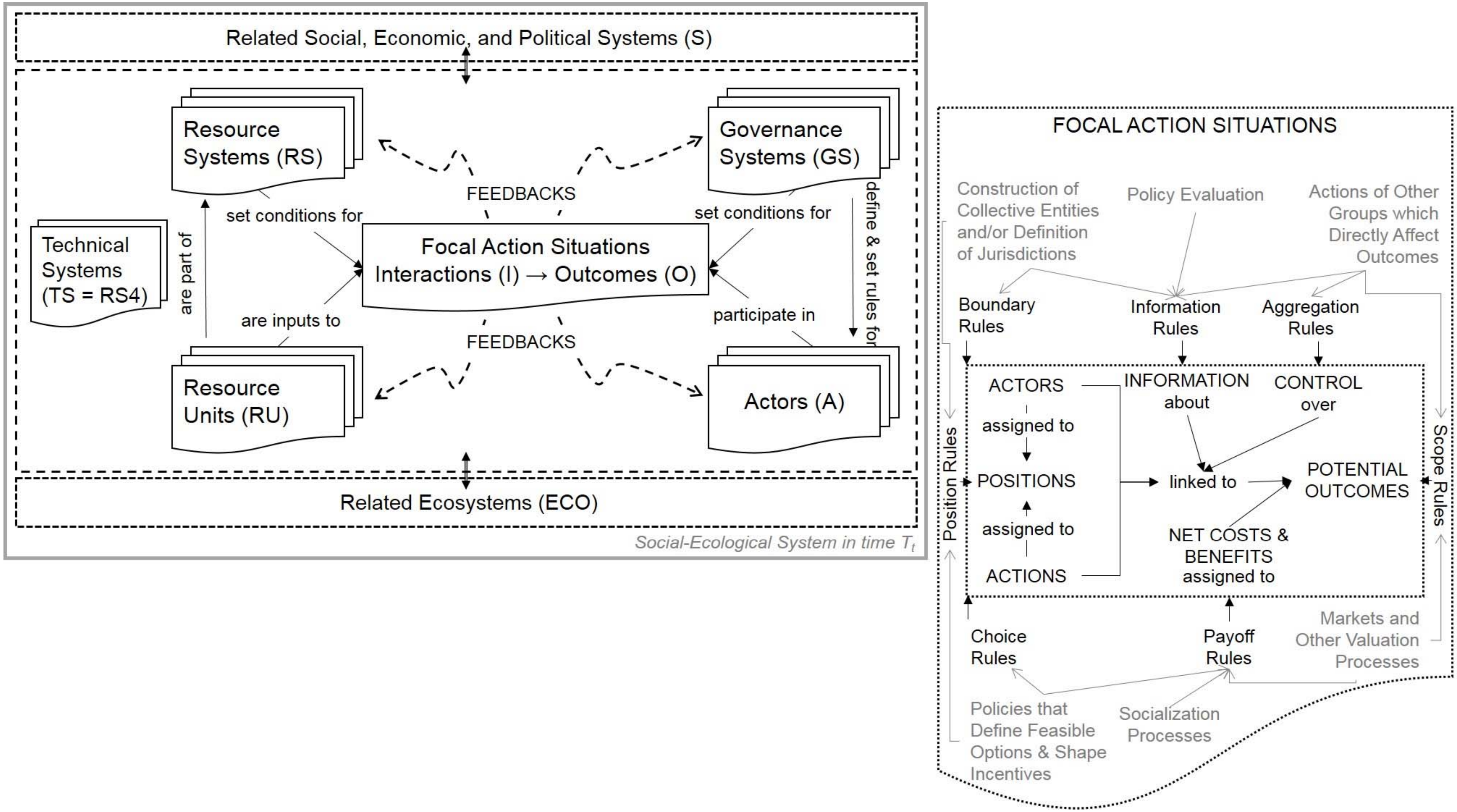

Abb. 9: ***Socio-ecological system framework with networks of adjacent action situations***

Sources: Own adaptation of [114, 115]

1.3.3 Framework for the literature review

Applying these insights from the (rural) electrification literature shows that a “Technical Systems” (TS) component needs to be added to the framework, which either could replace the RS component, constitutes a separate component, or is interpreted as a specific form of resource system (RS[1]) with a stronger emphasis on “human-constructed facilities” (RS4). Here the latter approach is taken because of the interactions of technical and “natural” elements [73] and the similarities between some technical solutions, especially micro-grids [111, 112], and common-pool resources (see Appendix A for a list of variables). However, not all RS elements on the second and lower tiers easily translate into elements of a technical system.

In the SES framework, there are three levels of analysis and related rules [113]: operational, collective choice, and constitutional. Since it is not always easy to disentangle them [72], this study uses McGinnis’s “networks of adjacent action situations” (NAAS) [114]. These NAAS are at the center of the SES framework (Figure 9).

With regard to rule-making organizations (GS5), a change in the list has to be acknowledged: In its original version, the SES framework only included governmental and non-governmental organizations [115], resembling a liberal conception of the public-private dichotomy [116]. McGinnis and Ostrom [73] replaced it with a list of public sector, private (for-profit), non-profit, community-based, and hybrid organizations. This list is, however, neither exhaustive, nor do McGinnis and Ostrom disclose their classification criteria on which they base this list. Without reproducing the arguments brought forward for why the concepts of public vs. private [117, 118] vs. community or social [119] and the non-profit or third sector [120, 121] are problematic, the study adopts the “community” label since this is the category in which cooperative approaches are commonly included. Pursuing mutual interests is what separates them from NGOs, which act on behalf of others (“general interest” [122]). As various studies have shown, formation and composition are of utmost importance for the working and impact of community organizations [123]. Partly, they build partnerships with public and other private actors [124] (“co-production” [125-128]; see related terms of “co-management” and “co-governance” in [129]). Were they to form joint ventures, they would have to be included in the “hybrid organizations” category. Alliances can be depicted through the network structure variable (GS9). The labels in the listing represent ideal types. Community energy companies, for instance, may also pursue financial and general interests [54, 130]. These issues will be taken up in the discussion section. A preliminary list of “public” entities (governments/administrations, regulatory agencies, donors/aid agencies, public utilities), private for-profit (utilities, investors/developers), nongovernmental non-profits, community-based organizations, and hybrid organizations (joint ventures, social enterprises) is used at this point. However, it seems necessary to develop an area-specific classification based on criteria such as interest and resources [131].

Ownership also plays a role in property rights systems. Schlager and Ostrom [132] distinguish five types of rights: access, withdrawal, management, exclusion, and alienation. In the electricity sector, property rights are part of the regulatory framework and closely related to the construction of the market, for instance in the case of exclusive grid concessions or licenses to operate mini-grids. Regulations may stipulate restricted rights of exclusion. Relevant third-tier variables should therefore emerge from the literature review.

Further research has to show if distinctions made between rules, rule-making organizations, property rights systems, and norms and strategies are clear enough and productive for empirical research in this area of application. Nevertheless, this study uses the provisional categories given in Appendix A for the coding.

The result is a framework that can be used to describe and analyze the institutional settings. Findings could be compared to those of others on other types of ownership and on other sectors. The structure and higher number of variables compared to similar descriptive tools [37, 75, 133] allows this study to better capture complexity and institutional diversity. The next step is to identify those elements and specifications relevant for cooperative electrification approaches in the South through a review of the available literature.

1.4 Results and discussion

1.4.1 Geographical representation

An initial analysis of the text corpus created using the search strategy described in Section 2 reveals that there are certain world regions and countries overrepresented in the sample. One possible explanation is that cooperative approaches are more common in these regions or countries than elsewhere or that there is a bias in the literature. The most frequently mentioned or studied countries are Bangladesh (69), the Philippines (68), India (50), and Nepal (44), followed by Costa Rica (32) and Kenya (25) (Table 8). While changing search terms and strategy may lead to different results regarding geographical representation, these numbers indicate, nevertheless, that studies on South and Southeast Asia dominate the literature in English.

Tab. 8: Geographical distribution of literature reviewed, type of data, and dominant models

Countries	Type of data Empirical	Overview	Mentioned	Total	(Dominant) models
Bangladesh	14	27	28	69	top-down/cooperative/NRECA
Philippines	9	21	38	68	top-down/cooperative/NRECA
India	12	24	14	50	top-down/cooperative/NRECA; VECs/top-down
Nepal	11	13	20	44	VECs (bottom-up/facilitated)
Costa Rica	3	6	23	32	top-down/cooperative/NRECA
Kenya	12	5	8	25	community micro-hydro
Brazil	2	7	14	23	bottom-up/cooperative; various
Argentina	1	8	12	21	bottom-up/cooperative
Bolivia	2	2	17	21	bottom-up/cooperative/NRECA
Sri Lanka	2	10	8	20	VECs (bottom-up/facilitated)
Indonesia	3	8	8	19	VECs/NGO
Tanzania	8	5	5	18	community micro-hydro
Chile	2	1	11	14	bottom-up/cooperative
Liberia	0	1	10	11	top-down/cooperative/NRECA (new)
Burkina Faso	4	2	4	10	top-down, cooperative, DANIDA; multi-functional platforms

DANIDA: Danish International Development Agency, NGO: Non-Governmental Organization, NRECA: National Rural Electric Cooperative Association, VEC: Village Electricity Committee

Source: Own compilation.

Despite of their long history, Southern Cone electricity cooperatives seem to be underrepresented, at least in the English language literature [134-136]. It seems that there have been electric cooperatives in India before the US began to export its model [137, 138], but it seems that no studies on these have been published.

Moreover, there are some studies on the efficiency of the Philippine electric cooperatives. In contrast, journal articles and reports on Bangladesh, where performance data of cooperatives are publicly available as well, tend to focus on the national level [139].

Different donors, especially the USA, but also Sweden and Denmark, have supported cooperative societies. Four out of the six most frequently mentioned countries received initial US support through the NRECA International, which has promoted the US model worldwide. Among the NRECA cases, those that were successful, at least in a first phase, are more prominent. Colombia or Nicaragua, e.g., have received little attention, whereas a larger number of analyses of Costa Rican electricity cooperatives exists.

1.4.2 Defining ownership

Aside from the geographical focus on South and Southeast Asia, the review of the literature revealed a great diversity in terms of ownership beyond the usual dichotomy (public, private) or trichotomy (public, private, community). In addition, the understanding of "ownership" seems to differ; Kariuki and Schwartz, e.g., base their definitions of the public and the private on "initialization" and "funding" [140]. There were also several instances of delegation or contracting out of services (i.e., responsibilities remain with the owner, e.g., a public agency), gradual transfer of rights to the community, or division of rights to several entities. Thus, ownership can be shared in different ways (see 4.4). Moreover, ownership may vary along the value chain (generation, distribution, retail) [141], e.g. in the "generator" model described by Mutubuki-Makuyana [142].

In practice, four different restrictions of certain rights can be identified: In the Nepalese lease model, a community group takes over the grid from the Nepal Electricity Authority, but without transfer of full legal ownership. In this manner, abuse can be prevented. In Thailand and Mozambique, there are cooperative groups that do not own grid or generation assets, but only have the right to earn income from the plants, which they put into a community fund.

The allocation of operation and maintenance (O&M), which goes along with certain control rights, differs considerably across countries. On the one hand, cooperatives called "COOPELs" in Burkina Faso are legally banned from O&M. On the other hand, village committees' rights in several Indian states are restricted to this role, e.g. in Chhattisgarh, Orissa, and West Bengal, partly even graded, i.e., shared with private companies. Village authority ownership and local community management is also practiced in Fiji and Pakistan [35]. These distinctions are not only useful for the description of property right structures, but become relevant in discussions on performance (see 4.8).

Another issue in the literature is bottom-up vs. top-down planning approaches and procedures (GS4). In this context, the World Bank [143] distinguishes between a "REC model" (Rural Electric Cooperative) following the US example and "community electric cooperatives" as small community-based organizations. In the US model, a central organization functions as conduit to channel funds and select areas for development. It sets up cooperatives and assumes a supervisory role [35]. While this approach seems to be able to overcome inherent limitations of the cooperative model regarding expertise and management capacities, it is reported to have a negative effect on sense of ownership, e.g. in Bangladesh, the Philippines, or Costa Rica (see Appendix C). Moreover, the Bangladeshi and Philippine cases illustrate that the success of this approach is tied to local political culture, authority and leadership, self-binding, and functioning of the state (S3) [144, 145].

In order to foster a sense of ownership and to further develop cooperatives, the Bangladesh Rural Electrification Board (REB) adopted a "graduation strategy" (change in GS7): Autonomy increases as cooperatives build capacity and can show that they can meet the performance criteria set by the REB [144]. Another approach taken by cooperatives to gain more independence from support and supervisory bodies is to create a common entity, e.g. for financing projects, as in the Philippine case (Rural Electric Finance Corporation). Instead of gradually transferring rights to the community, the model employed may involve a transfer of ownership after a certain period, e.g. from an NGO to the community after 2-3 years in Mutubuki-Makuyana's BOT model, named after well-established Build-Operate-Transfer structures in the infrastructure sector [142].

1.4.3 Choice of legal structure and degree of formalization

Besides ownership, the literature also differentiates between cooperatives and community models (→GS5). As Solis [146] points out, the main difference is one of formal registration and applicable law (GS6). Legal structures and related laws vary, e.g. in Sri Lanka, where associations are subject of the Voluntary Social Services Organizations Act and cooperatives of the Co-operative Society Law [147]. In the case of Xcalak, Mexico, the legal structure changed from VEC with unclear ownership rights and duties to a trust fund "Fideicomiso Operativo Xcalak", a joint venture of villagers, state, municipality, and a university [148, 149].

The legal structure may have an effect on the rights and access of operators, e.g. to financing or bank accounts, depending on the legal context [140]. Similarly, Payen et al. [150] argue that clustering projects in cooperatives can be a vehicle for upscaling. Two other reasons for "formalization" can be identified in the literature: First, certain legal structures may be required by donors, as in the case of World Bank support for community groups in Sri Lanka [151]. Second, choosing a specific legal structure often implies specific regulatory rules and regulators. In the Philippines, electric cooperatives can choose between staying under the regulation of the National Electrification Authority (NEA) as non-stock non-profit cooperatives, forming stock cooperatives under the cooperative regulator, or de-mutualizing and becoming stock corporations [145].

Upscaling (→A1) and formalization (→GS6) may, however, also lead to several problems such as growing distance between cooperatives and their customers or a lack of transparency and involvement. In response to upscaling, several cooperatives have created internal sub-structures: The South Lalitpur Electric Cooperative in Nepal has formed transformer sub-committees that consist of several functional groups [152]. Similarly, micro-hydro projects in Pakistan are governed by clusters of village organizations [153]. Districts and sections in Bolivia's Cooperativa Rural de Electrificación or island branches in Tuvalu's Solar Electric Cooperative Society are other examples. In the Philippines, some electric cooperatives contract out certain tasks, especially collection of fees, to Barangay power associations [145]. No in-depth study of these smaller entities or comparisons of different internal structures was found in the literature.

Besides formalization, the literature also reports processes of “deformalization.” On Namara, Fiji, villagers changed the cooperative society, formed in a top-down process, into an informal community scheme after the failure of the cooperative [154, 155]. As is argued with regard to self-help groups in Kenya as well [156], these informal groups are more flexible, which may be advantageous especially in highly unstable institutional environments or in cases of high uncertainty regarding future demand.

1.4.4 Intermediaries and hybrids

Many cases include intermediaries [143], e.g. NGOs, as project developers [150] (GS5, GS9). Important roles for strong intermediaries are not uncommon in the context of cooperative electrification in the Global South, although this can also be observed in the context of community energy in the North [157]. Roles of intermediaries vary: They can be initiators of projects, regulators, financiers, especially conduits to channel aid funds, developers, co-owners, or facilitators. In the latter case, activities include mediation of processes, knowledge exchange, capacity development, provision of information, and technical assistance.

In this context, Bangladesh’s REB and, to a lesser extent, the Philippines’ NEA have received considerable attention in the literature. This could be explained by the focus on US-sponsored cases, as the Rural Electrification Administration had a similar role as a supporter and regulator [58, 158, 159]. Hence, NRECA International, the executing agency for US aid programs, is frequently mentioned. In Nepal and Thailand, public agencies also support and regulate cooperative entities, especially at the beginning. The Indian case is unique as there are two public agencies directly involved in financing (the national Rural Electrification Corporation) and regulation (the State Electricity Board, SEB, at the state level). Since SEBs also used to compete with cooperatives, conflicts of interest led to a lack of support.

Other intermediaries (see list in Appendix B) have received less attention in the literature. Two studies address the role of NGOs such as IBEKA in Indonesia [160, 161]. The list in Appendix B shows that NGOs at different governance levels (local/regional, national, international) are involved in the projects. International NGOs and partly public agencies not only use their funds to support cooperative electrification, but also channel international aid money. Associations appear in several cases, especially if a critical number of cooperative groups exists or as a response to challenges to growth after electric cooperatives have been established. These intermediaries, their roles, interaction with other agents, and various ways to address capacity problems have yet to be compared.

The use of intermediaries is one of the two solutions often applied if the technical and managerial capacity of communities in remote rural areas is limited [37]. The second is mixed/hybrid ownership (GS5). In this case, public entities, private for-profit companies, or social enterprises may acquire shares and create a joint venture with the community or take over specific tasks such as O&M [162, 163]. These hybrid models could be related to discussions on “blended finance" [106]. Examples from the literature include trusts in Malawi, shareholder companies in Zimbabwe, joint ventures formed by IBEKA in Indonesia, Mein River in Liberia, and Lumama in Tanzania (see Appendix C). Roles are commonly assigned depending on resources. Besides resource constraints, the formation of this kind of hybrids can be explained by behavioral uncertainties, especially regarding the behavior of regulatory bodies or local customs and values. As the regulation literature has shown [164, 165], the coordination within these hybrid models may pose challenges, especially in cases where administrative procedures remain vaguely defined or are absent [150].

Private and community actors not only form joint ventures for primary electrification, but also for specific generation projects, e.g. in the case of Sociedad Cooperativa Popular Limitada's first wind parks in Argentina [166]. In other cases, cooperatives join forces for renewable energy projects. This is an approach that can only be found in more advanced economies and in the case of cooperatives such as C. Rio da Varzea and COOGERVA in Brazil [167, 168]. As in the case of intermediaries, the literature search did not reveal any systematic analysis or comparison of hybrids in the context of cooperative rural electrification in the South.

1.4.5 Actor characteristics

With regard to actor characteristics (→A1-9), the literature deals with questions of leadership and personal capacity, cultural background, energy system visions/perceptions, and social structure. In addition, principal-agent problems are mentioned.

Several studies have shed light on the central position of the general manager or leadership in general (→A5). In the Philippine cooperative CEBECO III, employees and members revealed a kind of "religious devotion" to a priest and presidential advisor who engaged in the cooperative and deterred other politicians from intervening in the business [145]. In the case of PALECO, it was the general manager, who had led the cooperative since 1994, who is responsible for the company's success [145], and in the case of Bangladesh's REB, it was the first chairman [144]. Lack of capacity for business management, project development, and O&M are frequently mentioned in relation to the issue of leadership.

Besides leadership and capacity, several cultural factors (→A7) have been discussed in the literature. First, cooperative traditions play a role when it comes to choosing organizational forms. In this context, positive (e.g. Indonesia, Malaysia) and negative (e.g. Tuvalu, Burkina Faso) experiences have been examined. In the case of Hukeri, India, there was a strong cooperative movement [169, 170]. Common ownership traditions such as those in Mozambique for land and water [140] or self-help traditions as in the case of Kenya ("Harambee", [171-173]) or Costa Rica ("cooperativismo", [174, 175]) constitute the "institutional repertoire" (GS8) to which cooperative electrification projects can resort. In Sri Lanka, electricity consumers societies have been modeled after funeral benefit societies [176]. German and Italian immigrants, who knew cooperatives from their home countries, formed early Brazilian cooperatives [177], whereas COOPERBIO has been linked to the landless movement [178]. Three aspects are important in this context: (a) The recourse to specific traditions is a process of social construction. Often, there are different experiences and existing institutions, which those who want to establish the cooperative group can use as a resource. (b) This approach may not be successful if it does not match governance systems. Common ownership in Burkina Faso, e.g., is traditionally restricted to the wider family, but not beyond [179]. (c) Associations with cooperatives can be negative, e.g. in Africa [180]. In this case, past experiences may pose an additional challenge to any attempt to establish cooperative electrification projects. Second, the general vision of the future of electric supply held by politicians and administrators can create technical (TS10) and institutional path dependence (GS10) [181], as illustrated in the case of Thailand [111, 182]. On the other hand, the Philippine example, with a private provision at the beginning of electrification, illustrates the possibility to break a path, here through a donor-funded program [183]. Third, in several cases, people have been reluctant to pay cost-recovering fees due to a mindset that has developed over time and which authors describe as subsidy mentality (Philippines) or image of electricity as universal state obligation (India). In India, politicians have reinforced this perception during election campaigns under the slogan “free power for agriculture” [184]. In Leganga, Tanzania, villagers refused to pay for the service since the plant had been donated [185]. Fourth, cooperative electrification often relies on the community’s social structure to guarantee payments (A6) [162], which explains higher collection rates than in other ownership models.

A typical control or principal-agent problem can be observed in the case of the Tuvalu Solar Electricity Cooperative Society, which went bankrupt due to mismanagement and appropriation of funds [186, 187]. Misuse of funds has also been reported for Mizque, Bolivia [188]. Muijzenberg [189] describes similar situations for the Philippines. It seems that in addition to missing or inadequate precautionary measures and unfavorable political culture, the lack of a sense of ownership on behalf of the customers is partly responsible for this failure. The Koro, Fiji, case illustrates that this principal-agent problem may occur between donors and recipients as well [154, 155].

1.4.6 Politicization and regulation

Mismanagement and appropriation of funds can be a result of “politicization,” which is much discussed in certain contexts, especially in the literature on electric cooperatives in the Philippines and after 2006 for Bangladesh. It seems to have played a role in India, even if SEB competition has been more detrimental to the development of rural electric cooperatives there [147, 170, 190]. Politicization can best be described in the SES framework as interaction between energy governance and political system in nested action situations. Authors have identified the local and national political culture (GS8) as important determinants for the likelihood of politicization, in addition to rent-seeking potential (RU4) [145, 189].

In Bangladesh, several safeguards to prevent political capture have been integrated into the cooperative system [144, 191]. It seems, however, that did not work well at the beginning of the 2000s [139, 144, 192]. As in the case of the Philippines [145], there are vast differences between cooperatives, though, so it is difficult to fully assess the impact of safeguards.
The problem of capture and rent-seeking is not unique to cooperatives; it may even be more severe for other types of ownership, especially public ownership. Thus, Estache [37], with reference to Sheely [193] and Vicente and Wantchekon [194], considers community-based monitoring and empowerment as countermeasures to capture and clientelism. However, community participation is not a panacea, as participation research in general has demonstrated [195, 196]. Nygaard [179] studies elite capture in the Burkinabe town of Sebba. He understands the electric cooperative as an arena for local power politics. Similarly to Hasnain and Matsuda [145], he emphasizes the rent-seeking potential ("symbolic resources" in his terms) as an important determinant for the composition of actors involved. Overall, comparative analyses of politicization in different countries could contribute to a better understanding of the impact of these processes.
Interactions with the political system further include tariff setting, regulation, and oversight. There are different ways to define tariffs in the context of rural electrification projects (GS6):

- In several cases, cooperatives have been allowed to determine type and level of tariffs on their own.
- A cap may limit the level of tariffs, as in the case of Nepal.
- In some cases, as in India and the Philippines in the past, government agencies determine tariffs. This may lead to tariffs that are too low for cooperatives to build reserves.
- Some countries have mandatory uniform national tariffs (e.g. Burkina Faso), which are usually low. Naturally, this has a severe impact on profitability.

Determining the right level of tariffs is not easy in a rural electrification context, especially because of the uncertainties around demand and its development over time. Karekezi et al. [197] show that if groups choose an appropriate design and manage the systems well, operational costs and loans can be covered. However, most scholars emphasize that tariffs are typically too low [96, 162]. Authors have identified several reasons for this: If nationwide tariffs by the national supplier, often a parastatal or former state-owned monopolist (S5), are low due to political interference and/or subsidies, this will influence the expectations (A7) of rural customers since it becomes the point of orientation [150], as reported for Ethiopia [101]. Besides regulation, social acceptance (A6) may set limits for tariffs [150]. Ilskog et al. [198] report a lack of knowledge and experience and describe experimentation with different tariff models for the case of Urambo, Tanzania. At the end, tariffs matched O&M costs at least. Overall, this tendency to charge tariffs that are too low has been used as an argument for supervision by a public agency or association.

With regard to the type of tariff, Greacen [111] emphasizes that the model chosen has to fit the source of electricity (RS1, RS6); otherwise, this would lead to over-consumption. Social acceptance (A6) plays a role in this context, since flat rates are easy to implement, but often considered unfair [198].

Besides the definition of tariffs, authors point to overlapping jurisdictions (GS1) between cooperative and electricity regulation in India, which causes conflicts, as instructions may be contradictory [199]. Positive changes in electricity regulation are reported for Thailand with the Very Small Power Producer Law of 2002 [111], while the introduction of concessions in Bolivia and Brazil have created regulatory uncertainties and challenges [96, 134] (GS7).

Electricity markets are usually highly regulated. Despite of attempted or implemented regulatory reforms in most countries around the world, competition with incumbent national suppliers (S5) may cause cooperative groups to fail because of the pricing challenge described above and/or as a consequence of grid extension strategies. Moreover, the economic status of the national grid operator can influence revenue streams, e.g. in Tanzania, where feed-in of excess electricity from micro-grids into the national grid fails because of TANESCO's quasi-insolvency [185]. The history of Indian rural electricity cooperatives illustrates the need to investigate the position of a cooperative group within the supply chain and the respective power positions. Until the enactment of the Electricity Act of 2003, SEBs had an intrinsic motivation to use their power as suppliers to push cooperatives out of the market [199, 200].

1.4.7 Financing, upscaling, and diversification

Tariffs and other regulatory rules largely determine economic viability, which, in turn, has an impact on the financing of projects (I5, GS5). Funding sources include financial contributions from members (e.g. in Sri Lanka), in-kind contributions by the community (e.g. micro-hydro power projects, Nepal), concessional and commercial loans, and grants from national governments, donors, or philanthropists. Concessional loans from development banks are much more common than commercial ones since local banks often do not offer conditions that are acceptable to community groups [150]. In more advanced economies and cooperative electricity sectors, partly more sophisticated financing structures can be observed. This includes non-recourse project financing by NEA to electric cooperatives in the Philippines and carbon finance used in Argentina for onshore wind power projects [201, 202]. The latter seems to be of interest to South Brazilian cooperatives as well, which aim to tap additional financing sources [167]. In general, it seems to be difficult to make carbon financing a viable option for rural electrification [203].

Some sources describe capital structures that vary substantially from commercially financed (self-financing/equity and commercial funds), especially in the Southern Cone [168], over (almost) equal shares in the cases of Mae Kampong (Thailand), Thiba (Kenya), and multi-functional platforms in Western Africa [26, 111, 203, 204], to grant ratios of 70% (Mpeketoni, [205]), 80% (Nepal, [188, 203]), 90% (Uttarakhand VECs, [206]), or 100% (Chipendeke, [150]). At first sight, there is no obvious direct relation between performance and capital structure/grant element, despite of the different incentives that these structures imply. However, there are no comprehensive analyses of capital structures available. Studies drawing on the social enterprise finance literature [207, 208] and current discussions of patient capital and blended finance [209, 210] could be worthwhile.

Beyond funding sources and financial structure, the literature touches upon two issues related to financial sector development: In some contexts, cooperatives or self-help groups function as micro-finance institutions, e.g. in Nepal [59, 147, 152]. They help members to finance connection fees or to provide guarantees for members (e.g. COOPESANTOS, Costa Rica, [174]). Community funds are set up to finance projects (e.g. Ndiriri, Mozambique, [142]). In Jae Sorn, the community fund developed into a community bank [111]. In other cases, cooperative electrification projects cooperate with local or national finance institutions: First, micro-finance institutions such as savings and credit cooperatives in the Lumama project, Tanzania [185], which finance productive uses and which, in turn, improve the economics of electricity supply. Second, they form partnerships with banks, as in Mswaswa, Malawi [211]. This shows that interactions with the financial system (S3) go beyond investment and financing (S5) of the projects themselves [212].

Financing needs increase with growth. Securing long-term capital needs and realizing economies of scale to make operations more profitable may pose challenges for cooperative groups [213]. This is not unique to energy cooperatives in the South, but generally observed for many cooperatives worldwide [214-216]. Cooperation between cooperatives and clustering are two strategies commonly applied to meet these challenges [150]. Often mentioned in the general rural electrification literature [1], the studies specifically dealing with cooperative electrification also emphasize the need to develop productive uses. As shown above, cooperative energy companies may support this by offering loans for this purpose if financial market regulations allow them to do so and there is a gap left by other financial market actors. The development of other infrastructures through cooperatives, as in the case of Nepal [217], can create further momentum for the electricity business due to growing demand and more productive use.

Another strategy to grow and stabilize community businesses is diversification (I5, GS1). In this respect, the literature lists different fields that cooperatives enter, e.g., other public utilities in Argentina or general regional development in Brazil.

1.4.8 <u>Performance</u>

Several studies have explored determinants of “success” and “failure” or, more generally, “performance,” most notably Gerger and Gullberg [188] and Yadoo [203], who systematically derive such factors from their comparative case studies, and Gollwitzer et al. [112], who examine design principles using a part of Agrawal’s [218] list of enabling conditions. Some of these findings will be reviewed below, but the section starts with the measurement and evaluation of performance.

Various measures of performance such as area/population coverage, system losses, outages, service hours and service level, collection rates, financial performance measures like rate of return and cost coverage (only O&M costs or including depreciation), and number of employees have been examined. Depending on the question at hand, different measures seem to be appropriate. In addition to studies using single measures, comprehensive evaluations have also been conducted, using, e.g., a human development approach (equity and diversity, sustainability, empowerment, productivity) [63]. Moreover, studies have evaluated performance in relation to other actors or models in the same country, across countries, or based on values in absolute terms. Depending on the choice of measured value, the evidence partly is contradictory. Against this background, it is not surprising that judgements of success and failure differ, e.g. with regard to Western African multi-functional platforms [219, 220] or the project in Mpeketoni, Kenya [205, 221, 222].

In some cases such as the Philippines and Bangladesh, studies have observed changing performance over time. Hence, performance analyses have to take different phases of cooperative development and the development of the energy sector into account. It seems that in the case of Bangladesh, safeguards included in the rules in use (GS6) stopped working due to increasing political pressure [144].

Vagueness or ambiguity of rules – which can be demonstrated with reference to different types of property rights (GS7) – seems to be more likely to adversely affect success (O) than community ownership as such. This negative effect of ambiguous rules or fuzzy rights has been reported from Indian VEC cases [141, 223]. Yadoo [203] goes one step further and hypothesizes that “sense of ownership” (A7) might be more important than de-facto legal ownership. Since there are indications of a positive relation between sense of ownership and system sustainability [224], understood as long-term functioning of systems, the question whether different types of participation influence sense of ownership to different degrees has gained attention in infrastructure research beyond the energy sector. Marks and Davis [225], e.g., observe a threshold effect regarding financial participation and higher sense of ownership for cases in which community members co-decide on service levels compared with some other forms of participation like labor contributions. A correlation between relatively low investments and sense of ownership seems to exist in the Philippines, for instance [226]. How types of legal ownership, sense of ownership, and project success are related remains subject to debate.

Some general problems of community ownership have been reported: On Pacific islands, communities have experienced difficulties to set aside funds for O&M (I5) [227]. Due to a lack of capacity (A7), community-owned systems collapsed after the transfer to the community [105].

Therefore, long-term support from a permanent central institutional system to community organizations was necessary [35]. Studies have emphasized in the case of Tanzania that oversight (I9) is necessary [198]. Several studies have stressed the importance of the composition of users (A2), especially to increase productive uses and include “anchor users,” e.g. a public user such as a hospital or school or a civil-society organization [1, 150, 203]. Payen et al. call this the “ABC” (anchor, business, community) model [150]. Besides demand development and composition of demand, collection rates play an essential role for performance. Collection rates, in turn, not only depend on institutional factors, but also on the quality of components (RS5), which highly influence quality of supply. Several cases have illustrated that users dissatisfied with the quality of supply are less inclined to pay the agreed amount in time [203, 226, 228].

1.4.9 Ecology, technology, and sustainability

The last thematic cluster identified here comprises interrelations between ecology (RS1, ECO), technology (RS4), and governance (GS). It is possible to distinguish between two thematic complexes: first, energy & water and energy & land nexuses and, second, ecological sustainability of technologies used, including changes over time and innovation.

With regard to the first complex, the literature indicates that there is a relation between electricity use and irrigation, especially in South Asia. Agricultural and energy governance overlap here. Electricity is a major cost factor for irrigation, hence the political pressure on electricity providers and on regulators to charge low tariffs for agricultural uses [184]. A second obvious link between water and energy exists in hydropower projects. In order to produce electricity, expertise concerning water dynamics and characteristics is necessary, but often not available to community members themselves [153, 229]. Moreover, conflicts between competing uses may appear, as in some villages in Thailand [111]. Land is a necessary resource for all energy projects. In order to get the permit to build power plants on land in rural communities, developers have to negotiate with these communities, especially since land use rights are often unclear. These negotiations could be easier if the community were to own the plants [150]. Authors take this as an argument for cooperative ownership especially of immobile parts of the infrastructure, i.e., (mini-)grids [142].

The second thematic complex includes questions of technology choice and innovation. Usually, either communities decide to use well-established technologies that are local or national “standards” such as micro-hydropower or, in countries like Bangladesh and partly the Philippines, fossil-based generation, or donors tie their support to specific technologies, as is the case in many solar PV projects. This finding is at odds with the community energy literature. Most studies stress “frugal innovations,” i.e., experimentation with the use of local resources and low-cost options [230], and talk about “laboratories of innovation” [231]. The literature on cooperative rural electrification in the Global South shows that pilots are to be found mostly in advanced economies (S1) and/or at later stages of development, e.g. onshore wind power plants in Argentina, which were introduced mostly by cooperatives [166]. It is argued that the non-profit orientation of cooperatives enabled investments in wind energy at the end of the 1990s [201], resembling arguments put forward regarding energy cooperatives in the North [54, 130]. In Costa Rica, this combines with the state vision of “carbon neutrality” [174]. The Coastal Electrification and Women’s Development Cooperative, Bangladesh, is a case that illustrates corporate development regarding ecological sustainability: Starting with diesel as a standard technology, it gradually replaced it with solar PV [232, 233]. In contrast, grassroots initiatives in the Brazilian Amazon experimented with renewable energies at the beginning of the process [177].

The observation that renewables are chosen mainly in more advanced countries is in line with priority arguments: Some studies state that since rural electricity makes up only a tiny fraction of national consumption and developing countries hold only small shares in global pollution, access should have priority over environmental concerns [234]. In a similar vein, some scholars hypothesize a U-shaped relation between pollution and development (“Environmental Kuznets Curve” [235-239]; recent applications in energy sector: [240-242]). However, there is no linear progression to less polluting technologies at a household level. Instead, there are multiple factors that influence energy choice [93]. Overall, this hypothesis has been contested and is probably insufficient to explain initiatives such as SE4All and SDG 7 or the example from the Brazilian Amazon given above. Due to its long-term nature, electricity investments tend to be dependent on past decisions [243-246]. These path dependences are illustrated by technology choices e.g. in Bangladesh. Whether this is linked to the top-down nature of the cooperative approach in that country is an open question. Several studies argue that developing countries may – in analogy to the communications market – leapfrog parts of the traditional energy sector trajectory due to technological developments and changes in costs [247-249] (for a critique and discussion of challenges e.g. [250-253]). It is not clear whether cooperative ownership can contribute to leapfrogging or whether there is no impact of the type of ownership at all. The studies described above, however, suggest that cooperative groups may at least facilitate technology diffusion.

Overall, the interaction between governance and technology choice and innovation are usually not at the center of the studies reviewed. There is a need for a model that is able to explain some of these relationships in greater detail. In addition, this kind of model would have to be tested empirically.

1.4.10 <u>Implications for the theoretical framework</u>

While the SES framework seems to be suitable to describe cooperative electrification processes, several refinements (see Appendix A) are necessary, especially with regard to GS variables, knowledge/mental models (A7), and political stability, other governance systems and markets (S3-5).

The results presented here indicate that further differentiations within the cooperative electrification sector beyond the “formal cooperative” vs “community group” dichotomy are necessary for studies of social mechanisms linking governance or institutional setup and performance. The same can be said about analyses of specific policy actions. Scholars have to be careful with generalizations when dealing with different types of cooperatives in the electricity sector. The results illustrate that there are several variations even within a relatively streamlined model such as Bangladesh’s Palli Bidyut Samitis. This also means that “cooperative/community ownership” does not automatically imply strong sense of ownership, for instance. These findings suggest future directions for research, i.e., a concretization and refinement of regime type (GS4) by including top-down vs. bottom-up processes, additional sub-categories for community organizations and hybrids as rule-making organizations (GS5), electricity market legal status (license, concession etc.), ownership rights, and “clarity” as specifications for property-rights systems (GS7), and network structure (GS9) to include internal organization of cooperatives, cooperation, and type and role of intermediaries. Cooperative or self-help traditions are a central element of the “institutional repertoire” (GS8).

Moreover, the literature addresses various aspects that can be assigned to the knowledge of SES or mental models variable (A7): image/past experience with cooperatives, potential non-congruence with traditional institutions, sense of ownership, mindsets regarding payments/obligations, knowledge (technical, including SES behavior; demand development), capacity, and expectations regarding prices.

Descriptions of political settings (S3) include local political culture and functioning of the state. The findings suggest that the financial sector is an important “other governance system” (S4). Lastly, competitive behavior of the incumbent grid operator and supplier (S5) seems to be important for the success of cooperative approaches in developing countries.

1.5 Conclusions

This comprehensive literature review illustrates the diversity of cooperative approaches from an institutional perspective, comprising various types of registered and non-registered, top-down or bottom-up initiated groups of local or regional inhabitants in developing countries that collectively organize their supply with modern forms of energy (or are organized to do so). Regarding performance, this review revealed dramatic differences within but also between individual nations. A specific problem described in the literature are bottlenecks regarding capacity and knowledge. To address this problem, different strategies have been developed, e.g. the inclusion of intermediaries in top-down or bottom-up initiatives with gradual transfer of ownership rights to the community or transfer after a fixed timeframe (BOT model) and the establishment of joint ventures. Further comparative work on these various governance-system design options is needed.

This study adopts and refines a Social-Ecological Systems (SES) framework. This "anthropological view" [37] on infrastructure tries to understand institutional diversity and the existence of polycentric governance structures and highlights self-governance as a "third way" to regulate infrastructure systems. Several studies have emphasized the relevance of congruence with local conditions (e.g. culture, norms, and values, or the heterogeneity of the population [254-257]) and the interaction between larger-scale governance systems and focal SES. The relationship between energy and financial systems is but one of the interactions that require further research. Refinements of the SES framework made in this article include a more detailed typology of organizations and ownership categories.

This revised framework could be used to develop hypotheses to be tested in qualitative, quantitative, or mixed-methods empirical research. After formalization [258], it may build the basis of an agent-based model. An evaluation of the strength of relations described in Section 4 would help researchers to identify "design principles" [99, 115, 218], i.e., an ontology that can be used to analyze the performance of cooperative electrification approaches and to inform energy policy in the South, especially with regard to the question if and which cooperative approach might make sense in a specific local and national context. A further step in this direction would be the modeling of these specific action situations briefly described in Section 4. In the previous section, several other open questions for further research have been listed. Particularly, there is a need for more in-depth and systematic comparative studies across regions or countries [56, 203, 259]. This literature review reveals that there is a certain geographical bias toward South and Southeast Asia. Historical analyses of cooperative experiences in the Southern Cone, but also in India, are missing in the text corpus analyzed here. Further research has to show if an extension of the text corpus to include non-English language texts changes this situation. In addition, more work could be done on less prominent and less successful cooperative electrification cases. In addition, work on internal governance structures of cooperative groups such as Barangay power associations in the Philippines or transformer sub-committees in Nepal could point to the optimal size of groups and the maximum number of levels for a cooperative to still work properly and keep sense of ownership intact. More research on sense of ownership and its relation to different types of financing is also a desideratum for future research, as are comparative studies of politicization processes in different countries and diversification strategies of cooperatives. Lastly, technology choice in cooperative electrification cases, innovation processes, and the role of cooperatives in the energy transition require further attention.

Such in-depth comparative analyses could show, perhaps, that cooperative approaches toward (rural) electrification are viable options to be considered by policy-makers and practitioners in the Global South.

Acknowledgements:
A previous version of this paper was presented at the "Conference on Cooperative Systems", Bolzano, 8-9 November 2012. I want to thank those who attended the session, especially Hagen Henry, Pier Angelo Mori, and Francesca Spinicci for their comments and suggestions. Thanks go to Stefan Schaltegger, Erik Hansen, and colleagues at the Centre for Sustainability management for helpful suggestions during a presentation of the paper in 2013. It has been fully re-worked, extended, and updated since. Moreover, I am grateful for valuable comments by two anonymous reviewers and the Writing Center at Leuphana.
This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Appendix A: List of SES variables

S	Social, Economic, and Political Settings	S1	Economic development	_Income levels*_	
		S2	Demographic trends	_Population density*_	
		S3	Political stability	_(Liberalization, privatization)_	Local political culture functioning of state
		S4	Other governance systems	_Development aid, regional development, environment, climate change_	
		S4’	Financial system		
		S5	Markets	_Incl. (level of) competition_	Behavior of incumbent(s)
				Fossil-fuel subsidies*, internalization*	
		S6	Media organization		
		S7	Technology	_Stage of development*_ _Technological change*_	
RS	Resource Systems	RS1	Sector	_Energy; land, water, local habitats/landscape, underground (“sources”)_	
_RS[1]= TS*_	_Technological Systems*_	RS2	Clarity of system boundaries		
		RS3	Size of resource system△		
		RS4	Human-constructed facilities	_Grid extension*_	
				Connected mini-grids*	_(Technical components)_
				Isolated mini-grids*	_Connectivity*_
				Single-user/standalone*	
		RS5	Productivity of system△		
		RS6	Equilibrium properties		
		RS7	Predictability of system dynamics△		
		RS8	Storage characteristics		

		RS9	Location	*Type of area**	*Urban**
					*Peri-urban**
					*Rural**
				*Topography**	
				*Remoteness**	
		TS10	*History of technology = path**		
RU	Resource Units	RU1	Resource unit mobility△		
		RU2	Growth or replacement rate		
		RU3	Interaction among resource units		
		RU4	Economic value		
		RU5	Number of units		
		RU6	Distinctive characteristics		
		RU7	Spatial and temporal distribution		
GS	Governance Systems	GS1	Policy area		
		GS2	Geographic scale of governance system		
		GS3	Population		
		GS4	Regime type	Monocentric vs. polycentric *(→ co-production)*	Top-down/bottom-up
				*Central or decentralized**	
		GS5	Rule-making organizations	Public sector organizations	*Governments/administrations**
					*Regulatory agencies**
					*Donors/aid agencies**
					*Public utilities**
				Private sector organizations (for profit)	*Private utilities**
					*Private investors/developers**
				Nongovernmental, nonprofit organizations	

				Community-based organizations	
				Hybrid organizations	*Partnerships/joint ventures (only community vs. different types of owners), social enterprises*
		GS6	Rules in use	Operational-choice rules	*Delivery mechanisms**
				Collective-choice rules△	*Type of electrification subsidy**
				Constitutional-choice rules	*Regulatory rules**
		GS7	Property-rights systems	*Electricity market: Concession, license, …* Ownership rights Clarity	
		GS8	Repertoire of norms and strategies		Cooperative/self-help tradition
		GS9	Network structure		Internal organization (levels) Cooperation Intermediaries (type, role)
		GS10	History or past experience	*(Liberalization, privatization, history of regulation)*	
A	Actors	A1	Number of actors△		
		A2	Socioeconomic attributes of actors	*Type of user* (→ willingness-/ability-to-pay)*	*Rich/upper & middle class**
					*Poor private households**
					*Large businesses**
					*Small businesses**
					*"Assured demand" users**
		A3	History of use		
		A4	Location		

		A5	Leadership/entrepreneurship△		
		A6	Norms (trust-reciprocity)/social capital△		
		A7	Knowledge of SES/mental models△	*Professional training* (knowledge: technology incl. SES behavior, demand development), ca-pacity*	Past experience with coopera-tives/image of cooperatives
				Image of technology (“energy vision”)*	Congruence with traditional in-stitutions
				*Expectations** (regarding prices)	Sense of ownership
				*Donor policy vision**	Mindset regarding payments
		A8	Importance of resource (dependence)△	*Vis-à-vis other development needs*	
		A9	Technologies available		
I	Interactions	I1	Harvesting	*Demand**	*State/level**
					*Development**
		I2	Information sharing		
		I3	Deliberation processes		
		I4	Conflicts	*Contestation**	
				*Coordination**	
		I5	Investment activities	*Installation**	
				*Operation & maintenance**	
				*Subsidizing**	
		I6	Lobbying activities		
		I7	Self-organizing activities		
		I8	Networking activities		
		I9	Monitoring activities		
		I10	Evaluative activities		

O	Outcomes	O1	Social performance measures	
		O2	Ecological *and technical** performance measures	
		O3	Externalities to other SESs	
ECO	Related Ecosystems	ECO1	Climate patterns	
		ECO2	Pollution patterns	*Environmental friendliness*
		ECO3	Flows into and out of focal SES	

Bold: relevant factor, italic: own explanation/addition, * (italic): own addition/revision, red: addition after narrative meta-analysis, △: relevant for self-governance according to [115]

Sources: Own adaptation of [73, 115]

Appendix B: Intermediaries in cooperative electrification projects in the South

Type of intermediary	Case/example	Specification	Country (CE activities)
Public agency	Rural Electrification Board (REB)	regulator	Bangladesh
	National Electrification Administration (NEA)	regulator	Philippines
	State Electricity Boards (SEBs)	regulator	India
	Rural Electrification Corporation (REC)	financier	India
	Nepal Electricity Authority (NEA)	regulator	Nepal
	Department of Alternative Energy Development and Efficiency (DEDE; formerly: National Energy Authority/Administration, NEA, Department of Energy Development and Promotion, DEDP)	(rural) energy agency	Thailand
	Peace Corps	volunteer program [USA]	Fiji, Liberia
Service unit	Alternative Energy Promotion Centre (AEPC)	government institution	Nepal
	Regional Service Centers (RSCs)	NGOs	Nepal
	Energy Forum Sri Lanka (EFSL)	network, non-profit	Sri Lanka
Non-governmental organization (NGO)	Mpeketoni Jua Kali Association (MJKA)	local, self-help, SME development	Kenya
	Associação Kwaedza Simukai em Manica (KSM)	local, development	Mozambique
	Asociación para el Desarrollo de San José de Ocoa, Inc. (ADESJO)	sub-national, community development	Dominican Republic
	Technology Informatics Design Endeavour (TIDE)	national, technology development	India
	Sibol ng Agham at Teknolohiya, Inc. (SIBAT)	national, network, technology development	Philippines
	Tanzania Traditional Energy Development Organization (TaTEDO)	national, energy	Tanzania
	Myanmar Inventor's Cooperative Society Ltd. (MICS)	national	Myanmar
	Guakía Ambiente	national, environment	Dominican Republic
	Action pour une développement équitable intégré et durable (ADEID)	national, development	Cameroon
	African Self-help Assistance Programme (ASAP)	national, development	Zimbabwe
	Gram Vikas	national (+international), development	India
	NRECA International	international [USA], rural electrification	*Various*
	Practical Action (formerly: Intermediate Technology Development Group, ITDG)	international [UK], development	Nepal, Sri Lanka,

Type of intermediary	Case/example	Specification	Country (CE activities)
			Kenya, Malawi, Zimbabwe
	Light Up The World Foundation (LUTW)	international [CA], lighting	Sri Lanka
	Fondazione ACRA-CCS	international [I], development	Tanzania
	Comitato europeo per la formazione e l'agricoltura (CEFA)	international [I], integrated rural development/volunteering	Tanzania
	SNV Netherlands Development Organisation	international [NL], development	D.R. Congo, Zimbabwe
	Winrock International	international [USA], development	Liberia
	Stockholm Environment Institute (SEI)	international [S], research	Tanzania
	Save the Children Fund (SCF)	international [UK], children's rights	Tuvalu
	Appropriate Technology for Community and Environment (APACE)	international [AUS], technology development	Solomon Islands
	Aga Khan Foundation	international [CH], development	Pakistan
	United Mission to Nepal	national, faith-based organization	Nepal
Social business	Institut Bisnis dan Ekonomi Kerakyatan (I-BEKA)	NGO spin-off	Indonesia
Association	*informal cluster: CEBECO I-III*	local, coops	Philippines
	Village Electricity Committee association in Bageshwar district, Uttarakhand	sub-national, VECs	India
	Association of Mindanao Rural Electric Cooperatives, Inc. (AMRECO)	sub-national, coops	Philippines
	Federación de Cooperativas de Electricidad y Servicios Públicos de la Provincia de Buenos Aires Ltda. (FEDECOBA)	sub-national, coops	Argentina
	Federação das Cooperativas de Energia, Telefonia e Desenvolvimento Rural do Rio Grande do Sul (FECOERGS)	sub-national, coops	Brazil
	Federação das Cooperativas de Energia e Desenvolvimento Sustentável do Rio Grande do Norte (FECOERN)	sub-national, coops	Brazil
	Federação das Cooperativas de Energia e Desenvolvimento Rural de Santa Catarina (FECOERUSC)	sub-national, coops	Brazil
	National Association of Community Electricity Users-Nepal (NACEUN)	national, community groups	Nepal

Type of intermediary	Case/example	Specification	Country (CE activities)
	Federation of Electrical Consumer Societies (FECS)	national, ECSs	Sri Lanka
	Philippine Rural Electric Cooperatives Association, Inc. (PHILRECA)	national, coops	Philippines
	National Association of General Managers of Electricity Cooperatives (NAGMEC)	national, managers	Philippines
	Federación Argentina de Cooperativas de Electricidad y Otros Servicios Públicos (FACE)	national, coops	Argentina
	CONELECTRICAS R.L.	national, coops	Costa Rica
	Federal Cooperative Agency	national, coops	Ethiopia
Facilitators	*social mobilizers*		Nepal
	promoters		Sri Lanka
Private for-profit	Prokaushali Sangsad Ltd. (PSL)	consultancy	Bangladesh
	various financial institutions/banks	financial	Sri Lanka
	Pelena Energy	developer (engineering, consultancy)	Solomon Islands
	APAVE	developer	Côte d'Ivoire

Abbreviations: AUS: Australia, CA: Canada, CE: Community/cooperative energy, CH: Switzerland, D.R.: Democratic Republic (of), ECSs: Electric Consumer Societies, I: Italy, NGO: Non-Governmental Organization, NL: Netherlands, S: Sweden, SME: Small and Medium-sized Enterprise, UK: United Kingdom, USA: United States of America, VECs: Village Electricity Committees

Source: Own compilation.

For Appendix C see “Anhang zu Paper 1"

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2 Global Governance and the Interplay of Coordination and Contestation: The Case of Renewable Energies in the South

Abstract

Developing an adequate sustainable energy supply in developing countries is a major challenge for the global community. Recently, a large number of organizations and enterprises have been supporting technological development, carrying out advocative actions, and offering finance for renewable energy. Concomitantly, there have been strong calls to improve coordination in this field. This article elaborates on the importance of institutional opportunities not only to favor coordination, but also to contest common wisdom shaping energy policies and specific project features at a given time. The result would be a more flexible renewable energy "governance dynamics" to provide the institutional framework for private actors and the interaction with public entities. Thus, three dimensions of global governance are analyzed: coordination, contestation, and the resulting process of collective/interactive regulation.

Keywords: global energy governance, contestation, nodal governance, distributed energy

2.1 Introduction

There is a common understanding that access to modern forms of energy plays a crucial role in development – as a necessary, even though not sufficient condition[3]. This shared belief, however, has not resulted in a coherent global political strategy emerging from international conferences dedicated to this topic, but rather a proliferation of activities by a growing range of different public and private actors. Renewable energies play a significant role in all current projections of future energy supply.[4] But neither do the main actors in the political arena agree on the optimal structure of the grid infrastructure and the technologies of energy supply, nor is there any consensus regarding support schemes in the North as well as the global South. Conceptual explorations making sense of the shape of the institutional landscape therefore seem to be helpful to understand institutional diversity and its merits as well as its limitations and the challenges emerging from it.

Most of the global energy governance literature focuses on effectiveness, static efficiency or legitimacy of transboundary institutional arrangements. Existing analyses of the emergence and the change of governance structures often deal with fossil fuels specifically. In contrast, this article contributes to the understanding of governance dynamics in the renewable energy

[3] Randall Spalding-Fecher, Harald Winkler, and Stanford Mwakasonda, "Energy and the World Summit on Sustainable Development: What next?" *Energy Policy* 33 (2005), 99–112; Douglas F. Barnes, "The challenge of rural electrification," in *The challenge of rural electrification: Strategies for developing countries*, ed. Douglas F. Barnes (Washington/DC: Resources for the Future, 2007), 1–17.

[4] See, for example, International Energy Agency, *World Economic Outlook 2015* (Paris: OECD, 2015).

sector specifically, referring to constructivist theories and the concept of nodal governance. Rather than putting all the emphasis on the necessity of more coordination, it seems necessary to have a closer look at the processes of how the set of actors develops and how they coordinate or contest the actions taken by others. How is this continuous process of contestation and coordination (decisionmaking and implementation) evolving? How can it be assured that even in the face of ongoing contestation, things get done?

Therefore, the basic idea of this article is to further develop the conceptual and theoretical framework to understand governance dynamics of renewable energy supply in general, and especially of financing rural electrification in the Global South. This implies also to draw on some threads of the more general discourse on global governance and to contribute in particular to the discourse around the notions of coordination, contestation, and the changes of positions and strategies in sectoral global governance.

This article is structured as follows: First, a short overview of the state of the art in global energy governance and the increasing quest for coordination in many sectors of global governance leads us to formulate doubts on the primary focus on institutionalizing coordination. Second, we look at global governance in a more dynamic perspective, assuming that processes of contestation are at the origin of multiactor constellations. A situation, where an increasing number of actors and of complex actor constellations is seen as the problem, cannot be understood by reference to free-riding but rather by a quest for power. We introduce the concept of nodal governance as an approach worth pursuing. We illustrate theoretical elaborations by different examples of governance dynamics related to the renewable energy sector of the South.

2.2 Work on Global (Renewable) Energy Governance: The Quest for More Coordination

2.2.1 Relevance of the Global Level in Renewable Energy Governance

In a frequently quoted article, Ann Florini and Benjamin Sovacool highlighted that not much had been written on global energy governance in general compared to the literature on governance in other sectors; in particular, global health and development cooperation.[5] In the years since, this picture has been changing with the growing body of literature on global climate governance.[6] Moreover, access to energy has appeared once again as a major item on the international agenda. The same can be said about the issue of energy security, which is –

[5] Ann Florini and Benjamin K. Sovacool, "Who governs energy? The challenges facing global energy governance," *Energy Policy* 37 (2009): 5239–5248.

[6] Frank Biermann, Philipp Pattberg, and Fariborz Zelli, eds., *Global climate governance beyond 2012: Architecture, agency and adaptation* (Cambridge: Cambridge University Press, 2010); Hayley Stevenson and John S. Dryzek, "The discursive democratisation of global climate governance," *Environmental Politics* 21 (2012): 189–210; Fariborz Zelli, "The fragmentation of the global climate governance architecture," *Wiley Interdisciplinary Reviews: Climate Change* 2 (2011): 255-270.

together with the supply of oil and gas – the focus of many of the global energy governance contributions.[7]

The lack of academic literature on the global governance of renewable energy until recently reflects to some degree that renewable energy has not been at the forefront of large conferences and the work of large international organizations – or if so, interest in it declined soon after. Certainly, most of the advances that had been achieved up until the turn of the millennium were primarily due to national-level activities.[8] As in energy policy in general, in renewable energy policy the national level plays a dominant role. However, beyond the issue of an unequal distribution of deposits of fossil energy sources and the ensuing trade dependence, some specifically transboundary issues arise in the energy sector as well: grid lines extend beyond borders, which makes transnational grid management and regulation necessary; for example, within regional power pools such as the Southern African Power Pool. Large-scale hydropower plants have an impact on water resources downstream, for example, along the Nile, which led to the creation of an intergovernmental organization, the Nile Basin Initiative. Moreover, renewable energy policy influences other policy fields, especially environmental policy, climate protection, and development cooperation. In both of these cases, transboundary issues are of utmost relevance: climate protection constitutes a global public good. Development aid tries to eradicate poverty through capital and technology transfer from the North to the South and through policy advice.

Overall, jurisdictional scale plays a role with regard to different dimensions, especially (1) norms (rules), goals and perceptions, and norm-building processes; and (2) actors or stakeholders within the political arena and their relationships. Norms defining how electricity should be supplied and electricity projects structured and financed are not only built at a national level, but are cocreated in supranational discourses and practices. Examples are:

- The support for feed-in tariffs for renewable energy deployment in developing countries by intergovernmental organizations (UN Department of Economic and Social Affairs [UN DESA], Ad Hoc Working Group on Long-term Cooperative Action [AWG-LCA]), civil society organizations (CSOs) and philanthropic foundations (Greenpeace, Project Catalyst, World Future Council), and business sector organizations (Deutsche Bank,

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7 See, for example, Antony Froggatt and Michael A. Levi, "Climate and energy security policies and measures: synergies and conflicts," *International Affairs* 85 (2009): 1129–1141; Andreas Goldthau and Jan Witte, "Back to the future or forward to the past? Strengthening markets and rules for effective global energy governance," *International Affairs* 85 (2009): 373–390; Sijbren de Jong, "Towards Global Energy Governance: How to Patch the Patchwork," in Graduate Institute of International and Development Studies, ed., *International development policy: Energy and development* (New York: Palgrave Macmillan, 2011), pp. 21–43.

8 Bernd Hirschl, "International renewable energy policy – between marginalization and initial approaches," *Energy Policy* 37 (2009): 4407–4416, at 4407.

World Wind Energy Association/International Renewable Energy Alliance), and its subsequent implementation in different countries (e.g., Tanzania);

- The policy advice by multilateral development banks or the imposition of certain policies through aid conditionality, here especially the liberalization of electricity markets, but also by CSOs; and
- The global discourse on the (un-)sustainability of biofuels or bioenergy in general.

All examples also illustrate the different types of actors influencing renewable energy policy and implementation of projects, especially in the Global South where often multiple market and government failures, low governance capacities, and high discount rates prevent the development of renewable energies.[9]

2.2.2 <u>State of the Art of Research on Global (Renewable) Energy Governance</u>

Despite the relative importance of the global level in this context, there still is a lack of linking important issues of the global governance discourse to the emerging pattern of global governance in renewable energy. Several authors map the institutional landscape and describe historical developments from the 1961 UN Conference on New Sources of Energy in Rome over the 1981 Nairobi conference, the 1992 UN Conference on Environment and Development (UNCED) in Rio de Janeiro, Group of 7/Group of 8 (G7/8) summits, and the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002 to the Rio+20 conference and the enactment of the Sustainable Development Goals (SDGs).[10] These mappings illustrate the proliferation of actors and fragmentation of global (renewable) energy governance, which is constituted by a complex web of organizations and institutions including global and regional intergovernmental organizations (IGOs) such as the UN system or energy sector governance organizations such as the International Energy Agency (IEA) and the International Renewable Energy Agency (IRENA), summit processes (e.g. G7/8, Group of 20 [G20]), international nongovernmental organizations (NGOs), multilateral financial institutions (MFIs), especially development banks, bilateral donors, and hybrid entities.[11] Other authors highlight general trends in

9 Paul Collier and Anthony J. Venables, "Greening Africa? Technologies, endowments and the latecomer effect," *Energy Economics* 34 (2012): S75-S84.

10 Florini and Sovacool, "Who governs energy?"; Hirschl, "International renewable energy policy"; Lars Holstenkamp and Wolfgang Hein, "Global governance and supporting the deployment of renewable energies in the South: Institutional mapping" Working Paper Series Business and Law No. 15 (Lüneburg: Leuphana University of Lüneburg, 2013); Sylvia I. Karlsson-Vinkhuyzen, "The United Nations and global energy governance: Past challenges, future choices," *Global Change, Peace & Security* 22, (2010): 175–195; Dries Lesage, Kirsten Westphal, and Thijs van de Graaf, *Global energy governance in a multipolar world* (Farnham: Ashgate, 2010); Sybille Röhrkasten, *Global Governance on Renewable Energy* (Wiesbaden: Springer, 2016), chap. 3; Achim Steiner et al., "International institutional arrangements in support of renewable energy," in Dirk Assmann, Ulrich Laumanns and Dieter Uh, eds., *Renewable energy: A global review of technologies, policies and markets* (Sterling, VA: Earthscan, 2006), pp. 152–162.

11 Benjamin K. Sovacool and Ann Florini, "Examining the Complications of Global Energy Governance," *Journal of Energy & Natural Resources Law* 30 (2012): 235–263. See also Suding and

global energy governance. [12] Most of these authors are skeptical about the proliferation of actors and demand more coordination and new institutions after the demise of post-World War II multilateralism, which was characterized by one UN special agency responsible for a specific sector or problem area. Several potential coordinators are analyzed (e.g., the IEA or the G8/G20 and their steering capacity).[13]

As studies on other sectors have shown, the phenomenon of a proliferation of actors and a growing complexity of actor constellations can be observed all over global governance fields; in particular, health[14], development aid,[15] and climate governance.[16] Concerns over the effectiveness of global governance mainly concentrate on the presumably increasing chaos of actors and the lack of coordination among them. On the other hand, the analyses of multiactor constellations point to a mobilization of resources that probably would not have been reached without the proliferation of actors, and the advocative and innovative role of CSOs in political conflicts.

In essence, the proliferation of energy governors can be seen as a result of these failures of coordination on a global level. Instead, several UN organizations together with bilateral donors or private partners developed activities in the field of renewable energies in developing countries: first, as a reaction to UNCED 1992; and second, in the form of partnerships, networks, and conferences – jointly called “multistakeholder platforms” – in the preparation and aftermath of the WSSD 2002. While UN and G7/8 summits have been characterized by dissent on renewable energy targets and competition on leadership of initiatives, building coalitions of like-

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Lempp, “The multifaceted institutional landscape”; and Steiner et al., “International institutional arrangements”.

[12] N. K. Dubash and Ann Florini, “Mapping global energy governance,” *Global Policy* 2 (2011), 6-18. See also Sylvia Karlsson-Vinkhuyzen, “The Legitimation of Global Energy Governance: A Normative Exploration,” in *Transitions to Sustainability*, ed. François Mancebo and Ignacy Sachs (Dordrecht: Springer Netherlands, 2015), 119–30; Sybille Röhrkasten, *Global governance on renewable energy: Contrasting the ideas of the German and the Brazilian governments* (Wiesbaden: Springer Fachmedien Wiesbaden GmbH, 2015).

[13] Lesage, Westphal and Van de Graaf, “Global energy governance in a multipolar world”; Thijs Van de Graaf and Kirsten Westphal, “The G8 and G20 as global steering committees for energy: Opportunities and constraints,” *Global Policy* 2 (2011): 19–30.

[14] Kent Buse, Wolfgang Hein, and Nick Drager, eds., *Making sense of global health governance: A policy perspective* (Basingstoke: Palgrave Macmillan, 2009); Ilona Kickbusch et al., eds., *Global Health Diplomacy: Concepts, Issues, Actors, Instruments, Fora and Cases,* Public Health (New York, NY: Springer, 2013); Ted Schrecker, ed., *The Ashgate research companion to the globalization of health* (Farnham: Ashgate, 2012).

[15] Jean-Michel Severino and Olivier Ray, “The end of ODA (II): The birth of hypercollective action” Working Paper No. 218 (Center for Global Development, 2010), p. 10, http://mercury.ethz.ch/serviceengine/Files/ISN/118485/ipublicationdocument_singledocument/c4d033da-776c-4cd6-896d-9b121f4bcdc1/en/wp218.pdf, here: 11; Arnab Acharya, Ana Teresa Fuzzo de Lima, and Mick Moore, “Proliferation and fragmentation: Transactions costs and the value of aid,” *Journal of Development Studies* 42 (2006): 1–21.

[16] Frank Biermann, “‘Earth System Governance’ as a crosscutting theme of global change research,” *Global Environmental Change* 17 (2007): 326–337; Eleni Dellas, Philipp Pattberg, and Michele Betsill, “Agency in earth system governance: Refining a research agenda,” *International Environmental Agreements* 11 (2011): 85–98.

minded members has turned out to be a more promising approach to overcome stalemates and build consensus.

Besides institutional mappings, the literature on global energy governance contains some typologies of specific aspects. On the institutional level, Peter Newell makes a distinction between private governance of private finance, public governance of private finance, and public governance of public finance for energy.[17] On the program target level, Benjamin K. Sovacool and Ira Martina Drupady distinguish between the "Donor Gift Paradigm" of the 1970s and 1980s, the "Market Creation Paradigm" of the 1990s and 2000s, and the "Sustainable Program Design" of the 2010s with a mixture of models applied.[18] Despite the importance of these changes in global norms for the regulation of energy finance in the South, neither Newell nor Sovacool and Drupady give an explanation for or a concise description of the drivers behind these processes.

2.2.3 *The Densification of Transnational Social Relations and Post-Westphalian Global Politics: A New Approach to Understand the Dynamics of Contestation and Coordination*

Observations from other sectors referred to above caution against seeing a panacea in a better *coordination* of energy policies around the world. Rather it seems to be necessary to analyze in more detail the processes of how the set of actors evolves and how they relate to one another; that is, how they coordinate or contest the actions taken by others, how they compete with or learn from others.

In the literature on renewables, there are only limited links to some threads of the global governance discourse, in particular

- The importance of contestation (opposing dominant positions among recognized alternatives or generally contesting the relevance of the politically accepted alternatives);
- The increasing role of nonstate actors creating the political space for it to become effective; and
- The growing importance of constructivist approaches in international relations (IR) theory (see subsection Contestation).

Due to various aspects of globalization, post-Westphalian global politics increasingly supports the presence of new actors and actor constellations (NGOs/CSOs; hybrid organizations combining nonstate and state actors) in political discourses and conflicts and forms of self-organi-

[17] Peter Newell, "The governance of energy finance: The public, the private and the hybrid," *Global Policy* 2 (2011): 94–105.

[18] Benjamin K. Sovacool and Ira Martina Drupady, *Energy Access, Poverty, and Development: The Governance of Small-Scale Renewable Energy in Developing Asia,* Ashgate Studies in Environmental Policy and Practice (Farnham: Ashgate, 2012).

zation in governance processes. We witness a transformatory process towards a global society, which yet has a rather contradictory character.[19] Transnational CSOs are not just another form of actors in global governance processes, but they are first and foremost an expression of a globalization of society, reflecting the construction of (still very partial) transnational communities[20] and of an important densification of transnational social relations, leading to a deepening of sectoral governance[21]. This challenges traditional ways of formalized international elite coordination that had been pursued through international organizations and includes the need to focus in theory and in politics more on the dynamic elements of global governance, of which the ongoing interaction between coordination and contestation forms an important starting point.

This transformation of actors and structures in politics beyond the nation-state implies an increasing flexibility of political processes. The approach that we propose here postulates that it is difficult to assign the role of future "coordinators" to specific actors, as most governance fields are characterized by an openness toward new actors that continuously contest positions that are taken as granted at a particular point in time (see subsection Globalization, Contestation, and International Relations Theory). Thijs van de Graaf illustrates these dynamics using the concept of "institutional capture", which, together with a loss of domestic support in a group of member states or a single member state, leads to the creation of a new organization and pressure on others to become members of it.[22] The creation of IRENA as an instance of contesting the IEA as the established organization in the field and IRENA's development since its inception can be seen as an example of a process of reversing formerly "normalized" positions. However, this description still tends to focus on a single coordinator or "focal point"[23] as in the concept of "power concerts" ,[24] which comes close to what we described differently in this article as "nodal governance". Instead, we propose to make reference to network approaches and analogies to describe and explain the functioning of multilevel governance of renewable energy.[25]

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[19] See, for example, David Held, Anthony McGrew, and David Goldblatt, *Global transformations: Politics, economics and culture* (Oxford: Polity Press, 1999).

[20] Marie-Laure Djelic and Sigrid Quack, *Transnational communities: Shaping global economic governance* (Cambridge: Cambridge University Press, 2010).

[21] Wolfgang Hein and Suerie Moon, *Informal norms in global governance* (Burlington, VT: Ashgate, 2013), pp. 18–23.

[22] Thijs Van de Graaf, "Fragmentation in global energy governance: Explaining the creation of IRENA," *Global Environmental Politics* 13 (2013): 14–33.

[23] Johannes Urpelainen and Thijs Van de Graaf, "The International Renewable Energy Agency: A success story in institutional innovation?" *International Environmental Agreements: Politics, Law and Economics* 15 (2015): 159–177; Lesage, Westphal, and Van de Graaf, *Global energy governance in a multipolar world*.

[24] Lesage, Westphal and Van de Graaf, *Global energy governance in a multipolar world*.

[25] See also the work of Nana de Graaff, who uses a somewhat different network approach to global energy governance: Nana de Graaff, "A global energy network? The expansion and integration of non-triad national oil companies," *Global Networks* 11 (2011): 262-283.

There are other studies that put less emphasis on coordination: Andreas Goldthau and Jan Witte highlight the necessity to properly design markets through rulesetting and creating appropriate institutions in order to balance competition and cooperation in global energy governance.[26] While they take different scales into account, their analysis focuses on a comparative-static evaluation of governance structures. Aleh Cherp, Jessica Jewell, and Andreas Goldthau add a dynamic perspective and advocate for a polycentric governance structure to appropriately address complexity and flexibility.[27] Benjamin Sovacool makes a similar argument.[28] We add to these studies further dynamic elements by introducing the concepts of contestation and nodal governance.

2.3 Introduction of Dynamic Elements into the Theoretical and Conceptual Discussion

2.3.1 Contestation

The term *contestation* was introduced to the theory of democracy by the US political scientist Robert Dahl, who characterized democratic "polyarchy" by the right and the potential to contest and by inclusiveness,[29] based on an article by French intellectual Bertrand de Jouvenel, who discusses the right of the citizen to influence the use of power, emphasizing that this cannot be done by just voting every few years, but implies "the power of prevention".[30]

This term was taken up in the IR discourse in the late 1990s, closely related to the rise of constructivism. This is particularly important in the analysis of social change and the sometimes radical transformation of what is seen as "common wisdom" in a policy field. The changing positions on the threat posed by nuclear power plants and also attitudes toward renewable energies provide good examples. Demands for new norms or strategies will arise in academic, technological, and political discourses and will be carried by the media, CSOs, or other new actors. Of course, this also applies to the international space, where perceptions and strategies are always mediated through processes of the social construction of what constitutes power, threats, ans so forth, and cannot be understood by presumably objective measurements of power relations.[31]

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26 Goldthau and Witte, "Back to the future or forward to the past?"

27 Aleh Cherp, Jessica Jewell, and Andreas Goldthau, "Governing Global Energy: Systems, Transition, Complexity," *Global Policy* 2 (2011): 75-88.

28 Benjamin Sovacool, "An international comparison of four polycentric approaches to climate and energy governance," *Energy Policy* 39 (2011): 3832-3844.

29 Robert Alan Dahl, *Polyarchy: Participation and opposition* (New Haven/CT: Yale University Press, 1971).

30 Bertrand de Jouvenel, "The means of contestation," *Government and Opposition* 1 (1966): 155–174, at 158. The request for the "power of prevention" itself is not unproblematic, when it begins to combine discursive power with military violence, as the 1973 coup d'état against Chile's democratically elected president Allende illustrates.

31 Martha Finnemore and Kathryn Sikkink, "International norm dynamics and political change," *International Organization* 52 (1998): 887–917; Martha Finnemore and Kathryn Sikkink, "International norm dynamics and political change," in P. J. Katzenstein, R. O. Keohane, and S. D. Krasner, eds., *Exploration and contestation in the study of world politics* (Cambridge: MIT Press, 1999), pp. 247–

To understand the constructivist meaning of *contestation* in governance processes in a more precise way, there is a need to establish links between *normalization* processes and power structures in a society. Thus, obviously the social construction of reality or truth is closely intertwined with the reproduction of power relations, including what is taken as truth in issues that appear essentially technical such as designing an effective energy system. Coordination strives for a consensus on definite strategies, which appear as effective since they systematically realize strategies that have been accepted as the optimum to realize a specific goal. But what if one or more of the original assumptions turn out to be false or not adapted to changing social or environmental demands? What if significant new elements enter the game? Certainly, there are methods of coordination that allow for a certain degree of flexibility, but they tend to remain imprisoned in a specific institutional framework (and relations of power) established to organize coordination ("path dependency").[32] Contestation, however, reflects a new interpretation of the framework conditions for a strategy adopted before (based on whichever legitimacy), which in the short run might lead to additional costs of reverting the project while in the long run will reduce costs or significantly increase the acceptance of a project.

Obviously, the quest for *contestation* can be established on quite different arguments and within different theoretical frames. The openness of a governance network permits a number of processes that improve strategies to deal with specific challenges: (1) the mobilization of additional stakeholders that might support the process through financing or the introduction of new ideas; (2) an increasing transparency that might prevent miscalculations concerning costs or political support, and (3) the chance to introduce critical arguments into the governance process concerning technical aspects as well as the opposition of affected population groups, but (4) also the access to innovation. In general, the openness to contestation at any moment allows for inclusive governance. Conflicts on leading concepts in global governance fields frequently support significant learning processes such as the contestation of global social movements against the structural adjustment strategies by World Bank and the International Monetary Fund (IMF) followed by a turn of the Bretton Woods institutions toward poverty reduction.[33]

78; Ann Florini, *The third force: The rise of transnational civil society* (Tokyo: Japan Center for International Exchange, Carnegie Endowment for International Peace, 2000); Margaret E. Keck and Kathryn Sikkink, *Activists beyond borders: Advocacy networks in international politics,* Cornell paperbacks (Ithaca: Cornell University Press, 1998); Robert O'Brien et al., *Contesting global governance: Multilateral economic institutions and global social movements,* Cambridge studies in international relations 71 (Cambridge: Cambridge University Press, 2000).

32 Stan J. Liebowitz and Stephen E. Margolis, "Path dependence, lock-in, and history," *Journal of Law, Economics, and Organization* 11 (1995): 205–226; Paul A. David, "Path dependence, its critics and the quest for 'historical economics'," in Pierre Garrouste and Stavros Ioannides, eds., *Evolution and path dependence in economic ideas: Past and present* (Cheltenham: Edward Elgar, 2001), pp. 15–40.

33 O'Brien et al., *Contesting global governance*.

A monograph by Sybille Röhrkasten has gone quite a way toward linking the concepts of contestation and global governance in the analysis of different ideas on renewable energy. However, she does not focus on new governance constellations due to the proliferation of nonstate and hybrid actors in global energy governance, but concentrates on the ideational background of German and Brazilian government strategies.[34]

2.3.2 Globalization, Contestation, and International Relations Theory

We distinguish *global governance* as a phenomenon of post-Westphalian global politics (see subsection The Densification of Transnational Social Relations and Post-Westphalian Global Politics) from *international governance*, which is founded on the interaction of nationstates. Though, of course, processes of contesting the hegemony of states by other states in the international system continue to be important, contestation in global governance (and, in particular, in sectoral global governance) includes positions that have few chances to prevail in national politics of powerful states. As a consequence of globalization, the aggregation of power and political contestation is only to a more and more incomplete degree taking place in national political systems. New governance constellations and changes in the equilibrium of collective decisionmaking are becoming evident in global governance[35]. This calls for a discussion on the concepts of institutional diversity, contestation, governance networks and nodal governance in a transnational setting. Contestation aims at changing the course of events by referring to new issues or insisting on the superiority of new strategies and makes use of the relative openness in global governance settings. At the same time, this very openness and the resulting multiplicity of actors and strategies leads to more frequent demands for coordination. Seen in such a way, there is a constant interaction between contestation and coordination, which implies elements of common decisionmaking, but also the pursuance of different strategies by different actors at the same time. In many cases these might be complementary, but sometimes conflictive with a need for compromises and a new round of coordination.

This process points to the importance of analyzing contestation of existing mainstream knowledge and strategies based on past coordination. *Contestation* refers to the use of the space for opposition in governance systems and, as such, constitutes an important starting-point for change. Contestation in various forms has played an important role in challenging hegemonic structures within the interstate system, which is a broadly discussed topic in all

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34 Röhrkasten, *Global Governance on Renewable Energy*, chaps. 4-7.

35 While some authors recognized that in their approach to the analysis of global politics – besides many constructivist authors, see, for example, James N. Rosenau, *Along the domestic-foreign frontier: Exploring governance in a turbulent world,* Cambridge studies in international relations No. 53 (Cambridge: Cambridge University Press, 1997); Held, McGrew, and Goldblatt, *Global transformations* – a large part of the IR discourses remains based on the assumption of an anarchical system of nation states. See for a good summary, see Anne-Marie Slaughter, “International relations, principal theories,” in Rüdiger Wolfrum, ed., *The Max Planck encyclopedia of public international law* (Oxford: Oxford University Press, 2011).

schools of IR research including constructivism[36]. In post-Westphalian global politics, this space has been considerably broadened by the growing involvement of nonstate actors recognized by liberalism, but in particular by constructivist authors quoted in subsection Contestation. Much of the literature on globalization and global governance discusses this aspect; in a recent article, Kenneth Abbott, Jessica F. Green, and Robert O. Keohane analyze the proliferation of what they call "private transnational regulatory organizations" in climate governance and stress their organizational flexibility and low entrance costs, but do not focus on their potential for contestation[37]. Another example of contestation are the numerous "multistakeholder platforms" created around and after WSSD 2002 which failed to establish a common understanding and goals related to the deployment of renewables. These partnerships often include CSOs and businesses or business associations (hence, the term *partnerships* used for them). These networks partly complement each other and partly reflect different modes of delivery. In the latter respect they constitute, at the same time, an example of competition between new governors.

David Fidler's "open-source anarchy" approach, a concept inspired by the opensource movement in software development (e.g., Linux) and the internet (e.g., Wikipedia) in which "anybody can access, use, modify and improve" on components of the system[38], allows a new understanding of actor relationships in international relations. Fidler also points to the proliferation of actors, but sees that in a broader analytical context linking it to a critique of narrow forms of constructivism. For Fidler, open-source anarchy is not just a matter of changing the interpretation of the world around us as an ideational process as stressed by constructivist authors[39], but also of significant "material conditions of competition among the actors"[40] – a central element of the "densification of transnational social relations". This has allowed for growing material capabilities (power) of nonstate actors in the anarchic international system and altogether in a high degree of "elasticity between power and ideas"[41].

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36 Realist and neorealist studies focus on the role of states in conflicts. See John Mearsheimer, "Back to the Future: Instability in Europe after the Cold War", *International Security* (1990); Robert Jervis, "The Future of World Politics: Will It Resemble the Past?", *International Security* (1991-1992). But also among constructivists, state-centered approaches can be found. See, in particular, Alexander Wendt, "Anarchy is what States Make of it: The Social Construction of Power Politics", *International Organization* 46 (1992): 391-425. For a broad view on aspects of contestation and hegemony in IR theory, see Peter J. Katzenstein, Robert Owen Keohane, and Stephen D. Krasner, eds., *Exploration and Contestation in the Study of World Politics* (Cambridge: MIT Press, 1999).

37 Kenneth Abbott, Jessica F. Green, and Robert O. Keohane, "Organizational Ecology and Institutional Change in Global Governance," *International Organization* (2016): 1-31.

38 David Fidler, "Architecture amidst anarchy: Global health's quest for governance," *Global Health Governance* 1 (2007): 1-17, at 9.

39 David P. Fidler, "A theory of open-source anarchy," *Indiana Journal of Global Legal Studies* 15, (2008): 259–284.

40 Ibid., p. 274. Fidler does not only refer to conditions strengthening the material capacities of nonstate actors but also to changing relations between powerful states, which cannot be discussed here.

41 Ibid., p. 283.

Contestation among states is inherent in the Westphalian system of international relations, but coordination of international actors appears to be an option – threatened, however, by severe conflicts among them. In a system of opensource anarchy, nonstate actors are not only able to exert pressure on states, but also to organize themselves to pursue goals on a transnational level. This produces new flexible coalitions for change mostly based on mechanisms of nodal governance (see below) when old forms of coordination are breaking down and negotiations for new developments are blocked. Former mainstream actors tend to incorporate new elements into their conception of reality, but stick to features closely linked to their particular form of operating and realizing profits based on coordination linked to states. Thus, an ongoing process of contestation and trials of alternative approaches might be more productive than attempts to incorporate new elements into old power structures.

The growing contestation of the construction of large dams because of their severe social and environmental impacts since the 1970s[42] and popular protests that began to stop more and more dam projects in the 1980s (Tasmania, India, Thailand, the Philippines)[43] – resulting finally in the establishment of the World Commission on Dams (WCD) in 1997 – constitute an interesting example of opensource anarchy and its impact on global energy governance. The WCD was a global multistakeholder body initiated by the World Bank and the World Conservation Union (IUCN) in response to this growing opposition to large dam projects.

In 2000 the WCD Report[44] was published and received broad attention and recognition, being considered an innovative framework for planning water and energy projects intended to protect people and the environment affected by dams, and ensuring a more equitably distribution of benefits. Ann M. Florini comments that "civil society's role in global governance is changing from that of a gadfly to that of direct participant in the management of global issues."[45] Since then, in particular the need to reduce CO_2 emissions fostered a new wave of planning and constructing large dams, frequently without observing the WCD framework.[46] Nevertheless, an assessment published in 2010 recognized a general acceptance of specific environmental and social norms related to large dam projects – in particular, the development of partnerships

42 In the 1970s civil society opposition in India against dam building grew, and the Silent Valley project in Kerala was one of the first to mobilize cooperation between local and international NGOs to resist construction. See S. Khagram, "Towards Democratic Governance for Sustainable Development: Transnational Civil Society Organizing around Big Dams", in Ann M. Florini, ed., *The Third Force: The Rise of Transnational civil society* (Tokyo: Japan Center for International Exchange, Carnegie Endowment for International Peace), pp. 83-114, at 90.

43 Florini, *The third force*.

44 World Commission on Dams (WCD), *Dams and development: a new framework for decision-making* (London: Earthscan, 2000).

45 Florini, *The Third Force*, p. 236.

46 See, for example, International Rivers, *Ethiopia's Gibe III Dam: sowing hunger and conflict*. (International Rivers, Factsheet 2011) https://www.internationalrivers.org/sites/default/files/attached-files/gibe3factsheet2011.pd.

amongst key stakeholders that can produce transformative resource-sharing agreements – showing that many of the WCD recommendations around negotiated decisionmaking are working in practice.[47] Even though results are far from perfect, this example demonstrates the impact of actors who formerly were not integrated in the coordination of energy planning on norm-building processes.

2.3.3 Regime Complexes and Nodal Governance

As stated above, observers of global governance mostly criticize a loss of effectiveness due to a proliferation of actors that have become involved. In more abstract terms, this problem has been discussed in the literature on regime complexity[48]. While in the beginning the analysis was basically critical, focusing on complexity as an element of making strategic action on social challenges more difficult, later writings have been more ambiguous, even with a positive view on processes of autoregulation based on multiple contestation. A similar change of perspective can be observed in the discourse on climate governance; in particular, after the failure of the Copenhagen climate conference in 2009. Authors such as Paul Suding and Philippe Lempp[49] or Florini and Sovacool[50] seem to imply that coordination reaches more effectiveness. In contrast to this position, Elinor Ostrom and others working on institutional diversity, especially for common-pool resources, and on social-ecological systems show that there are many instances where bottom-up processes have led to a stable and seemingly efficient or successful regulation of these resources or systems.[51]

So far, there are few theoretical approaches that explain successful processes of self-organization. We consider the focus on policy networks as the most promising, though quite diverse, approach.[52] Due to the lack of space for a more in-depth discussion, we will concentrate here

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47 Deborah Moore, John Dore, and Dipak Gyawali, “The World Commission on Dams + 10: Revisiting the large dam controversy,” *Water Alternatives* 3(2): 3-13, at 3.

48 Initiated by an article by Kal Raustiala and David G. Victor, “The regime complex for plant genetic resources,” *International Organization* 58 (2004): 277–309. See also Karen J. Alter and Sophie Meunier, “The politics of international regime complexity,” *Perspectives on Politics* 7 (2009): 13–24; Daniel W. Drezner, “The Power and Peril of International Regime Complexity,” *Perspectives on Politics* 7 (2009): 65–70; Robert O. Keohane and David G. Victor, “The regime complex for climate change,” *Perspectives on Politics* 9 (2011): 7–23.

49 Suding and Lempp, “The multifaceted institutional landscape and processes of international renewable energy policy.”

50 Florini and Sovacool, “Who governs energy?”

51 See, related to climate policies, Elinor Ostrom, “Nested externalities and polycentric institutions: Must we wait for global solutions to climate change before taking actions at other scales?” *Economic Theory* 49 (2012): 353–369; Roger A. Pielke, *The climate fix: What scientists and politicians won't tell you about global warming* (New York: Basic Books, 2010).

52 See, for example, Eva Sørensen and Jacob Torfing, eds., *Theories of Democratic Network Governance* (Basingstoke: Palgrave Macmillan, 2007). For the use of social and political networks as the defining mechanism of post-modern society see Manuel Castells’s concept on the „network society.“ Manuel Castells, *The rise of the network society*, 2nd ed., Vol. 1 of The information age economy, society and culture (Chichester: Wiley-Blackwell, 2010).

on the concept of “nodal governance” as proposed by Scott Burris, Peter Drahos, and Clifford D. Shearing.[53] Most of the new actors, which have entered fields of global governance, either joined existing networks or formed networks themselves within the ambience of a specific field of governance. Networks tend to form nodes – formal or informal institutions – where they interact with other networks and work to improve conditions to realize their goals. They are points in such networks, which dispose of strategic thinking on the matters that the node has emerged to govern, where power is accumulated through technologies to exert influence, resources to support the operation of the node, and institutions “that enable the directed mobilization of resources, mentalities and technologies over time”[54]. Governing nodes take many forms at very different scales, from international organizations and government agencies to foundations, or from NGOs to street gangs.

According to Burris, Drahos, and Shearing, “Nodal governance is an elaboration of contemporary network theory that explains how a variety of actors operating within social systems interact along networks to govern the systems they inhabit” [55]. Nodal governance consists of more or less interconnected governance networks with “a plurality of mechanisms that enable or constrain the exercise of power and rapid adaptive change”[56]. The interactive processes have created new forms of coordination, contestation, and networked power in the respective policy fields. Multiple forms of transnational links in fact coordinate all kinds of activities: research, production, marketing campaigns, political strategies, CSO campaigns, and whatever might be of interest for a transnational group of actors. Nodal governance is structured by links among a large number of nodes and the rise of certain superstructural nodes[57] (or “supernodes”), which move the contestation and coordination processes to higher levels of social and political organization and frequently canalize agreements and compromises reached in network structures into institutions of authoritative decisionmaking. Due to the openness of these supernodes, they also function as a hub to signal global public pressure on governmental institutions to reconsider decisions made.

Due to its central role in development cooperation, the World Bank Group has been such a node of global energy governance. The same can be said of the IEA as sectoral organization and provider of global energy market information. As described above (see subsection Relevance of the Global Level in Renewable Energy Governance), the UN system has failed to

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53 Scott Burris, Peter Drahos, and Clifford D. Shearing, “Nodal governance,” *Australian Journal of Legal Philosophy* 30 (2005): 30-58.
54 See ibd., p. 37-38.
55 Ibd., p. 33.
56 Wolfgang Hein, Scott Burris, and Clifford D. Shearing, “Conceptual models for global health governance,” in Kent Buse, Wolfgang Hein, and Nick Drager, eds., *Making sense of global health governance: A policy perspective* (Basingstoke: Palgrave Macmillan, 2009), pp. 72–98, at 76–77.
57 See Burris, Drahos, and Shearing, “Nodal Governance,” p. 38.

reach consensus on renewable energy targets until recently. Several attempts have been made to erect coordination mechanisms such as the interagency forum UN-Energy. Yet these initiatives have not succeeded in bringing more coherence and depth to UN energy activities.[58] This may be changing with the UN Secretary-General's Sustainable Energy for All (SE4All) initiative. After the failures to implement renewable energy goals in intergovernmental negotiations, a network of some UN agencies, governments, academics, and CSOs developed a set of agreeable targets in several international conferences. Thus, additional (private) stakeholders were involved and common wisdom contested. The SE4All initiative has become a major point of reference in policy documents and a forum for different public, private, and hybrid governors. In addition, it has led the way to the inclusion of universal access to energy as one of the seventeen Sustainable Development Goals – namely SDG 7 ("Ensure access to affordable, reliable, sustainable and modern energy for all") – which were adopted in 2015.

The SE4All initiative has developed several activities so far that include: (1) the formation of thematic networks ("High Impact Opportunities") and multilateral partnerships (Energy+ led by Norway and the Paris-Nairobi Climate Initiative by France and Kenya); (2) the collection of commitments by public donors and private investors; and (3) the densification of networks and building of new nodes ("regional and thematic hubs"). The Economic Community of West African States Centre for Renewable Energy and Energy Efficiency (ECREEE) is such a regional hub. Through the coordination of national action plans and several other activities from policy advice and capacity building to financial support for the implementation of projects, it exemplifies the working of nodal governance and the exertion of networked power. ECREEE channels official development assistance (ODA) moneys used as grant co-funding through calls for proposals, develops a project pipeline to attract foreign direct investment, functions as meeting point, monitors progress of programs and the sector in general ("observatory"), and assists to formulate renewable energy policies.

Besides regional centers, there are also national coordination hubs (e.g., in Kenya).[59] While the initiative put energy and especially rural electrification back high on the international development and climate change mitigation agenda, there is no consensus on the way to reach the targets or on specific technologies as the controversies around large hydropower (ecological impacts of dam, resettlements), bioenergy (food vs. fuel), nuclear energy (safety, ultimate

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58 Lesage, Westphal and Van de Graaf, *Global energy governance in a multipolar world*, p. 53. Karlsson-Vinkhuyzen as well as Sovacool and Florini draw a somewhat more modest conclusion on this coordination effort. See Karlsson-Vinkhuyzen, "The United Nations and Global Energy Governance"; Sovacool and Florini, "Who governs energy?"

59 European Union Energy Initiative Partnership Dialogue Facility (EUEI PDF), *Mapping of Energy Initiatives and Programs in Africa* (2016), at pp. 24-25, www.euei-pdf.org/sites/default/files/field_publication_file/mapping_of_initiatives_final_report_may_2016.pdf.

waste disposal, proliferation), or Carbon Capture and Storage (health, safety) show. Yet with decreasing costs of distributed energy such as solar photovoltaics (PV), decentralized approaches become more likely to be supported on a large scale. As with most partnerships, it is unclear if donors will make additional pledges or just reaffirm commitments made elsewhere. However, it is most likely that at least some additional resources will be mobilized due to the fact that donors strive to launch their own initiatives, especially when hosting a major occasion, and due to the flexibility of arrangements leaving room for different approaches towards implementation – as an illustration of what Fidler calls "open-source anarchy". Moreover, as with other multistakeholder platforms, the initiative gives room for experimentation across public and private sectors and beyond conventional development aid approaches. Overall, it may become what Burris, Drahos, and Shearing call a "superstructural node". Private stakeholders are involved in SE4All activities; however, their exact role and influence needs to be studied in more detail in further research.

2.3.4 Contestation-Coordination Dynamics

Apart from the arguments for the importance of contestation on all political levels, global governance constitutes an arena where continuous dynamics of coordination and contestation is of particular relevance. The change of a given governance structure for a particular policy field (here, energy supply) and a specific political arena is driven through a process of

(1) Coordination for addressing a certain global problem – here, electrification through renewables or a diversification of the supply structure;
(2) The entry of additional stakeholders – including national and transnational NGOs/CSOs – contesting rules and goals and addressing existing nodes;
(3) The building of new nodes and supernodes;
(4) The establishment of niches where alternatives are implemented and tried out; and finally
(5) A modification of governance structure and goals.

Coordination in the energy sector has taken place on various occasions: the UN processes mentioned above, which mostly failed until recently; the G8/20, which – beyond certain initiatives – has not formed a consensus either,[60] and the IEA, which has been highlighting the dominant role of conventional technologies until recently[61]. On the project level, the World Bank Group, trying out different forms of governance such as a "programmatic approach",[62] can be

60 Dries Lesage, Thijs Van de Graaf, and Kirsten Westphal, "The G8's Role in Global Energy Governance since the 2005 Gleneagles Summit," *Global Governance* 15 (2) (2009): 259-277.
61 Urpelainen and Van de Graaf, "The International Renewable Energy Agency."
62 On this see, for example, Lars Holstenkamp, "An Overview of European Programs to Support Energy Projects in Africa and Strategies to Involve the Private Sector", in Paul Hoebink, ed., *European Development Cooperation – In Between the Local and the Global* (Amsterdam: Amsterdam University Press, 2010), pp. 95-123.

added. Several different actors have contested existing rules and goals and addressed these nodes: the failure of UN processes have led to the creation of various policy networks including state and nonstate actors. In addition, it is a major reason why the German government together with partner countries has created IRENA outside of the UN system.[63] As Röhrkasten highlights, domestic state and nonstate actors have played a major role in this push to contest IEA policies.[64] On a project level, World Bank policies with regard to large hydropower have met opposition (see subsection Globalization, Contestation, and International Relations Theory). These examples include processes of nodeformation, which bear new institutions like IRENA or SE4All (see subsection Regime Complexes and Nodal Governance). Nodeformation seems to be ongoing in global renewable energy governance. In addition, contestation may lead to attempts to try out alternatives, such as PV and wind energy, often using hybrid forms of governance. Nodeformation can be seen as a process of coordination. These contestation-coordination dynamics result in a modification of governance structures and goals, most intuitively illustrated by the enactment of SDG 7 (see subsection Regime Complexes and Nodal Governance).

2.4 Conclusion and Policy Implications

While there are serious doubts about progress in the overall governance of world affairs, in many policy fields global governance has become much more intense and differentiated. The number and forms of actors involved are proliferating. Transnational communities that have evolved are having a growing impact on raising and defining news issues, becoming part of the coordination with state actors and international governmental organization, and also stirring up projects and political strategies through contestation.

On a micro level these dynamics have an impact on technical project design, project governance, and financial resources available for specific types of projects. Hybrid governance and financing structures are indicators that times of change away from the traditional structures of Westphalian international politics.

Some policy implications may be drawn from or are related to these rather conceptual considerations: Taking sectoral governance dynamics into account may lead to a different assessment of institutional proliferation and potential gaps in the institutional landscape identified by some global energy governance scholars. Coordination does not necessarily imply higher efficiency and effectiveness, in particular, if it turns out to be an obstacle to flexibility and innovation. Neither must the amount of financial resources available for access to sustainable energy in developing countries be seen as fixed: further organizations and institutions may provide for additional sources of capital for renewable energies in the Global South. Therefore, a

[63] Urpelainen and Van de Graaf, “The International Renewable Energy Agency.”
[64] Röhrkasten, *Global Governance on Renewable Energy*.

dynamic analysis taking processes of contestation and coordination, competition, and learning effects will most certainly come to different conclusions, especially if fragmentation and divergent preferences are treated as inevitable circumstances. Finally, a better understanding of coordination-contestation dynamics and of nodeformation may help in any move to modify governance structures and goals in a specific direction.

The framework developed here may help to improve the understanding of these governance dynamics across scales. However, while some of the examples given illustrate the theoretical arguments presented in this article, the usefulness of the framework has to be tested through in-depth empirical studies of these cases. In addition, comparative case studies should also look into outcomes and effectiveness of different governance structures to evaluate the empirical content of our predictions.

3 What drives the development of community energy in Europe? The case of wind power cooperatives

Abstract

The dominant model of energy infrastructure has historically been conceived in a very centralized fashion, i.e., with hardly any citizen involvement in energy generation. Yet, increasing attention is being paid to the transition process towards a more decentralized configuration. This article examines the factors likely to foster citizen and community participation as regards wind power cooperatives in Denmark, Germany, Belgium and the UK. Using Elinor Ostrom's Social-Ecological System Framework, the analysis highlights a double-edged phenomenon: prevailing and growing hostility toward cooperatives, on the one hand, and, on the other, strategic reactions to this evolution. What comes out indeed is that, throughout most of these countries, the emergence of some coordinated inter-organizational actions among cooperatives enables them to survive in their critical environment.
Keywords: Wind power; Cooperative; Community energy; Social-Ecological System.

3.1 Introduction

The dominant model of energy infrastructure has historically been conceived as very centralized, with hardly any citizen involvement in energy production. Yet, an increasing number of scholars, citizens and policy-makers advocate the transition towards a more decentralized configuration, involving geographically dispersed and small-scale generation units located close to consumers [1]. Decentralized systems are said to present several advantages over centralized ones, including reduced costs for transmission and distribution systems, reduced grid power losses, more efficient data management systems and a larger share of zero-carbon technologies [2]. In turn, this configuration requires an active role from energy users, the latter becoming themselves “prosumers” or co-providers of energy services [3].

In this context, it is thus meaningful to study the factors likely to foster citizen participation. Community energy projects, i.e., formal or informal citizen-led initiatives which propose collaborative solutions on a local basis to facilitate the development of sustainable energy technologies, may have an important role to play in this respect. These initiatives are increasingly perceived as key potential actors in the transition toward low-carbon energy systems [4]. While incumbent actors suffer a lack of trust from the public [5], the implementation of decentralized renewable energy installations and many energy efficiency measures need to be steered by trustworthy individuals and organizations rooted in local communities. Community energy enhances social acceptance of technologies at the local level, as evidenced by comparative research for the case of wind power [6, see also 7]. Moreover, it is linked to identification processes in rural areas and can be interpreted as an expression of more participation in decision-making on this vital infrastructure [8]. Against the background of these findings on the possible economic, social and political impacts of community energy, we focus on the conditions under which a specific form of community energy − wind power cooperatives − emerges.

Renewable energy (RE) cooperatives in general enable citizens to collectively own and manage RE projects at the local level [9, 10]. From an economic standpoint, cooperatives present a different model of ownership than conventional business organizations. Unlike capitalist corporations, they are owned by their members/users rather than investors. In addition, net earnings are usually divided pro rata among the members – not according to their shareholding – but according to the volume of transactions they have conducted with the firm. In addition, when part of the net income is allocated as a return on capital shares, such profit distribution is subject to a cap, which means maximization of return on capital may not be a key objective. Finally, they present a democratic governance structure, which involves equal individual voting rights and the absence of barriers to entry for new members.

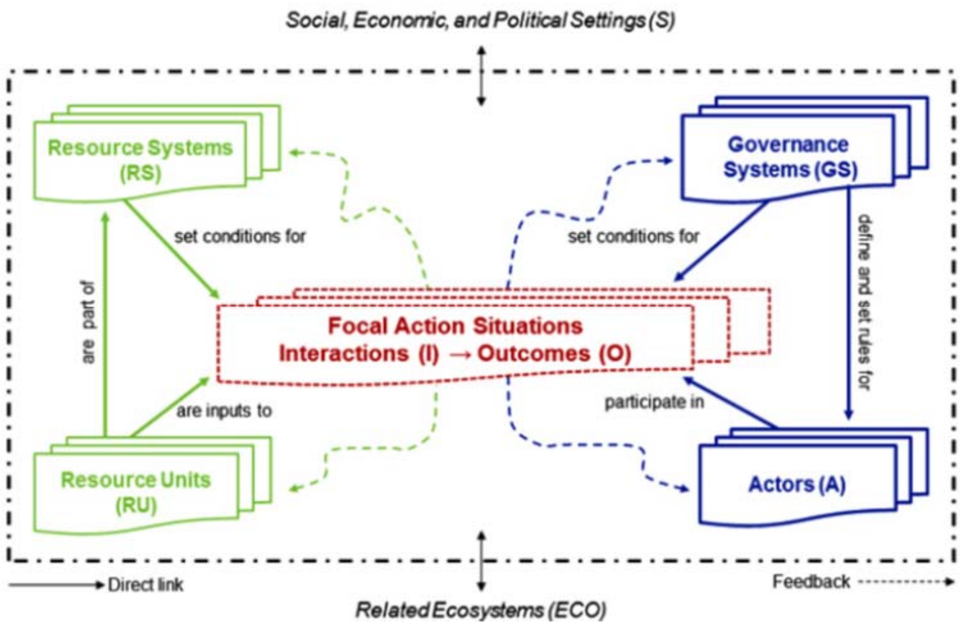
However, the weight of the RE cooperative sector varies enormously across Europe. While the RE cooperative model is well-established in some countries, it remains marginal in others. In this article, we conduct a comparative analysis of the contextual factors that affect its development in four countries, focusing on the case of onshore wind power: Denmark, Germany, Belgium and the UK. The analysis highlights how different factors combine to facilitate or, conversely, hinder, the development of RE cooperatives. We emphasize the common patterns that emerge from this trans-national comparison without neglecting national specificities. One important pattern observed in these countries can be described as a double movement. The first side of the movement is a convergent observation of an increasingly more hostile environment for cooperatives, a fact which puts them at a relative disadvantage compared to conventional actors. The second side of the movement is a process of strategic reaction from the part of cooperatives, which consists in the emergence of inter-organizational coordinated actions among RE cooperatives in Denmark, Germany and Belgium, such as the creation of joint electricity supply or trading companies. These joint initiatives are the result of strategic responses of small players to regulatory changes and enable them to survive in increasingly hostile environments.

3.2 Analytical framework

Large differences in the development of RE cooperatives have been observed among European countries. Various factors have been explored to explain such disparity. Formal institutional rules, such as support mechanisms for renewables and spatial planning, along with societal norms including attitudes towards the cooperative model and cultures of local energy activism, have been identified as major influences on the occurrence of locally owned community energy [11-13, 9, 14, 7]. Other explanations include (bio-) physical conditions, and the actors' ability to act strategically to changes in their environment. Finally, it has recently been argued that it is meaningful to investigate how these factors interact in a systemic fashion rather than studying them in isolation [1, 15, 16]. The so-called "Social-Ecological System" Framework may be helpful in this task.

3.2.1 <u>The energy system as a Social-Ecological System</u>

In a recent article, Hodbod and Adger [15] argue for framing energy systems as Social-Ecological Systems. In this perspective, we build the conceptual framework of this paper using insights from the Social-Ecological System (SES) Framework developed by Ostrom and her collaborators [17]. The SES framework has traditionally been used to study the interactions between the biological basis of ecosystems and social processes. However, recent expansions of the framework make it applicable to questions of the governance of humanly designed technological systems, such as energy infrastructures [18]. The center of this framework is constituted by an "action situation", in which multiple actors interact with each other under the influence of different contextual variables. These interactions produce outcomes, which are linked to contextual variables through feedback paths (see Fig. 10).



Source: McGinnis and Ostrom [18].

Abb. 10: Graphical representation of the social-ecological framework

Contextual variables include Resource Systems, Resource Units, Governance Systems and Actors. Resource systems designate the biophysical/technical systems from which Resource Units are extracted. These Resource Units can then be consumed, used as inputs in a production process or exchanged for other goods and services. Governance Systems include "the prevailing sets of processes or institutions through which the rules shaping the behavior of the [actors] are set and revised" [19: 181]. Actors are individuals or collective entities who participate in relevant action situations and are defined by some shared attribute(s), such as leadership, social capital, access to technologies, management skills, etc. Social, Economic, and Political Settings and Related Ecosystems respectively represent the broader social and ecological contexts that may influence the focal SES exogenously.

Hence, the SES framework has the advantage of embracing and integrating into one logical entity different approaches: approaches based on agency, which focus on the thoughts and actions taken by actors expressing their individual power in social contexts, and approaches oriented toward structure, which focus on the set of broader social forces and institutions which constrain the choices made by actors. Finally, the framework also sets the biophysical/technical boundaries in which social interactions take place.

3.2.2 Application of the SES framework to the case of energy systems and RE cooperatives

The factors influencing the development of RE cooperatives involve action situations and actors at multiple levels. For instance, most support instruments for renewables are designed at the national level, while, in the case of wind power, planning regulations are usually located at the regional or local level. The case here is thus characterized by a multi-level or polycentric system [1]. Yet for the purpose of this article, we consider countries as the main geographical area of analysis. The outcome that is relevant for our inquiry is the pattern of occurrence and success of RE cooperatives operating on national power markets.

Regarding Resource Systems and Resource Units, energy systems can be subdivided into two major types of resource systems: biophysical resource systems and technical resource systems. Biophysical resource system variables encompass the type and abundance of primary energy resources, their location, etc. Technological resource system characteristics cover the type and size of technology, the distance from the grid, the intermittency, the storage capacity, and many other factors.

In this article, we are primarily interested in the structural factors, i.e., Governance Systems variables which influence the patterns of appearance and success of RE cooperatives. We consider Resource Systems and Resource Units essential background factors. On the other hand, while idiosyncratic features of RE cooperatives may account for differences between organizations, they are unlikely to explain why this sector displays different degrees of development across the four countries. Yet there are factors under the form of societal norms, such as attitudes toward the cooperative model or cultures of local energy activism, which also play an essential role. We here consider them as Actors variables since these norms exist only to the extent that they are embedded in actors. We return to some important interactions between the elements of the SES Framework in the following discussion.

3.2.3 Operationalization of Governance Systems and Actors variables

The SES Framework attempts to identify the fundamental building blocks which need considering when studying SESs and their internal interactions. As such, the framework can be applied to all types of SESs. Yet, to conduct our analysis, it is essential to further specify the factors that are relevant in our case. We have identified four main factors based on the literature and our empirical analysis: two Governance Systems variables (support mechanisms for renewables and planning policies) and two Actors variables (attitudes toward the cooperative model and cultures of local energy activism).

Support mechanisms for renewables

RE cooperatives use RE technologies that are not cost-competitive to conventional technologies for power generation under current power market designs. Support mechanisms have been developed to cope with this problem, which lies at the intersection of Resource Systems and Governance Systems variables. They have stimulated the use of RE technologies by leveling the playing field and making RE projects economically feasible. Feed-in tariffs (FiT), feed-in premiums (FiP) and quota obligations are the most widely used types of mechanism encouraging the generation of electricity by RE sources in Europe. Some authors argue that actors like RE cooperatives are most likely to benefit from risk reducing support mechanisms, which keep transaction costs for financing and operating RE projects low [20]. Indeed, these organizations have limited resources because they rely on their members' equity and external project financing, e.g., bank loans. Moreover, as they focus mostly on one or very few local projects, they are generally risk averse because of constraints to hedge and distribute risks in small portfolios. Whether a support mechanism is market-dependent or market-independent constitutes an important factor for risk reduction. Market-independent mechanisms like FiTs offer fixed remunerations which are independent of volatile electricity prices and are often accompanied by purchase obligations. This gives high investment security because of predictable cash flows and low transaction costs. Market-dependent mechanisms, such as FiPs or quota obligations, are fully or partly based on volatile electricity prices, which gives producers the incentive to react to price developments and can increase transaction costs for marketing electricity. For small actors like cooperatives, therefore, market-independent mechanisms are generally perceived to be more favorable than market-dependent ones [21].

Planning policies

Various aspects of planning procedures, which define rules and relevant actors in the operational phase, are likely to affect the development of RE cooperatives. On the one hand, it has been argued that participatory schemes improve the chances of getting planning consent because they can build on local social networks supporting wind power [14]. On the other hand, the small scale of cooperatively-owned projects increases the relative planning risk, especially if planning requirements are not differentiated depending on the size of the project. In addition, RE cooperatives may find it more difficult than large-scale players to afford the failure of planning applications due to lack of resources; they may therefore be more reluctant to engage in projects in the first place. Legal obligations for developers to open the capital to citizen participation may help overcome this obstacle.

Attitudes toward the cooperative model

The extent to which a society is familiar with the cooperative model is likely to play a role. In countries where the cooperative movement has an old and well-established tradition, people know about this legal structure and are aware of its benefits. In countries where the general public and other actors are less familiar with this model, this low awareness may potentially constitute a “cognitive barrier” [9]. On the other hand, unwelcome experiences with a specific type of cooperative model can constitute a “(negative) historical legacy”. Thus, cooperatives may have a negative reputation in some areas. RE initiatives for joint investments will most probably take other forms in these cases.

Cultures of local energy activism

Various authors [13, 22, 7] argue that local ownership is related to traditions of energy activism, and particularly to the anti-nuclear movement. Indeed, anti-nuclear activism is often accompanied by increased interest in alternative energy. In the Netherlands, for instance, the origin of wind cooperatives is strongly linked to an anti-nuclear movement, the Dutch Organization for Renewable Energy (ODE) [11].

3.3 Methodology

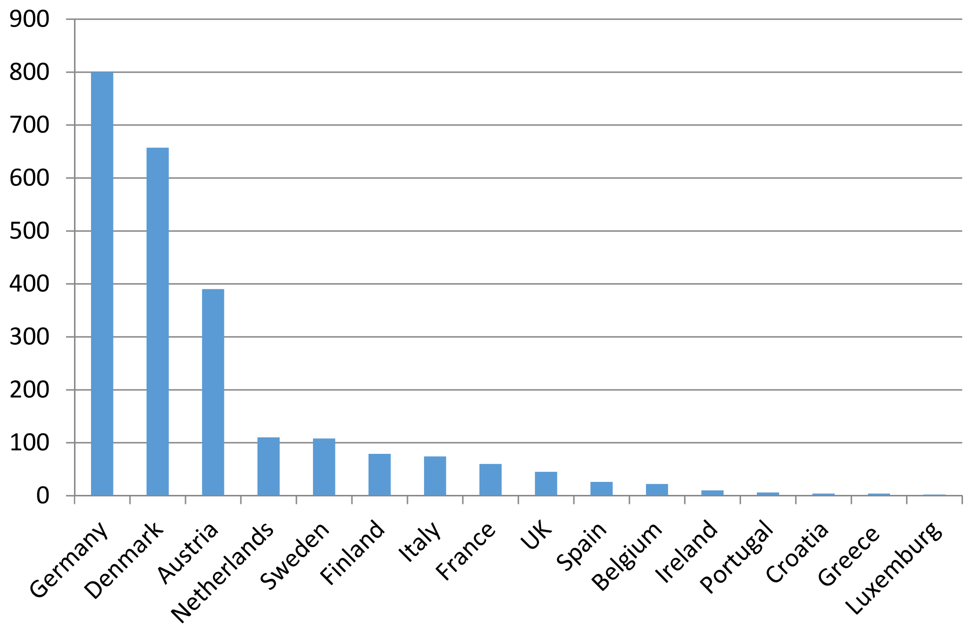
We have conducted 40 semi-structured interviews with key actors (cooperative managers and board members, intermediary actors, policy makers) in each of the four countries, and carried out an extensive analysis of different types of documents: regulatory reports, legislation regarding RE generation and citizen participation and documents from relevant actors, e.g., meeting minutes, annual reports of cooperatives, etc. An overview of the conducted interviews is summarized in Table 9.

Tab. 9: Interviews conducted

Number	Position/ Organization	Country	Date
1	Cooperative manager	Denmark	23.06.2014
2	Consultant/cooperative board member	Denmark	10.07.2014
3	Researcher/cooperative member	Denmark	27.06.2014
4	NGO manager	Denmark	08.07.2014
5	Association board member	Denmark	02.07.2014
6	Association manager	Denmark	01.07.2014
7	Local administration official	Denmark	27.06.2014
8	Bank manager	Denmark	09.07.2014
9	Company manager	Denmark	03.07.2014
10	Public electricity company manager	Denmark	03.07.2014
11	NGO director	Denmark	14.05.2014
12	Association director	Denmark	01.08.2014
13	Local administration	Germany	10.05.2012
14	Local administration	Germany	28.08.2012
15	Local administration	Germany	05.11.2012
16	Local administration	Germany	24.08.2012
17	Municipal association officer	Germany	11.09.2014
18	CEO municipal utility	Germany	25.06.2012
19	CEO municipal utility	Germany	03.03.2014
20	Regional wind energy agency officer	Germany	20.11.2012
21	Cooperative association officer	Germany	06.11.2012
22	CEO wind cooperative	Germany	22.11.2012
23	Biogas plant owner	Germany	29.01.2015
24	CEO windpark SPVs	Germany	20.09.2012
25	CEO cooperative association	Germany	04.09.2013
26	Cooperative board member	Belgium	04.10.2013
27	Cooperative manager	Belgium	04.10.2013
28	Cooperative manager	Belgium	06.03.2014
29	Coordinator of an association of cooperatives	Belgium	26.09.2014
30	Wind energy facilitator for the Walloon Region	Belgium	14.10.2014
31	Cooperative board chair	Belgium	15.10.2014
32	Wind energy facilitator for the Flemish Region	Belgium	17.11.2014
33	Cooperative employee	Belgium	19.11.2014
34	Cooperative employee	Belgium	19.11.2014
35	Cooperative board member	Belgium	20.11.2014
36	Independent researcher on community energy	The UK	30.05.2014
37	Cooperative energy activist	The UK	06.06.2014
38	Cooperative board member	The UK	13.06.2014
39	Cooperative energy activist	The UK	09.09.2014
40	Policy maker, Department of Energy & Climate Change	The UK	22.10.2014

3.3.1 Case selection

Several reasons account for our selection of four countries: Denmark, Germany, Belgium and the UK. On the one hand, they correspond to different development stages of the cooperative energy sector (see Fig. 11).



Source: REScoop.eu.

Abb. 11: ***Approximate number of renewable energy cooperatives in seventeen European countries, 2014***

While in Denmark and in Germany, RE cooperatives are already well established, in Belgium and the UK they exhibit a much lower degree of development albeit promising growth perspectives. In addition, these four countries have different main support mechanisms for RE development: Germany and Denmark have implemented a Feed-in tariff whereas the UK and Belgium mainly use a quota obligation system based on the trade of certificates.

3.3.2 Data collection

Although RE cooperatives are but one model of community energy among others, they are the focus of the present study. There are methodological and substantive reasons justifying this choice. Methodologically speaking, looking at the whole spectrum of community energy initiatives would considerably complicate the comparative analysis. In addition, as cooperatives are formally registered organizations and benefit from a legal framework in most European countries, they are easier to compare internationally than informal initiatives. Furthermore, the cooperative model is arguably one of the strongest forms of community energy in Europe. At European level, it is indeed the only model that is represented by a federation, REScoop.eu. RE cooperatives are also strongly embedded in the international cooperative movement, an international network of cooperatives and advocacy organizations that aim at promoting and spreading the cooperative principles of solidarity and democratic governance [23]. Furthermore, while the access to finance during the at-risk stage is acknowledged as a barrier to the development of community energy projects [24], cooperatives are a particularly suitable model to ensure the financial viability of small-scale projects through fundraising among community individuals compared to other models depending on grants or loan schemes.

Finally, we concentrate on one technology, onshore wind power, because it is the technology that is most commonly developed by cooperatives across the four countries studied. Wind power is also characterized by high technical potential and has a major role to play to reach European renewable targets. In addition, focusing on one technology greatly facilitates the comparison between countries.

3.4 Findings about the four countries concerned

3.4.1 Denmark

Background

Denmark is a pioneer in wind power, the development of which is closely connected to cooperatives. These are formally organized as general partnerships where individual citizens invest jointly in the procurement of wind turbines to operate them and sell the electricity output. In 2002, cooperatives owned slightly less than 40% of the total number of 6,300 turbines installed, and over 150,000 households owned shares in wind power cooperatives. The remaining turbines were owned by single owners (approx. 40%) – mostly farmers –and utilities (approx. 20%) [25]. By 2004 the number of households owning shares in cooperatives had decreased to 100,000 and by 2009 to 50,000 [26]. The number of new wind turbine cooperatives after 2009 is difficult to quantify but new wind power projects mostly tended to be developed and owned by utilities and professional project developers.[65] The Danish Wind Turbine Owners association (DK VIND) estimates that by 2010 15% of all turbines in Denmark were owned by cooperatives [27]. An expert estimates that in 2014 there were still 300-400 wind power cooperatives with local people holding a majority of shares (interview 2).

Support mechanisms

Historically, the main support mechanisms available were investment grants for wind turbines from the Danish state in the 1970s and 1980s, tax exemptions for income from wind turbines and, from the mid-1980s, fixed Feed-in tariffs including guaranteed grid connection, purchase obligations and priority transmission for wind power producers [12, 28]. Tax exemptions and FiTs created a high investment security for wind projects by guaranteeing stable incomes and financing from banks was available at reasonable interest rates (interview 3).

[65] Ownership in wind turbines was centrally registered in Denmark until 2001. There has not been official government data on ownership groups ever since and the figures presented here are based on the available literature and expert interviews.

After a reform of the electricity sector in 1999, Denmark enacted new rules for wind power support. Wind turbines authorised between 2000 and 2002 as well as those already in operation received a 25% lower FiT and payment duration was limited. This reduced economic feasibility for new wind projects and the occurrence of new cooperatives was slowed considerably. The support mechanism was drastically changed in 2003. After the election of a new liberal-conservative government, Denmark implemented a fixed FiP scheme in 2003. Producers received the Nord Pool market price[66] and a fixed maximum premium. Moreover, all new producers had to market their electricity directly on the wholesale market.

Consequently, between 2003 and 2008, there came no new cooperatives while many existing ones dissolved. The main reason was that the premium was too low to compensate for low Nord Pool wholesale prices, and price volatility was perceived as a big risk by ordinary citizens and thus “scared people to enter into the cooperative game” (interview 1). Meanwhile, the government had set up attractive incentives for decommissioning and repowering old turbines, which were often owned by cooperatives. After receiving good offers, many cooperatives dissolved and sold off their turbines to commercial actors. “[…] there was a tendency that the bigger developers were the only ones who could deal with these problems” (interview 7).

In 2009, the support mechanism was reformed again when the Danish government enacted the Promotion of Renewably Energy Sources Act of 2009 (REA 2009). The fixed premium payment was increased, which, as to several interviewed experts, made cooperative wind projects economically feasible again. However, with increased turbine sizes, capital investments for wind projects have also increased. Due to price volatility under the Danish FiP, financing cooperative wind power projects has remained challenging after 2009. Cooperatives have thus increasingly sought alternative funding resources [29]. One of these was the creation of a trading company called Vindenergi Danmark, which purchases and trades electricity at Nord Pool on behalf of wind power cooperatives and other private producers. Vindenergi Danmark is organized as a non-profit cooperative owned exclusively by its members. Even though there are no exact figures, it is estimated that two thirds of all cooperatives trade with Vindenergi Danmark (interview 9).

Planning policies

Denmark is the only of the four countries considered here to have from the outset promoted the ownership of wind power by local citizens, companies and cooperatives through planning schemes and specific regulations. Around 2000, in fact, cooperatives, single owners and farmers owned 80% of all wind turbines in Denmark because the government restricted ownership of wind turbines to local actors living or being registered in geographical proximity to the turbine

66 Nord Pool is a common electricity spot market between Scandinavian and Baltic countries. Denmark joined the exchange in 2000.

they owned [12]. Restrictions were completely deregulated after 1999, which opened ownership to commercial actors such as foreign companies, and initiated the commercialization of wind power in Denmark.

Spatial planning was also reformed in 1999 in reaction to the growing impacts from larger turbines and the decreased availability of designated sites for wind power. Costs for planning increased after the reform because procedures became more restrictive and lengthy due to higher requirements. This factor and the arrival of more professional actors became considerable obstacles for new cooperatives because commercial actors were able to pay higher prices and act faster than cooperatives with democratic decision-making (interview 12). Consequently, local ownership has suffered a drawback since the early 2000s and “it became clear that it is quite a challenge to obtain local acceptance if wind power development is only driven by professional developers or by large energy companies” (interview 4).

In 2007, the Danish government started to observe stagnation in wind power and increasing local resistance against wind projects as problematic. To restore and maintain public acceptance, the Danish government enacted specific regulatory measures to proactively ensure citizen ownership in wind power projects. Under the REA 2009, a local citizens’ option to purchase wind turbine shares was implemented, thereby compelling developers of a new wind turbine to offer at least 20% of the ownership to local citizens living within a radius of 4.5 km from the turbine. On the other hand, a public guarantee fund was established to support the financing of preliminary investigations, planning, etc. by local wind power cooperatives.

Attitudes towards the cooperative model

Historically, Denmark has a long tradition of cooperative enterprises. The first cooperatives were established in the agricultural sector and became one of the widest spread forms of commercial activities in the country during the first half of the 19th century. To this day, cooperatives have been a common feature in Danish life, and can be found in many sectors, e.g., food industry and retail, but also in public services such as consumer owned energy utilities. Even though many cooperative enterprises in rural areas suffered a drawback in the 1970s, principles of solving problems collectively at the local level and establishing vehicles for cooperation, such as e.g., cooperatives, have remained widespread in Danish society. So, when wind power technology became commercially available in the 1970s this fell on a fertile cultural soil for the cooperative model.

Local energy activism

Denmark is characterized by a strong tradition of local energy activism. Anti-nuclear protests and grassroots activism experimenting with alternative ways of producing energy go hand in hand. On the one hand, these voices can be traced back to the strong and well-organized

Danish anti-nuclear movement, which was able to influence policy towards support for RE [29]. On the other hand, grassroots actors – individuals, farmers or local citizens organized in co-operatives – actively engaged in developing alternatives: they set up wind turbines on their properties, fought for grid connection and support from government, shared experiences and cooperating with a nascent manufacturing and servicing industry for wind power (interview 12). Another important driver for local energy activism and cooperative initiatives is local added value through wind projects. Historically, wind power development in Denmark was based on the principle that those having to bear the impacts of wind turbines should also enjoy their benefits. This principle was challenged after 2000 by the commercialization of wind power, when actors external to local communities started implementing wind projects. This trend triggered local resistance against wind projects when local citizens felt excluded from decision-making and economic benefits (interview 11). Today, there are more than 200 local groups opposing wind power [30].

3.4.2 Germany

Background

Germany, like Denmark, is a leading country in RE deployment within Europe. Onshore wind power has been the dominating RE technology with around 50% of all RE sources. Community ownership is estimated to have a share of around 20% in this segment of the market [31]. In the initial phases of the wind energy sector, this share has even been much higher.[67] The decrease in the share of community energy may be explained by the trend toward profession-alization and commercialization in this sub-sector of the energy market [32]. The most common legal form for community wind is the limited partnership with limited liability company as general partner (GmbH & Co. KG, henceforth: limited partnership model). The main difference with the cooperative model is that usually voting rights are allocated according to the amount of capital invested in the limited partnership model, i.e., the cooperative democracy principle does not apply. Although cooperatives have experienced a rapid growth in recent years–there are around 973 energy cooperatives, among which 82 are active in wind [33] – they are mostly active in solar generation, as the latter yield comparatively higher returns.

Support mechanisms

The German support system has played an essential role in the development of the German RE market and contributed to its highly diversified actor structure in power generation [12, 32, 7]. Both RE development and small actors have been favored by stable instruments since 1991. Another essential step was the enactment of the Renewable Sources Act (German:

[67] Bolinger [12] cites a figure of three quarters.

Erneuerbare-Energien-Gesetz, EEG) in 2000, which granted RE power plants fixed tariffs combined with priority feed-in. This considerably reduced market risks and guaranteed investment security. Loans at preferential conditions and associated refinancing possibilities by Deutsche Ausgleichsbank, now Kreditanstalt für Wiederaufbau (KfW), constituted an additional favorable factor and helped develop a stable and broad base within the banking sector, especially also through local banks in coalitions with other local actors.

Since 2012, RE plant owners have had the possibility to directly market their electricity and receive the difference between fixed tariff and average exchange price – the so-called “market premium” – from grid operators. This FiP system has been compulsory since the 2014 amendment of the EEG. Due to transaction costs and economies of scale with a resulting minimum size of the portfolio needed, it is difficult for small actors to enter the electricity sales market, which is dominated by few actors with large market shares [34].

Planning policies

We highlight two aspects of the planning procedures. First, Germany has planning procedures somehow making wind energy projects calculable despite prevailing risks linked to environmental assessments and to the pressure of anti-wind groups. Second, there is widespread support for the idea of community ownership at the local level despite the incapacity of municipalities to legally enforce it.

The planning phase in Germany usually takes three to five years for wind energy projects. For this phase, risk capital is needed which is usually available in energy cooperatives only at a very limited scale. Yet, there have been several solutions developed in praxis involving either supporting structures such as joint ventures of smaller actors like energy cooperatives or the involvement of third parties like developers or utilities [35]. Priority and suitability areas for wind power plants are designated by local authorities and differ in restrictiveness between regions or even within a region (interviews 14-17). Similar differences can be observed with regard to the increasingly well organized “anti-wind” movement which interacts with local authorities (interview 18), but seems to be less strong in some areas with high penetration of community wind (interview 21). In general, the problem of cooperative wind energy projects seems to be not so much with planning procedures, but rather with securing the acquisition of land tenure [35] and–at least until recently–with investor protection legislation [36]. “The problem is to acquire the properties at the beginning, and the land owners are so greedy and the external developers […] offer such high rents […] But they offer 8-12% at the beginning, so that a community initiative does not get hold of the properties” (interview 21).

Local regulatory and planning authorities in some regions also try to actively promote community ownership (interviews 13, 14) because of the supposed positive effects on acceptance, even if this is contested or relativized by some interviewees (interviews 18, 19).

Attitudes towards the cooperative model

Modern cooperatives have a long tradition in Germany. In some areas, however, there have been negative experiences with rural cooperatives, due to prevailing skepticism about the cooperative model. Cooperatives have been regarded as “old-fashioned” and knowledge of the legal form declined, at least until the marketing campaigns led by cooperative associations in connection with the 2006 amendment of the Cooperative Societies Act [38].

The rise of the new energy cooperative model coincides with the financial crisis and a search for new economic models. In this context, the cooperative model as a democratic legal form has been considered to be the ideal legal base for this movement. The higher share of wind cooperatives in southern Germany compared with the northern part may at least partly be explained by the coincidental financial crisis and development of wind energy in Southern Germany – despite prevailing tax advantages for the KG model (interview 21).

Two regions known for a traditionally strong cooperative movement, namely Weser-Ems and Baden-Württemberg, stand out among clusters of developing energy cooperatives. A similarly conducive institutional environment seems to exist in Frankonia (the northern part of the federal state of Bavaria). Energy cooperatives are less developed in the Eastern part of Germany, owing to the socialist era's possibly negative legacy as well as to a financially worse-off population (interview 21).

Local energy activism

From the end of the 1980s and the beginning of the 1990s, Germany has had a strong anti-nuclear movement as part of the broader environmental movement which supported the development and deployment of RE technologies [39]. This activism within advocacy coalitions seems to play a role in many bottom-up initiatives including such energy cooperatives. Yet, such legal forms differ despite the essential closeness of the movement to the cooperative idea, as the distribution of the limited partnership model in Northern Germany shows [39]. Nor can the strength of the anti-nuclear movement explain the differing distribution of energy cooperatives across Germany. These are not necessarily located in the centers of the anti-nuclear movement. The environmental movement in East Germany, which today has fewer energy cooperatives, also articulated critique against nuclear power at about the same time as in West Germany [40].

Moreover, it seems that there is a mixture of motivations behind joint investments in wind power. Profitability expectations have been playing a higher role in Germany than elsewhere [12, 32]. Advocacy coalitions in wind power have reached beyond the anti-nuclear movement and included interested engineers, farmers and other small firms. Along with a process of professionalization, stronger competition over sites, and higher rent expectations by landowners, this stronger profit-orientation may also hinder the development of cooperatives in some areas (interview 21).

3.4.3 Belgium

Background

Electricity generation in Belgium is still clearly dominated by Electrabel, the incumbent company and former state monopoly. A similar situation prevails on the electricity supply market. In Wallonia, there are 19 RE cooperatives (9 of which are already active) and 6 local citizen associations, i.e., organizations supposed to be upgraded to cooperatives in the future. In Flanders, there are 5 RE cooperatives and 3 local citizen associations. This, for the country as a whole, gives a total of 23 RE cooperatives and 11 local citizen organizations. They are all active in wind, although some develop other technologies as well. Walloon cooperatives represent 4.6% of wind power installed capacity [6], while the two largest Flemish cooperatives represent about 4% of total wind power installed capacity in Flanders. Most initiatives are volunteer-based. These figures suggest that the cooperative energy sector is still marginal. The case of Belgium is interesting, though, because these cooperatives count pioneers, such as Ecopower which is one of the largest cooperatives in Europe in terms of membership.

Support mechanisms

Electricity from RE sources is given priority in both connection to and use of the grid. In addition, it is promoted mainly through a quota system based on the trade of certificates. In general, RE is a regional matter; only offshore wind power and hydro power are governed by national regulations. Therefore different frameworks exist in the country to support the development of RE sources, but the general mechanism of green certificates is common to all regions. According to the Social Economic Council of Flanders, the green certificate system favors incumbent, large scale energy producers to the detriment of new and more participatory initiatives [41]. Existing, large electricity producers and suppliers have an advantage over new players because they can easily develop cheap RE production by burning biomass in existing coal plants. Getting a permit for a new biomass power plant or wind turbines is far more difficult. This tendency of green certificates to favor incumbent actors was highlighted by different practitioners: “Green certificates have been implemented to encourage green energy projects. But again, these big consulting firms quickly analyzed the situation, and Electrabel converted the Awires [coal] plant to burn pellets… […] green certificates had been invented to oblige big companies to change their ground, but they continue exactly the same way” (interview 26). In recent years, the green certificate systems have undergone deep changes, both in Flanders and in Wallonia, which resulted in a steep decrease in the value of certificates. These changes have had important consequences for RE producers, including cooperatives, whose income declined steadily (interviews 26-28, 33, 34).

To be able to compete on the supply market, 6 wind cooperatives in Wallonia in 2013 jointly created a supply company, named Cociter. This is constituted as a cooperative and purchases the wind power generated by its members. By doing so, cooperatives benefit from economies of scale and reduce transaction costs because obtaining a supplier license requires to fulfill various economic and technical conditions.

Planning policies

The Belgian institutional context is not particularly conducive to cooperative initiatives. In Flanders, for instance, Pepermans and Loots [42] note that wind power has been developed following a top-down fashion, while bottom-up emergence is an exception. One problem emphasized by several interviewees is the "first-come, first-served" system prevailing in wind siting processes in both regions. This means that authorities address the permit requests in chronological order. This policy, combined with the scarcity of suitable sites, the increasing number of wind developers and the zoning policies of the competent authorities, have created a highly competitive environment and encouraged a "wind rush" on the available locations. In this context, cooperatives lack the time and resources to act as fast as large-scale wind power producers [42]. Since 2011, less new wind projects have been realized, especially in Wallonia, due to the increasing number of juridical appeals against wind power projects. To counter this trend, new regulation adopted in 2013 by the Walloon government makes it compulsory for wind farm developers to open the capital of any new project up to 24.99% for citizen participation and to 24.99% for municipalities' participation [6].

Attitudes towards the cooperative model

With origins going back to the mid-19th century, the cooperative tradition in Belgium is by no means new. However, contrary to what occurred in most other European countries, the essential cooperative principles were forgotten during the creation of the legal identity of cooperatives or, more specifically, "compliance with them was simply considered optional" [43:5]. As a result, two kinds of cooperatives have since co-existed: the ones implementing the cooperative principle; the others not sharing the cooperative ideal but adopting the cooperative status for its convenience. A similar division can be traced concerning RE cooperatives, because different investor-owned power companies, including the Belgian incumbent company, created their own cooperative firms to increase citizen participation in wind power projects. However, a detailed examination of the statutes of these "top-down" initiatives clearly shows that the business purpose of these cooperatives is the acquisition of a cooperative capital to finance RE production plants by granting loans to the companies actually owning and operating the assets.

Hence, cooperative members do not actually co-own wind turbines, which remain the property of these operating companies– generally the parent power companies or one of their subsidiaries. The emergence of these organizations is a challenge for "bottom-up" cooperatives and forces them to emphasize their specificities to acquire legitimacy. In this perspective, "bottom-up" RE cooperatives gathered into a national federation, REScoop Belgium in 2013, which was split into two regional sections the year after. Belgian cooperatives and, notably, Ecopower, have been instrumental in the creation of the Federation at the European level, REScoop.eu.

Local energy activism

Anti-nuclear mobilization in Belgium has remained marginal and failed to convince the public [44]. Still, several cooperative administrators interviewed confirmed that their activity had, at its origin, a link with local protest movements against nuclear waste or nuclear energy. " […] there was a project of nuclear waste repository, people mobilized to reject it and contacted local associations of environmental protection to help them organize conferences to oppose the project [...] we organized a conference about the possibilities of going without nuclear energy […] and one of the solutions that were suggested in the area was wind turbines" (interview 26). Hence, some cooperative initiatives seem to be linked to local anti-nuclear activities, however small.

3.4.4 The UK

Background

The UK is one of the best locations for wind power in the world. Despite this favorable endowment in natural resources, the cooperative energy sector is underdeveloped as compared to Germany or Denmark. In 2011, there were 19 RE cooperatives which wholly owned a generation capacity of 19.6MW and had part ownership in a further 1.22GW of capacity through investment in larger, commercial schemes. Eight organizations were at launch stage and a further 16 were in the process of or planning to undertake feasibility studies [45]. The UK's energy sector is biased toward large scale facilities and corporate ownership. Most energy supply in the UK is concentrated into six large companies, known as the "Big Six": British Gas, EDF, E.On, nPower, Scottish Power and Scottish and Southern Energy. Only 0.3% of the generated electricity does not originate from these utilities. This probably explains the leading role of the UK in offshore wind power generation, since "the nature and scale of offshore wind implies that their development is concentrated in the hands of utilities rather than individuals or communities" [24:545]. The UK has a much smaller capacity of onshore wind power, the ownership of which is also dominated by utilities.

Support mechanisms

In the UK, the generation of electricity from renewable sources has originally been incentivized through Renewable Obligation (RO), a quota system that compels electricity suppliers to prove that a certain proportion of the electricity supplied was generated from renewable sources. Various scholars argue that this system and its predecessor, the “Non Fossil Fuel Obligation”, are responsible for the lack of diversification in terms of scale and ownership structures [12, 13, 24]. A Feed-in tariff scheme was launched in April 2010 and targets RE plants with a capacity of up to 5MW. It aims at protecting new scales and ownership schemes from the more competitive environment created by the RO, which had led to few large actors. In his study on the roles of the FiT in community energy development, Nolden [24] however notes that, while the FiT presents positive effects for community-led development, such as a lower dependence on grants, this isolated measure is unlikely to modify the dominant policy framework centered on large-scale developments. This is confirmed by several interviewees. For instance, one expert states: “it still does not really fit the system […] there is strong political support for [community energy], from all parties, but it’s not changing the rules of the system, which is still very much designed for these big players” (interviews 36).

The UK has developed an ambiguous position toward cooperative energy. On the one hand, it has actively sought, in recent years, to promote community-based actions in favor of renewable energy, through several policy initiatives, such as the Community and Renewable Energy Scheme in Scotland or the Assembly's Community Scale Renewable Energy Programme in Wales. In January 2014, the Department of Energy and Climate Change (DECC) launched the Community Energy Strategy, which aims at creating a suitable environment for community-led initiatives to grow and support them to produce, reduce, manage and purchase energy [46]. Practical measures include a £15m Rural Community Energy Fund (RCEF), which was jointly established by the Department for Environment, Food and Rural Affairs (Defra) and the DECC to support rural communities in England to develop RE projects. A similar £10m fund, the Urban Community Energy Fund (UCEF), was created for urban areas.

On the other hand, in the summer 2014, Her Majesty’s Treasury announced that two major incentives to investors currently available to RE projects − the Enterprise Investment Scheme (EIS) and Seed EIS (SEIS) tax relief − would be removed from projects qualifying for the Feed-in Tariff, RO and renewable heat incentive (RHI). SEIS allows a taxpayer who has invested in an eligible scheme to claim back up to 50% of his investment in tax relief. This scheme has been used by some community energy schemes to offer considerably higher returns overall to investors. A different relief scheme will be available, but not for companies registered as co-operatives.

Planning policies

There has been consistent evidence that planning procedures in the UK represent a considerable burden for onshore wind power development as compared to other countries, both in terms of planning delays and high planning application failure rates [14, 47, 48]. In addition, the planning requirements in terms of imposed delays and negotiation costs are disproportionately demanding for small-scale projects as compared to large-scale developments [49].
As regards measures favoring shared ownership, according to Pollitt [50: 38], "there has been an unwillingness to actively involve communities in co-ownership of onshore wind developments, possibly because of the dominance of large power companies in the UK within the wind power sector and the high transaction costs of such engagement". However, authorities seem to be willing to change this situation. With the publication of the Community Energy Strategy, the Secretary of State for Energy and Climate Change asked the renewables industry and the community energy sector to work together to establish a voluntary Framework to guide shared ownership of RE. A taskforce was established in 2014 to develop such framework and published its final Shared Ownership Framework [51]. So far, however, the initiative is still embryonic and dissensions exist between community energy groups and the energy industry regarding the percentage that developers should offer (interview 40).

Attitudes towards the cooperative model

A key reference point in the first wave of cooperative development is the Rochdale Society of Equitable Pioneers, which was founded in 1844 north of Manchester by a group of weavers. Bolinger [12: 50], however, notes, that despite this pioneering effort, "the use of cooperatives has not permeated UK society to the same degree as other European countries such as Denmark and Sweden". The UK does not have a specific cooperative law, so almost any legal business form can be structured along cooperative principles. So far, though, RE cooperatives have mainly been formed as industrial and provident societies (IPS). An IPS is an organization that conducts an economic activity either as a "bona fide" cooperative (BFC) or a "society for the benefit of the community" (Bencom). IPS are registered under the Co-operative and Community Benefit Societies Act 2014 and are administered by the Financial Conduct Authority (FCA). The latter institution seems skeptical about the cooperative model in the field of energy. In 2014, the FCA blocked a number of RE cooperative applications on the grounds that members would not participate enough in these organizations. Indeed, FCA rules require a BFC to show participation which it lists as "buying from or selling to the society", "using the services or amenities provided by it" and "supplying services to carry out its business" [52]. Directly supplying electricity from a wind turbine to members would be the most natural way for RE cooperatives to establish such a commercial participation. Yet, UK regulation is such that RE cooperatives are too small to apply for supplier licenses. According to community energy activists

Tab. 10: Synthetic table

	Germany	Denmark	The UK	Belgium
Support mechanisms	**1991:** first law that allowed for the feed-in of RES. **2000:**Renewable Sources Act. Objective: create more stable investment conditions. **2014:** Replacement of the FiT by a FiP and obligation to market electricity directly.	**Before 1999**: low-risk investment conditions due to tax exemptions, fixed FiTs **2003**: establishment of FiP and obligation to market electricity directly to wholesale market as major obstacles to the creation of new cooperatives. **Since 2009**: increase of premiums, improved investment conditions and emergence of new cooperatives	Main support mechanism: quota system. **2010**: introduction of a FiT for installations <5MW. Launch of various programs to back up the development of community energy. **2014**: reform of the tax relief schemes. New tax relief scheme not available for cooperatives	Quota system based on trade of certificates: favors incumbent players to the detriment of small-scale challengers. **2011-2012**: saturation of the green certificates market and decrease in income for RE cooperatives.
Planning procedures	Widespread support for community ownership at the local level, even if no specific instruments to legally enforce it. Discussion in some federal states to make participation obligatory.	Ownership restriction of wind turbines until 2000 **1999**: reform of planning conditions and new obstacles for cooperatives due to rise in costs for planning and increasing competition. **2009**: obligation for developers to open capital of new projects for citizen participation.	Planning requirements disproportionately demanding for small-scale projects as compared to large-scale developments. Ongoing discussions to implement a voluntary framework for shared ownership of RE.	Unfavorable planning conditions for small-scale and participatory projects: "wind rush" due to first-come, first-served system. **2013**: in Wallonia, obligation for developers to open capital of new projects for citizen and municipalities participation.
Attitudes toward the cooperative model	Long cooperative tradition, but negative experiences with rural cooperatives in some areas, which partly explain the choice of other community energy models.	Long historical cooperative tradition, including in the electricity sector.	Cooperative movement comparatively weaker, despite pioneering initiatives. Skepticism of the FCA with respect to the cooperative model in the energy sector.	Long historical cooperative tradition, but co-existence of "true" and "false" cooperatives Creation of "top-down" cooperatives by investor-owned companies.

	Germany	Denmark	The UK	Belgium
Local energy activism	Strong anti-nuclear movement, but cannot explain regional differences. Higher role played by Profitability expectations.	Strong and successful anti-nuclear movement which boosted the search for alternatives. Tradition of local added value through wind projects.	Weak anti-nuclear movement. Strong landscape and nature protection activism.	Weak anti-nuclear movement, but some cooperatives rooted in local protests against nuclear wastes.

Source: constructed by authors.

(interviews 37, 39), the refusal of the FCA to register RE cooperatives as BFC could be harmful to the sector, because this legal form is better suited to this model than the Bencom legal form. This is because "BFCs can pay a co-operative dividend which some see as central to the success of a community consumer model, whereas the treatment of capital and profits in Bencoms is currently a very contentious issue" [53: 3].

Local energy activism

Historically, grassroots initiatives based on local energy generation as well as a militant anti-nuclear movement were virtually non-existent in the UK [22]. Rather, a strong tradition of landscape and nature protection activism has inspired opposition to wind projects [13]. This lack of local energy activism may offer an additional explanation for the low number of wind power installations based on local ownership.
Table 10 presents a synthetic view of the comparative analysis.

3.5 Discussion: a double movement

The results presented above can be summarized as constituting a double movement.[68] The two sides of this movement are explained hereafter.

3.5.1 The first side of the movement: the tendency towards a more hostile environment

As the analysis of support instruments and planning policies shows, the first side of the movement is the tendency in the four countries studied towards a more hostile environment for cooperative initiatives; these are put at a disadvantage compared to traditional developers. In Denmark, tax incentives and low-risk investment conditions created by fixed FiTs, combined with ownership restrictions prior to 1999, contributed to large scale cooperative ownership of wind power until 2000. Since 2003, price volatility under the FiP design and a low premium have been major obstacles for the occurrence of new cooperatives and the survival of existing ones. As such, the Danish institutional context has become more similar to experiences in Belgium and the UK, where market-dependent systems have been in place for many years. The UK seeks to secure the development of community-based initiatives with the introduction of a FiT for small installations, but this measure appears to be very isolated in a context which still favors large-scale players. Germany is experiencing a policy evolution similar to Denmark, but with a delay of five to ten years [54]. The fixed FiT regime was abandoned in 2014 in favor of a more market-dependent FiP scheme, resulting in a slightly higher exposure to volatile electricity market prices and the responsibility of producers to market electricity on wholesale markets. In addition, one German federal state is following Denmark´s example to legally enforce the financial participation of citizens in new wind power projects [37]. A similar legislation

[68] The expression is borrowed from Karl Polanyi's classical book "The Great Transformation".

exists in Belgium but the effectiveness of these instruments in creating new cooperatives or strengthening acceptance has been questioned [6; 30].

This increasingly hostile environment is also shaped, to some extent, by the evolution of technological Resource Systems characteristics, such as the size of wind turbines. The growing size of wind turbines in the countries studied has had two effects. First, planning regulations have become more stringent and posed additional regulatory constraints on cooperative initiatives due to higher costs and increased complexity for obtaining permits. These changes in planning procedures in Denmark and Belgium have led to the entrance of more professional and commercial developers, which have discouraged cooperative initiatives. In Germany, this tendency to commercialization of projects is even older and stronger, as the limited partnership model has typically been developed in collaboration with more professional and commercial developers [54]. Second, larger turbines have required higher capital investments. This has also encouraged the arrival of commercial actors because the latter have had advantages due to relatively higher liquidity combined with the capacity to make fast decisions. The arrival of these actors has created more competition for cooperatives to obtain sites for wind power development.

However, our analysis also reveals that these tendencies are not unalterable facts. According to the institutionalist approach adopted in this article, markets are themselves complex institutional arrangements. We also refer to Polanyi [55], who takes the view that the economic sphere and market exchanges are embedded in their social, political, and cultural contexts. Accordingly, conceiving of economic activities regardless of their context is ideological. The set of Governance Systems variables – support mechanisms and planning policies – adopted by a country at some point in time is therefore the outcome of interactions between political and grassroots actors in yet other action situations, located at deeper levels of decision-making. This outcome reflects these actors' energy policy priorities, and partly also the political equilibrium reached at that moment. The case of Denmark illustrates this particularly well. Until 2001, the Danish parliament was governed by a coalition of parties favorable to wind power and renewable energy. This situation, combined with the influence of strong grassroots movements and wind power advocacy groups, led to the “cooperative-friendly” policies during the 1980s and 1990s. In 2001, when a liberal-conservative party came to power, it embraced a neo-liberal approach to energy policy and cut all support for RE sources, which had to stand on their own in the free market.

It appears, therefore, that the development of wind energy cooperatives is ultimately related to issues of power. Yet the framework proposed by Ostrom and her colleagues seems to inadequately acknowledge the role of power and interests in the crafting of institutions. Scholars studying these issues have generally focused on the “fitness” of institutions to the characteristics of the SES. Yet, “besides fitting the SES they govern, institutions also need to be supported by a favourable political, economic and discursive context" [56: 158]. Institutions not only result from the interactions of (boundedly) rational individuals steered by monetary or non-monetary incentives; they are also shaped to a large extent by power distribution [57].

3.5.2 The second side of the movement: strategic reactions of cooperatives

The analysis revealed that agency, understood here as the characteristics of actors and their strategic interactions within action situations, also plays an important role. Besides the importance of actors in the design of Governance Systems variables and the roles played by social norms and culture highlighted above, this is clearly reflected in coordinated actions undertaken by cooperatives in the different countries studied. In Denmark, wind power cooperatives and individual owners of wind turbines were able to react strategically to changes of support mechanisms by pooling their resources and setting up the trading company Vindenergi Danmark to take care of electricity sales to the wholesale market. In Southern Belgium, a similar company, Cociter, was created to purchase and directly supply to final consumers the energy produced by cooperatives. The case of Bürgerwerke eG offers a similar example in Germany.[69]

Coordinated actions constitute the second side of the double movement. They reduce transaction costs, increase revenues from electricity sales for producers. By pooling their resources and benefitting from economies of scale from an increased wind project portfolio, cooperatives effectively increase the economic feasibility and investment security for wind projects. Hence, such coordinated actions can be regarded as strategic reactions to new regulations and increasingly unfavorable environments. However, there is a second interpretation of the emergence of coordinated actions, which relates to the issue of power relationships mentioned above. Coordinated actions are not simply about pooling resources and increasing the probability of the economic survival of cooperatives. They are also a way of enhancing their bargaining power in the face of incumbent energy actors. Indeed, the latter are smaller in number, have relatively homogeneous interests and are able to coordinate their substantial resources to resist any change that threatens their interests. In contrast, cooperatives are scattered, generally focus on very local issues and have limited resources and power. Thus, coordinated actions may also be seen as an attempt to reach a more balanced distribution of political power in energy markets, which is still very biased in favor of large-scale players. The creation of federations of RE cooperatives at national and European levels can typically be interpreted in this way. Finally, it is interesting to note that, just as the cost of creating energy cooperatives is higher or lower depending on contextual factors, the formation of coordinated actions, as a

[69] Bürgerwerke eG is a fast growing joint venture of currently 28 community energy companies (27 cooperatives and one civil law association) selling electricity from community energy power plants plus hydropower. The overall philosophy is to take over all tasks in this area which cannot be executed by a single local community energy firm.

collective-action problem, also entails costs which are affected by institutional and actors variables.

This finding is important for subsequent analysis of decentralized energy systems. While decentralization of governance in energy systems is sometimes conceived as a panacea, the emergence of coordinated actions among cooperative initiatives calls for a more polycentric approach, according to which “various scales need to be taken into account when designing regulatory answers and setting up governance arrangements” [1: 136]. In this perspective, although decentralized energy systems obviously exhibit a strong local component, inter-organizational coordinated actions highlight the importance of the ability of local initiatives to transcend their local experience in order to form networks at higher levels and articulate their interests to national and European strategies.

3.6 Conclusion

This article has sought to explain the differences in the degree of development of the wind power cooperative sector in four European countries. We have focused on four explanatory factors, namely support instruments for renewables, planning policies, attitudes toward the cooperative model and local energy activism. Relying on some elements of the Social-Ecological System Framework, we have emphasized the systemic interactions between these factors and the multi-level features of energy systems. Our results can be summarized in what we have called a “double movement”. In this perspective, our results highlight the existence of coordinated actions among cooperatives. We have shown that these coordinated actions can be interpreted in two ways, which respectively emphasize the economic and political contents of these initiatives. On the one hand, they represent strategic reactions of small participatory organizations to adapt to policy evolutions and increasing competition on power markets. On the other hand, they also constitute a way of establishing networks in order to increase their power in energy markets. In this vision, cooperatives not only adapt to externally imposed regulatory changes but also seek to actively shape these changes toward conditions more in line with their interests.

This study suggests various avenues for future research. First, at the theoretical level, energy systems should be decomposed into multiple action situations connected sequentially or simultaneously. We have emphasized at various places that the development of renewable energy cooperatives is a polycentric process, which involves the interaction of actors at different levels of decision-making. The framework developed by Ostrom and her colleagues is particularly helpful in this endeavor. In addition to taking into account physical, socio-cultural and institutional characteristics in the analysis of collective action, Ostrom emphasizes the need for citizens’ self-organization and participation in the process of crafting resilient, just and democratic institutions. If an elite or a dominant group establishes rules without the consent of local communities, they are not likely to serve the common good. This strongly resonates with the participative and inclusive features of renewable energy cooperatives. Moreover, by putting institutions at the center of her approach, Ostrom insists on the necessity of a deep metamorphosis of our core economic institutions. Community-based initiatives will not be able to achieve much unless their development is accompanied by deeper changes in the rules of the game. For these reasons, it is argued here that this framework holds great promises for the analysis of the decentralization of the governance in energy systems. Another implication would be to assess more accurately the role of power relationships, both theoretically, within the SES framework, and empirically, in the development of wind energy cooperatives. Third, coordinated actions among cooperatives would deserve further analysis of their functions, the way they are created and the actors they involve. For instance, they likely differ in the extent to which they play a more economic or political function. Some may be more oriented towards economic functions while others primarily exert a political role. It would be interesting to study these distinctions and how they relate to other factors.

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4 *Finance and justice in low-carbon energy transitions*

Abstract

Up to $61trillion of power systems investment is needed to fulfil the Paris Agreement. The mobilisation of so much capital is a huge challenge. As such, energy policy is changing to meet the needs of commercial finance. However, very little has been done to question the justice implications of this capital mobilisation, and what alternatives there are to commercially-oriented finance for low carbon energy systems. This paper uses a comparative analysis of two developed economies to explore how 'alternative' forms of finance operate in each nation's energy investment landscape. We find alternative finance is often set in opposition to commercial capital. Alternative finance in both nations is motivated by financial justice outcomes that are poorly understood in current energy policy. Our findings suggest that 6 principles are key to 'just' energy finance: affordability, good governance, due process, intra-generational equity, spatial equity, and financial resilience. Energy policy that seeks to mobilise capital, should take account of all six principles.

Keywords: Energy Investment; Alternative Finance; Energy Justice

4.1 Introduction

The scale of the low-carbon energy challenge is illustrated by global investment costs. The total investment needed for the global energy system, is up to $61 trillion if the sector is to decarbonise rapidly enough to limit planetary warming to less than 2 degrees Celsius; this requires a tripling of 2015 investment levels [1]. These sums clearly surpass state funding possibilities [2], and will need to enrol diverse forms of private capital. This research identifies the justice implications of these forms of capital, by analysing the finance landscape of two nations. The aim is to explore how finance shapes the justice outcomes of energy transitions, and how energy policy could shape these justice outcomes.

In this paper we are referring to ‘capital’ in its money form, intended to generate a surplus through investment and transformation into fixed assets seeking a return. For finance, or ‘forms’ of finance, we mean the vehicles through which money capital is transformed into fixed assets. This can be as debt or equity; applied via loans, shares, bonds etc. ‘Institutions’ of finance can here be taken as the types of organisations orchestrating this activity. These could be pension, insurance and wealth funds (also referred to as institutional investment), commercial banks, development banks, forms of crowdfunding (i.e. peer to business equity), venture capital etc. We also must be clear on how we are defining ‘justice’. Here we use Sovacool *et al.’s* [3] eight principles of energy justice; availability, affordability, due process, transparency, sustainability, inter-generational equity, intra-generational equity, and responsibility. These principles are the indicators of ‘just’ energy futures which we apply to energy finance using two questions: 1, what are the implications of the current finance system on just energy transitions? And 2, what principles of justice could energy finance satisfy?

Prior research has shown that states now design energy policy to mobilise new institutions of finance. They target new sources of capital for energy transitions [4-5]. Taking account of the justice implications of this capital mobilisation in the energy sector is critical, because in other sectors, agnostic assumptions about the influence of capital have led to poor justice outcomes [6]. Recent analyses of the financialisation phenomenon in energy, water, and rail, have exposed how the needs of international financial institutions, are increasingly prioritised over the continued operation, development, and maintenance of these systems[70]. Financialisation results in private returns to investors being prioritised above possible social and environmental benefits [7,8]. Failures in this respect endanger social acceptance and legitimacy [9].

Energy system investment of up to $61 trillion by 2060 implies an urgent need to mobilise far greater and more diverse forms of capital, yet little has been done to explore how energy finance can secure both low-carbon transitions, and avoid poor justice outcomes and social damage. To address this gap, our research investigates the justice dimensions of different forms of energy finance, using eight principles of energy justice [3].

The paper is structured as follows. Section 2 explores existing research on energy finance. We then explore how 'alternative' finance broadly defined, is growing substantially across various markets. We use Hall and Soskice's varieties of capitalism work to analyse the background conditions giving rise to particular forms of financial actors in each nation. Section 3 summarises the methods used. Section 4 presents the UK and German case summaries, detailing the justice implications of different energy finance trends. Section 5 analyses the case data to propose 6 principles of just energy finance.

4.2 Energy finance

4.2.1 Accelerating low-carbon energy investment

There is a clear gap between the volume of capital needed to enable low-carbon transitions, and the current level of investment [1]. To meet climate change commitments, capital allocation to low-carbon investments must accelerate [2]. The majority of research by energy finance scholars focusses upon this acceleration falls into three fields: (1) state-facing policy prescription, (2) investor-facing risk perception and de-risking research, and (3) sociology and political economy analyses of finance in energy transitions. Each field has different theoretical starting points and economic assumptions about the behaviour of energy investors and therefore how and where capital is allocated [10,11].

[70] The process by which financial institutions and markets grow in importance, size and influence within a national economy. The Financialisation of basic urban and infrastructural systems including housing, water, and other systems is explored by the FESSUD programme (http://fessud.eu/)

Direct policy advice to nation states on low carbon energy investment demonstrates the importance of investor heterogeneity in the innovation chain [12-14]. The research on policy measures has focussed on better Research, Development, and Demonstration (RD&D) partnerships, advocacy coalitions with financiers, mission driven public investments, demand stimulus[71], and (RD&D) tax system reform [15, p. 531].

The second field presents the risk-return profile of investments as the key enabler for private finance [16,17] and addresses two main problems. The first deals with investor risk perception [18,19], behavioural responses to risk across investor types [20,21], and capacity to assess risk across different energy assets using various tools [22,23]. The second strand investigates either specific de-risking mechanisms such as state backed guarantees, loan concessions, or grants [24,25], subsidy and energy policy approaches to risk management using deeper market reforms [5], and investor mobilisation to challenge state decisions on subsidy reform, in order to establish a precedent for ex-post subsidy risk management through arbitration [26].

In both policy-centred and de-risking fields, the needs of finance capital and investors are foregrounded. There is an implicit (or sometimes explicit) argument that the needs of finance capital must shape energy policy, if it is to achieve the desired levels of investment at least cost. The basic premise being that, a lower cost of capital for low-carbon generation will translate into more affordable low carbon energy for households and business [27]. Both fields have substantially improved our understanding of the needs of private capital and how energy policy can meet those needs. However, energy finance research so far has had very little to say about the ethical or justice dimensions of energy finance. It adopts either a 'more is better' stance, or works on matchmaking between risk profiles, investor preferences and fund structures.

The final category of existing research, the sociology and political economy of energy finance, *has* started to question whether different forms of finance and sources of capital can have wider distributional impacts than the final cost of low-carbon energy. For example, Baker claims that the interests of international finance capital in the South African energy transition subordinate socio-economic and environmental developments [28]. There is also growing understanding that energy finance is part of much wider systems of accumulation that have far reaching consequences across labour, gender, and nature/space relations [29]. This connects with literatures on financialisation, which show how various systems are subject to "the increasing dominance of financial actors, markets, practices, measurements, and narratives" [30, p. 3], with detrimental effects on wider business and societal objectives in both developed and developing contexts [31].

The investment needs of energy transitions are increasingly used as an enabler of financialisation of energy policy [5]. Polzin et al. [32] argue that a financial monoculture has emerged,

[71] Demand stimulus here refers to investment demand and not energy demand. It is used to show how different subsidy schemes affect investors 'demand' for energy projects in their portfolios.

which is not resilient to crises, and that designing energy policy to serve this monoculture only further exposes energy transitions to boom and bust investment cycles in the wider financialised economy. The nexus of work on sociology and political economy of energy finance deals with values, motivations, systemic effects and distributional outcomes of financialisation and explores what alternatives there might be [4,29,33,34]. However this work has hitherto lacked a coherent framework of analysis to integrate these concerns. In what follows we explore whether energy justice principles can help generate this framework. The challenge is to find a series of principles through which investigations of the sociology and political economy of finance, can make meaningful qualitative judgements about something more than the effect of various policies or tools on the cost of capital.

4.2.2 Energy justice and energy finance, introducing the 8 principles

Energy justice can be described as “a global energy system that fairly disseminates both the benefits and costs of energy services, and one that has representative and impartial energy decision-making” [9, p.436]. Three forms of justice are considered; distributional - the distribution of environmental benefits and ills and their associated responsibilities; procedural – access to decision-making procedures that ensure equitable outcomes; and recognition – the fair representation of individuals, who are free from physical threats, and offered complete and equal political rights [35,36]. Sovacool et al. [37] add cosmopolitan justice as a further form, which argues that all human beings have equal moral worth and are deserving of energy justice.

Energy justice can be a conceptual tool, an analytical tool or a decision making tool [3]. The three (or four) forms are appropriate for a conceptual discussion. However, they provide insufficient detail for supporting specific decisions, for example; how could the finance sector be shaped to enable just energy transitions? Therefore further work [37] developed an energy justice framework based on eight principles that can be applied to real-world problems: (1) availability, (2) affordability, (3) due process, (4) transparency and accountability, (5) sustainability, (6) **inter-**generational equity, (7) **intra-**generational equity, and (8) responsibility.

Energy justice has been successful in the conceptual and academic spheres, but Heffron et al. call for a more direct link with policy [38]. Recent work on energy justice has explored how these principles can be embedded in business model innovations for energy [39], showed how the challenge of affordability and fuel poverty cuts across all tenets of energy justice [40], and highlighted the impact that the concept of energy justice can have on policy decisions [38]. It has taken up the "spatial turn" in energy research [41,42] and discussed geographical dimensions of inequality and inequity under the label of "spatial justice" [43,44]. In this attempt, it went beyond mere geographical location, and analysed the social construction of spaces and its justice implications – e.g. unjust *distribution* and *misrecognition* of certain locations [45], or negative impacts of large-scale solar energy finance via disposition of land rights [46].

However, as yet the mobilisation of capital, be it state, commercial, or citizen finance, has received no systematic analysis from a justice perspective. Doing so now allows us to connect our understanding of energy finance research, and its turn toward the broader financialisation phenomenon, with the literatures on energy justice. To do so we explore two further fields before returning to our research questions. First, what alternatives there are to strictly financialised sources of capital for energy transitions i.e. 'alternative finance'; and second, how we can usefully conceptualise the various political economies of finance that differ across nations.

4.2.3 Alternative finance

Beyond mainstream commercial lending and equity relationships, structured almost exclusively by the risk return calculus identified above, there is an 'alternative finance' sector which seeks multiple outcomes [47]. The capacity of alternative financial innovations to deliver justice outcomes remains under-researched. This is curious given the current growth of alternative finance, both in Europe and around the world, with significant markets maturing in the Americas [48][72], Africa and the Middle East [49][73], China and the Asia-Pacific [50][74] as well as those across Europe [51][75] and within the UK [52].

'Alternative finance' includes those financial instruments that emerge outside of the traditional channels of capital raising and financial intermediation [53,54]. Online alternative finance[76] is now: supplying credit to small and medium enterprises (SMEs), raising venture capital to start-ups, funding the creative industries, and creating new ways for individuals and institutions to choose how and to whom money is lent and invested. This definition includes those 'mission oriented' platforms that match capital to social and environmental causes [50,55]. The sector strives to facilitate productive investment in the 'real economy', disintermediating elite banking institutions and so drawing capital away from the financial speculations that played a devastating role in the global financial crisis [56].

Alternative finance companies typically operate online and share a similar business model, in which an individual or collective actor providing money ("funder") passes it to another individual or collective actor seeking money ("fundraiser") through a website or smartphone app ("platform") that is managed by the company that then takes a percentage commission on the funds

72 Total market volume across the USA, Canada, Latin America and the Caribbean of US$35.2 billion
73 Total of US$242m in online alternative finance funds raised across both Africa and the Middle East in 2015
74 China is the world's largest online alternative finance market by transaction volume, registering RMB 638.79 billion in 2015 (circa US$101.7 billion allowing for currency fluctuations)
75 In Europe, the total online alternative finance market grew by 92% in 2015 to reach €5,431m (circa US$6,467m allowing for currency fluctuations) with German market valued at €249m (circa US$296m) in the same year
76 In this definition of online alternative finance, we follow Zhang et al. [50] in understanding the provision of finance to individuals and businesses through alternative channels via online marketplaces outside of the banking system. This definition therefore excludes activities such as peer-to-peer insurance, online money market funds or third-party payments.

raised [56]. These platforms facilitate all manner of financial transaction: from “peer to peer” (P2P) money lending, either to consumers (P2C) or to businesses (P2B), to selling shares (“equity crowdfunding”), or simple gifted money in ‘reward’ or ‘donation’ crowdfunding.

The global alternative finance sector uses these online channels to move money into a wide range of activities, including general business finance, property development, community projects, and renewable energy infrastructure. Indeed, the market connections between alternative finance and alternative energy systems are very strong, as new forms of finance, with more or less explicit social and environmental justice aims, provide for renewable energy schemes that could otherwise not raise capital through traditional routes [4,57]. Vasileiadou et al. ([58] p.150) argue: “*the field of sustainability transitions can benefit from turning to the financial mechanisms that can facilitate the spread of renewable energy*”. Given the claims on socio-environmental outcomes and economic development often made by the alternative finance sector [59,60] our research targets these actors to explore the justice implications of financing low carbon transitions via alternative means of raising capital.

4.2.4 Varieties of capitalism

In an UK/Germany comparison it is important to stress that we are not comparing economies with identical financial institutions [61]. Important differences exist between the two cases. Primary amongst these is the character, or ‘variety’, of capitalism present within each country. Drawing upon Hall and Soskice (2001) [62], we can state that all variants of capitalism function within market economies, and share some common institutions and practices, but that these operate in very different ways and so deliver a significant variety of outcomes [63].

Hall and Soskice (2001) demonstrate that the circulation of capital in national [capitalist] economies is mediated and shaped by historically specific institutions that in turn shape productivity outcomes across sectors [62]. Utilising the ‘varieties of capitalism’ approach with respect to our chosen case studies, we can state that the UK has a *liberal market economy* (LME) heavily reliant upon competitive markets and with highly developed capital markets motivated by the maximization of share price in the short term. As such, the UK’s ‘neoliberal’ economy is reliant upon the success of its banking and finance sectors with investment typically facilitated by equity or debt instruments traded in liquid securities [4]. Germany, on the other hand, has instead a *coordinated market economy* (CME) with a distinctive set of institutions that appear to be more stable over time, and less reliant than the UK on short term share prices, with banking and finance sectors facilitating long-term investment in companies and infrastructure because of a broader “corporatist industrial structure” [64] and ‘ordoliberal/social democracy’ hybrid [65].

Comparing energy finance in these two cases is thus more complex than might appear. Despite the apparent advantages of its CME structure for enabling longer-term sustainable investment, in Germany public authorities still lack the necessary capital from private institutional investors, who are typically more averse to restraints such as high transaction costs and risk-return-concerns [66]. Indeed, it is for this very reason that Yildiz [66] suggests that alternative financing innovations must be better researched and developed if the wider energy transition is to be successful.

It is partly for these reasons that we stop short of Baumol et al. [67] by not dividing these ‘varieties of capitalism’ into classifications of either “good” or “bad”. Given the varieties of capitalism within which energy finance evolves, we are interested here in how energy finance providers are affecting justice outcomes.

4.2.5 Summary and research question

This section demonstrates that the majority of research on energy finance focusses on policy advice or the risk return calculus. Recent work on the sociology and political economy of finance shows promise in unpicking the ethical, distributional, or justice implications of this capital mobilisation, but has hitherto lacked clear categories of analysis. The 8 principles of energy justice are emerging as an organising concept for broader explorations of energy justice. We explore data on energy finance in two nations and question whether the 8 principles of energy justice are sufficient to investigate the justice outcomes of mobilising large volumes of finance capital. Our question is:

1. What are the implications of the current finance system on just energy transitions?
2. What principles of justice could energy finance satisfy?

4.3 Methods

The research team undertook a synthesis of 64 elite semi structured interviews conducted by the team between 2012 and 2017 across the UK and German energy finance sectors. The interviews were the result of four purposive samples by the authors covering renewable energy finance, alternative finance sector growth, and civil/civic energy sector development.

The UK sample comprised: 10 institutional or utility investors, 17 alternative finance providers or experts, 2 civil servants, and 1 project developer. The German sample comprised 1 alternative finance platform, 8 institutions of public or mutual banking pillars, 1 academic, 2 NGOs, 7 co-operative developers or representatives, 5 private developers or manufacturers, 3 transmission system operators, 1 civil servant, 5 utilities, 1 law firm, and 1 regional public agency. Interviewees were selected with professional knowledge of renewable energy (RE) development and financing in each nation.

The full interview list is available as a supplementary document in [68].

The interviews were re-coded against the 8 principles of energy justice identified by [37] and against emergent justice criteria beyond the 8 principles. The interviews were used to construct comparative case reports [69] which were developed for each nation. The question set was developed iteratively around four sub themes: who participates in energy finance and how, the effect of energy policy on investment attractiveness, the multiple values pursued by different stakeholders, and the justice and equity effects of different financial vehicles. These themes were interpreted for justice outcomes by the authorial team.

4.4 Results

The results section is structured as follows. Sections 4.1 and 4.2 present case study summaries for the UK and Germany which present three things: (1) the institutional context for each nation, (2) the evolution of energy policy and energy finance, and (3) how these factors affect justice outcomes in energy transitions. In Section 4.3 we compare the case studies and reflect on the wider role of finance in energy justice, as described by the 8 principles and introduce two additional aspects of justice that emerge from case study findings.

Supplementary materials 2&3 [70,71] present full case reports from each nation. Readers with a particular interest in the empirical foundations of the case summaries below are referred to the full case reports.

4.4.1 UK case summary

Institutional context

Prior to the 2008 financial crisis, low carbon energy finance in the United Kingdom was predominantly composed of project finance from banks and balance sheet financing by utilities. Post financial crisis, banks required lower ratio of debt to equity which meant that they were less likely to finance renewable energy projects. The reduction of commercial bank lending invited other financial market participants into the energy space, not least institutional investment by insurance, pension and wealth funds.

In parallel there has been a surge in alternative finance with a focus on renewable and local energy. This surge aims to address a broader range of outcomes than financial return. Some of these outcomes relate specifically to the energy system (for example, the focus on 'productive' investment that has benefits for society as well as delivering returns to investors), others relate to the finance system more generally (for example increasing engagement and reducing the control of a small number of large institutions). The United Kingdom is now the largest alternative finance market in the European Union by a considerable margin and generally considered to be the most mature. It has a total online market size of £3.2 billion in 2015 (circa US$4.5 billion allowing for currency fluctuations).

Evolution of energy policy and energy finance

One of the most significant changes to UK energy policy during the study period was the Electricity Market Reform package. One of the principal drivers for this package was the scale of investment in low carbon technologies that was needed to respond to Climate Change Act (2008) targets. Investment needs analysis showed the requirements of the power sector were beyond the capacity of post-crisis utility balance sheets [72]. It was identified that additional sources of finance would be needed to support the necessary transformation of the energy sector, and that new energy policy was required to stimulate this investment in a way that did not affect the price and affordability of energy. Affordability, i.e. keeping costs of capital low in order to reduce final costs of energy, was the primary justice principle identified by the market based UK sample.

Electricity Market Reform and the enabling Energy Act 2013 [73] developed a new subsidy system; feed in tariff type arrangements with contracts for difference (CfDs), designed to crowd in institutional investors (pension, wealth, insurance funds etc) on the basis of easily calculable cash flows, an outcome it largely achieved between 2014 – 2017 [5]. This level of financialisation of energy policy in the UK meant that by 2014 the access to capital problem was being solved via a change in the investor base, away from a simple bank/equity relationship to a more mixed landscape, in which large insurance, pension and wealth funds are targeted as sources of capital, somewhat to the neglect of alternative forms of finance.

Finance and justice outcomes in energy transitions

Reliance on (indeed encouragement of) institutional finance to fill the energy finance shortfall has significant implications for energy justice. Our UK case report shows this form of finance is highly intermediated which makes it very hard to connect funding to finance and therefore trace who is making decisions about investments in energy, what their aims and goals might be, and how these might affect energy system transformation or justice outcomes. It also tends to be very exclusive because of the scale of investment needed. This means that decisions about what to invest in are not transparent, and negative inter-generational equity impacts are experienced because it is impossible to benefit from direct energy investment without holding individual money capital of several hundred thousand pounds. The case data shows UK energy policy has attended almost exclusively to the affordability principle of energy justice, elevating the minimum possible cost of capital above other justice concerns. However, beyond this, the UK case report [70] shows market based and institutional finance is poorly aligned with other justice outcomes.

By contrast, alternative finance is currently more transparent; the link between money capital and the projects it supports is made explicit, and transparency is a key selling point for investors and projects alike. This transparency criterion fulfilled by alternative finance platforms is the first and strongest of the 8 original principles of energy justice [37]. Alternative finance also has a clear contribution to make to intra-generational equity. This is because of the low capital barriers to entry. For example some UK platforms invite investment from as little as £5, where in market based finance the minimum amount needed to invest directly in schemes can often be over £25,000. These low barriers to entry are often cited by those who use the term 'democratic' finance [56]. This lowering of access thresholds is a key enabler of intra-generational equity as it opens up opportunities to invest in low-carbon transitions in a more direct and meaningful way than any UK financial institution was able to achieve pre-crisis.

A further feature of alternative finance identified in the case data relates to 'due process' specifically regarding those procedures of constructing bid and offer documents that enable engagement and accountability of stakeholders in individual projects. As barriers to investment are low, so are barriers to information around the performance of the asset, predicted revenues, scheme timescales and profits. As such the citizen engagement activities of alternative finance contribute to the justice principles of 'due process'. By offering local residents and medium-low income investors access to information and new ways of investing in low-carbon energy projects, due process indicators such as stakeholder decision-making and participation are enabled. While the lines between due process and transparency are not always clear, the data clearly shows a procedural element of scheme building and stakeholder involvement which goes beyond simple information sharing.

The case data also shows a strong association of the alternative finance sector to financial system resilience. A clear narrative emerged that alternative finance providers see themselves somewhat insulated from the volatility of financial markets. They see alternative finance as contributing to system resilience through building diversity, and standing at a remove from more globally connected flows of capital which they argue are more exposed to systemic crises. Building diversity as a means of resilience would hold to logical argument, particularly in a relatively homogeneous market, but causal links are yet to be proven between the growth of alternative finance and systemic resilience [60].

Our sample identified challenges with scaling up the niche alternative finance market and whether it is possible to retain the same level of transparency and equity when the sector becomes more mature and consolidated. The mission of some alternative finance providers extends to specific sustainability or justice goals, for example, some specialise in renewable energy projects, but this is not universal.

The UK case report shows that the justice outcomes of energy finance are very dependent on the form of finance deployed, which is in turn strongly driven by contemporary energy policy. This case showed energy policy in the UK was explicitly designed to meet the needs of market based finance, largely due to this form of finance being dominant in the UK. However, the alternative finance sector did benefit from energy investment opportunities created by energy policy. The justice principles served by market based finance relate almost exclusively to the cost of capital and its effects on the affordability of energy. Beyond this commercial market based finance has some negative justice outcomes, particularly around transparency and intragenerational equity. The alternative finance sector addresses these principles to some degree by providing low cost opportunities to invest directly in low-carbon energy schemes. The alternative finance sector goes further by necessitating new stakeholder engagement processes which relate to the due process principle. Lastly, the alternative finance sector argues that it contributes to system resilience by diversifying the UK economy away from “too big to fail” [Interview #28] banks and contributing to what the International Monetary Fund (IMF) have called a global public good of financial system stability [74]. Therefore from the UK case, our justice implications from within the 8 principles are:

- Affordability
- Due Process
- Transparency [good governance]
- Intra-generational Equity

And from beyond the 8 principles we add:

- Financial system resilience

4.4.2 Germany case summary

Institutional Context

Germany traditionally has a decentralized, universal bank-based financial system, and banks form a dominant share of energy financing. The banking system includes three types of banks:

- For-profit private banks including four large banks, smaller regional banks and branches of foreign banks;
- The public banking sector, including (a) “Sparkassen”, i.e. municipally-owned savings banks and (b) “Landesbanken”, i.e. banks owned by federal states (“Länder”) and regional savings banks associations, which are less profit-oriented.
- Cooperative banks, including credit cooperatives, the cooperative central bank DZ Bank AG and specialised institutions

Additionally, the state provides low interest refinancing through the national development bank KfW and through Rentenbank, which is the development bank for the agricultural and food sector. Many local banks, i.e. Sparkassen and credit unions, are highly involved in the renewable energy sector due to these favourable refinancing conditions and easily calculable cash flows. A relatively dense branch network and close ties to the local economy, especially SMEs, enabled local banks to build a strong renewable energy credit portfolio.

As has been argued elsewhere [4], this conducive institutional environment led to a co-evolution of citizen renewable energy projects and a socially motivated, small-medium scale bank based financing system. It reduced the financing ‘problem’ to the question of how much equity the projects needed and where to source it from. As a result of a more diversified banking system, there is a much less active alternative finance sector in Germany. While still a niche market, interviewees do see a role for it in case of non-standard types of projects, giving equity like returns to citizen capital and providing a new avenue for financing less bankable projects in new markets such as storage, or aiding more traditional projects in reaching financial close.

Evolution of energy policy and energy finance

The renewable energy transition in Germany emerged from the anti-nuclear movement and small-scale, community or farmer owned projects played a large part from the beginning. A feed-in law was introduced in 1991 to ease negotiations with grid operators and to improve the economic feasibility of projects. In combination with the strong support from the public banking system for investment in small-scale projects[77] this has resulted in a high proportion of investment from local residents and communities. Empirical insight from Germany on ownership structures of existing renewable energy infrastructures (excluding offshore wind, geothermal energy and pumped storage hydro power stations) reveals that citizen participation schemes defined in a broad sense account for approximately 47% of the installed renewable energy capacity in Germany in 2012 [66]. The introduction of the Renewable Energy Act in 2000 aimed to broaden the investor base, to professionalise the sector and to mainstream renewable energy financing. As a result a greater proportion of institutional investors have entered the energy finance market in Germany. In 2014, the German government gradually changed the support scheme from a feed-in premium to an auction-based system in order to comply with the EU Environment and Energy State Aid Guidelines (EEAG) and to limit the costs of the support scheme. Some market players feared that this move could endanger a main characteristic of the German renewable energy system: its high "diversity of actors". Specific measures have been put in place to support community energy projects, but there are fears that these do not go far enough to overcome challenges for the standard project finance approach. Nevertheless, there is currently a strong representation of local residents in energy sector investment.

Finance and justice outcomes in energy transitions

The justice themes that came through strongly from the German data were transparency, due process, intra-generational equity and spatial development. Transparency, due process, and intra-generational equity are within the existing 8 principles framework while spatial equity/local economic development is an emergent theme. A further theme on financial sector resilience was also indicated, but remained under-developed in the empirical sample.

Interviewees stressed the importance of transparency and accountability as a procedural dimension of the investment process, particularly for community energy. Financial sector interviewees often referred to transparency as an explicit aim, i.e. transparency on the assets in which the clients' money is invested in. The way in which transparency is achieved for RE schemes was the way equity vehicles of community energy communicated the financial performance of investments to the wider community.

[77] Particularly refinancing options from the federal development bank KfW

In common with the alternative finance sector in the UK, community equity stakes often enabled better due process outcomes by enrolling communities in discussions over the timing, rollout and benefit sharing of schemes. Thus, the financial vehicles of the citizen equity stake often led to improved scheme acceptance as a function of improved due process. The equity vehicles commonly raised for German RE schemes require staged stakeholder engagement. Equity in this case offers a strong route to a procedural as well as distributional justice outcome because it necessitates clear communication and engagement with stakeholders and citizens close to proposed RE developments.

The third strong theme from within the 8 principles was intra-generational equity. From an energy finance perspective this was expressed by the sample as clear discussions about who is in and out of different investment offers. These intra-generational equity issues concern whether the benefits of energy investment were available to all citizens, could be equitably distributed, and whether any purposive exclusions were fair. There was an implicit assumption that those closest to the disbenefits of energy projects should be offered the first ability to share rewards but financial regulations do not allow for spatial discrimination in many cases, which can work against stated justice outcomes.

While spatial distributional benefits are related to intra-generational equity, we also found a strong spatial justice element which runs through the entire public and co-operative banking sector, which transcends energy only projects. Two of the three pillars of the German model voice explicit spatial development and economic resilience goals. Both the Sparkassen/ Landesbanken and the Volksbank networks are operationalising these goals through renewable energy investments. The local circulation of capital and the diverse effects this can have on local economic resilience is bound up with questions about the effectiveness of import substitution vs more open trade policies that are beyond the scope of this paper to address. However it is clear that there is a strong narrative of local provisioning of both energy and energy finance as a route toward more systemic resilience of regions.

In the German interviews, we find little coverage of two of the 8 original principles of energy justice: availability, and affordability. Issues of three more; sustainability, inter-generational equity, and responsibility, were not absent, but were often assumed as 'given' since our interviews largely explored the mobilisation of finance around low-carbon energy transitions.

To summarise the principles of justice that relate to energy finance in Germany are:

From within the 8 principles:

- Due process
- Transparency [good governance]
- Intra-generational Equity

And from beyond the 8 principles we add:

- Spatial equity/local economic development

- Financial sector resilience [to a lesser extent in the empirical data but to a greater extent from secondary sources]

4.5 Discussion: Energy finance and principles of justice

In both cases examined there is a significant representation of finance types that are well aligned with some of the 8 principles of energy justice and beyond (i.e. the banking system in Germany and alternative finance in the UK) but which have evolved differently as a result of the institutional structure and varieties of capitalism of each location. Looking across both case studies at the potential of finance to enable or constrain energy justice, we find that this potential is unevenly distributed between principles.

4.5.1 Energy justice principles strongly associated with finance

The case data demonstrate a close relationship between different forms of finance and 4 of the 8 principles of energy justice articulated by Sovacool et al. [37]: affordability, due process, transparency, and intra-generational equity. Due process and transparency, principles are closely tied to procedural justice as they enable meaningful involvement in decisions about the energy system; and intra-generational equity and affordability, relate to distributional justice categories as they concern the distribution of benefits between communities in the present [3]. New forms of finance are emerging that improve due process by allowing a far broader range of citizens to participate in meaningful decisions on the energy system; firstly by providing opportunities to invest in projects, allowing citizens to express preferences in terms of what should be built; secondly by broadening the range of actors who are able to engage directly in the energy system; and thirdly by regulating the financial information shared with communities and potential shareholders about particular developments.

Finance can also affect the transparency of decision-making. Institutional investors frequently have interests (such as the need for shareholder return) which shape decisions (for example to prioritise short-term revenue over long-term value such as emissions reductions) but which are not transparently declared. Institutional finance is also heavily mediated so it is difficult to trace decision-making processes which have a significant effect on investments in the energy system. As such, accountability to funders and to citizens is poor. The normalised citizen equity stake in Germany and alternative finance platforms in the UK, can increase transparency and accountability by providing a much clearer link between funding, investment (projects) and revenues (income from investments). This transparency is supported by a greater emphasis on reporting about where funding comes from and where it is invested, increasing the accountability of decision-making.

One of the principal driving forces cited by many providers of alternative forms of finance was to broaden the engagement of citizens regardless of the financial resource they have available to them. This is also promoted by the local banking systems in Germany, both public and mutual. When directed to energy finance, this can mean that more people *"have a stake in a sustainable energy mix"* (Source #28: Alternative Finance Platform Provider, UK 2015); investment provides a means of engagement in the energy system. The barriers to entry are very low at present, partly as a function of the mission of the organisations involved in these forms of finance, but there is fear that consolidation of the alternative finance sector in the UK will increase the barriers to entry. Therefore, intra-generational equity is driven in-part by the *mission* of finance, not just the *form* of finance.

There was some evidence that alternative finance in the UK could increase the availability of high quality (low carbon) energy, through investing in crucial aspects of the system which are traditionally harder to fund, such as demand management. They can also have a significant effect on the *affordability* of energy; the rate of return demanded on funding can increase the cost of new technology and infrastructure [75], but by providing competition to commercial finance there is the potential for lowering or benchmarking finance costs. It was also clear that investor risk perception, and management of regulatory risk through mechanisms such as arbitration and state guarantees, was a fundamental constituent of the price of capital and that work to reduce the risk premium was welcome. However, there was little or no discussion of the justice implications of risk reduction from our sample. This was surprising given the current debates around investor arbitration [26] and the investor state dispute settlement clauses that have become a key site of dispute in wider international trade negotiations [76].

4.5.2 Energy justice principles weakly associated with finance

The link between finance and the justice principles of availability, sustainability, *inter*-generational equity and responsibility were less clear in the data. Sustainability was mentioned as a mission of some specific financial organisations but not of the form of finance itself. Inter-generational equity was addressed only once, when an interviewee recognised the relationship between debt and future generations:

> *"Debt is a claim on future revenues, a claim on someone's future, their wealth, their future wealth, and the reason why Islamic finance bans it [sic], is it's usually an unfair sharing of the risk"*
> *Source #26: Alternative Finance Platform Provider UK, 2015.*

There was no substantive discussion of responsibility for the energy justice implications of finance decisions.

4.5.3 Emergent energy justice and finance themes

The case data shows two strong and significant emergent themes relating to justice, which were not adequately captured by Sovacool et al.'s 8 principles. These were related to: (i) the spatial dimensions of justice; (ii) the role of finance in building resilience. Finance is an important medium through which the burdens and benefits of energy system transformation are distributed. This distribution not only happens across income groups but can also cluster in particular geographies or be absent in others. Much of this ‘place-based’ finance is due to the financial vehicles adopted by projects and the ownership of debt participating in projects. For a UK solar development funded by developer equity and debt from a commercial bank, the retention of local value is minimal. In contrast, the same kind of project in Germany may have multiple equity stakes from the local community and draw on debt from locally rooted institutions. The distribution of the financial interest from an energy project in this case will mean positive value retention for the local community. This is a characterisation of a general rule. Clearly purely commercial or citizen led projects can exist in each nation. However, the deep involvement of citizen equity, and debt from the public or mutual banking pillars in Germany is clearly more common than in the UK.

Inter-country or inter-regional distribution of burdens and benefits was also discussed at length. For example, ‘foreign’ energy companies who would use profits from activities in the UK to invest in energy systems transformation in their ‘home’ country:

> *“and I think we can’t expect there to be an asymmetric flow of investment between different countries all of whom are trying to suck as much capital into their energy systems as possible and all of whom want their consumers to pay as little for their energy as possible”*
> *Source #5: Institutional Investor, UK 2013.*

> *“Wind farms are often purchased or sold as investment objects; with the negative consequence that there is no local contact person anymore and thus no local rootedness and acceptance for decentralised energy decreases;”*
> *Source #55: Developer/Service company for community wind DE, 2017*

Beyond mitigating international flows of energy investment and return, some forms of finance are able to take a more spatially explicit approach and build resilience not just locally but in the wider finance system:

> *“What it can do is that it can prevent the economic decline from going below a certain level. It can stabilise.… And the savings bank, because it is anchored within that local area and also bound to only operate in that local area, will have to live off the profits that it can make in that local area.”*
> *Source #19: Banking institution [Savings bank] DE, 2014*

Perhaps more subtly, energy finance was also seen as a way of engaging citizens with their locality and as a means through which they could generate and retain social and environmental, as well as financial value, giving them more control over their locality and their livelihoods:

"So a good example is somewhere like Frome[78]*, where a lot of economic resilience in Frome is coming from community investment. They've done energy, they've done land, they've got their football club"*
Source #36: Alternative Finance Enabler, UK.

"But this is really something where civil society, where communities where municipalities where people from outside the authorities get together and try to create something and try to be independent and take some responsibility for their lives and that is something that is very close to the founding mission of the savings banks. So we want to enable people to take responsibility for their own lives and do something about it."
Source #19: Banking institution [Savings bank] DE, 2014

We argue that the case data supports a consideration of 'place-based' finance and spatial equity as a key form of energy justice, particularly important at the interface of energy transitions and finance. In this, we go beyond existing studies of energy poverty [45] or social investments [46] in several ways: First, finance may not only instigate or be entwined in vicious circles producing unjust results, but can also produce virtuous circles of local development. Second, the interviewee responses regarding inter-regional or inter-country distributional effects, indicate that there are different domains (governance, control, and financial returns) and processes (social acceptance) to be taken into account. Third, finance is part of spatial processes of recognition and empowerment (or the lack thereof).
The second additional category proposed is financial system resilience, and specifically whether investment in energy assets by alternative finance can make a given financial system more or less crisis prone. The role of energy finance in building system resilience was identified strongly by the UK alternative finance sector and energy investing was one productive avenue they had found to operationalise that wider goal:

"one other thing that's been healthy in the finance industry is all the challenger banks. I think everybody, I mean the Govermnent, and a lot of the general public, are pretty desperate to see the big four banks having much much less control over the country's finances."
Source #32: Founder, alternative finance platform UK, 2015.

"…resilience for me starts with diversity, and I know it's very trite but, this 5 banks that are too big to fail and too big to jail, that is the fundamental driver of the opportunity for crowdfunding. I don't think we'd be here if it wasn't for 2008…"
Source #28: Alternative finance platform chair UK, 2015.

[78] Frome is a small town in the UK which has pioneered local resilience and sustainability initiatives, including decentralised energy developments. See http://transitionfrome.org.uk/

This theme was less well developed in the German sample though one savings bank employee stated:

> *"…to have a structure below, something local, something decentralised something that might even be there in the longer term and not be effected by the big winds blowing on the financial markets I think that's important. And it makes you a bit more independent"*
> *Source #19: Banking institution [Savings bank] DE, 2014*

This is not to say the German banking model is immune to crisis [77], yet the lower tier of the public banks (Sparkasse) and the cooperative banking network did not suffer in the same way as other financial institutions more dependent on international financial markets. Indeed the Sparkassen and cooperative models have been repeatedly analysed as a potential model to provide basic banking and SME business lending both as a long term solution to UK productivity problems and as a potential counter cyclical agent [78-81]. In addition, the goal of "preserving the diversity of actors" in the energy sector, which is at the heart of current discussions about institutional reforms, can be linked to the idea of resilience, even if this is normally not done by stakeholders and is only marginally touched on in our interviews.

We argue for financial system resilience to be included as a principle of energy justice when researching the interface of energy and finance. We concur with Polzin et al. [32] in arguing that a financial monoculture has the potential to expose energy investment to global boom and bust cycles. We propose that energy has the potential to play the opposite role. By linking energy policy to non-cyclical financial institutions such as savings banks or alternative finance platforms it could very well play a stabilising role as opposed to exacerbating future crises. We argue for this as a justice category in the same terms as the IMF [74], that financial sector stability can be seen as a global public good, or with the United Nations who see access to stable domestic finance as key to Sustainable Development Goal (SDG) 8 [82].

4.6 Conclusion

Trillions of dollars of international capital are unlikely to be sourced from one form of finance alone. It is likely that various mixes of state, commercial, and 'alternative' money capital will be required for low-carbon energy transitions. In this paper we have detailed these interrelations for two nations in order to understand which principles of justice are important to the interface of energy and finance. We asked: w*hat are the implications of the current finance system on just energy transitions?* And *what principles of justice could energy finance satisfy?*

We found that depending on the form of energy finance and its organising institutions that it can positively or negatively affect affordability, due-process, good governance, inter-generational equity, spatial equity, and financial system resilience. These are the 6 categories of justice most relevant to financing energy transitions.

This analysis shows that taking account of the variety of capitalism in each nation, and its attendant financial institutions can illuminate several ways in which these principles can be operationalised, from pursuing financial innovation through alternative platforms to expanding public or mutual banking provisions. Further work should explore how energy policy can be assessed against each principle, whether risk reduction clauses and mechanisms such as investment arbitration can be better theorised within energy justice, and how future energy policy which aims to attract new capital, can use these 6 categories to pro-actively pursue explicitly just outcomes.

Acknowledgements

Part of this work was supported by the Engineering and Physical Sciences Research Council under grant Ref: EP/N029488/1. This work was also supported by a grant issued by Friends Provident Foundation through their 'Building Resilient Economies' programme. http://www.friendsprovidentfoundation.org/grants/projects/financial-innovation-today-towards-economic-resilience-the-bauman-institute-part-of-the-university-of-leeds/. The authors would like to thank the reviewers for their helpful comments which illuminated several lines of enquiry which substantially strengthened this work.

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5 Who benefits from participatory energy transitions? International experiences of community energy

Abstract

Participation in community energy initiatives is being supported by national energy policies across the world, mainly based on its assumed openness and participatory character. However, these initiatives are generally dominated by well-educated, high-income groups. This lack of representativeness may endanger their political legitimacy. In spite of this general trend, our research – based on data from surveys (Germany) and a case study (Australia) – shows that the socio-economic composition of community energy initiatives varies significantly between individual cases, especially with regard to educational level of investors. Moreover, we derive some mechanisms – restriction to small groups due to financial regulation and recruitment primarily through social networks – that lead to less inclusive structures in the Australian case. Finally, we highlight some initiatives to address less affluent people in Australia ("solar gardens"), Germany ("tenants' electricity") and several Commonwealth countries ("indigenous community energy").

Keywords: Community Energy; Justice; Acceptance; Energy Democracy; Socio-Economic Composition

5.1 Introduction

Participatory energy transitions from a centralized, fossil-fuel fired and/or nuclear-based energy system to a more distributed system built on renewable energies are a worldwide phenomenon. Denmark (Olsen, 2018; Toke, 2011) and Germany with its "Energiewende" (energy turnaround; Morris and Jungjohann, 2016) are prominent examples. Different regional and national practices, styles, modes and structures of these transitions have been developed. One of these specific forms of governance is community renewable energy (CRE), which means more collaborative forms of participation in renewable energy projects. The community energy sector is very heterogeneous with a multitude of models differing in scale of technology, legal and finance structure and degree of participation, the concrete form of which highly depend on national and sub-national policies (Holstenkamp, 2018; Oteman et al., 2014; Walker et al., 2010). Due to this heterogeneity, there is no commonly accepted definition of the term. However, existing definitions centre on financial investments by citizens and/or local community organisations that are characterised by openness, decision-making power in the hands of community members and – often, though not uncontested – regionality and regional value-added/development (Becker et al., 2017; Brummer, 2018; Holstenkamp, 2018; REN21, 2016).

Political initiatives like the inclusion of renewable energy communities in the European Union's revised Renewable Energy Directive (RED II) tend to assume that these communities are democratic initiatives. Proponents of community energy tend to legitimise support schemes by CRE's assumed democratic nature and effects on social acceptance of projects locally. Legislators in Denmark and the German federal state of Mecklenburg-Western Pommerania justified their respective compulsory co-ownership rules for wind power plants in this way (Maly et al., 2018; Olsen, 2018). However, empirical results indicate that CRE may not be as inclusive as presupposed (Bauwens and Eyre, 2017; Fraune, 2015; Yildiz et al., 2015).
In the following, we first present normative approaches that justify the demand for social inclusiveness of CRE (2.1). However, there are good reasons to expect less balanced socio-demographic compositions based on empirical participation and investment research (2.2). As statements by interviewees in Lienhoop (2018) demonstrate, this may pose problems of legitimacy of CRE. We demonstrate general trends building on an Australian case study (4.1) and a review of surveys on German CRE initiatives (4.2). We also use the Australian case to demonstrate some selection mechanisms and relevant framework conditions. However, the composition of membership significantly differs between cases, as demonstrated by statistical analyses based on three German surveys (4.3). Finally, we take up both aspects – general trends and differentiations – to draw some policy conclusions. These include the description of policy initiatives to include less privileged parts of the population (4.4) and the need to take impacts on the social composition of CRE initiatives as well as differences in the CRE sector into account when analysing effects of legal changes on CRE (5).

5.2 Background and Literature Review

5.2.1 Why Inclusion?

From an economic point of view, one could argue that community energy does not necessarily have to be inclusive in the sense of being representative and socially balanced as long as community energy companies are commercial enterprises and are supposed to generate profits for their members. However, we argue that there is a normative core of the phenomenon and that low levels of inclusiveness may undermine the legitimacy of community energy at a certain point. We describe the normative core resorting to three strands: (1) literature on community energy and energy democracy, (2) research on energy justice and (3) studies on the "social licence to operate".
In their well-known paper, Walker and Devine-Wright report results from a survey conducted among members of CRE initiatives in the UK on how they themselves would define community energy. As a result, they present a model in which they distinguish an outcome and process dimension according to the opposite characteristics "distant & private" and "local & collective" as well as "closed & institutional" and "open & participatory" (Walker and Devine-Wright, 2008,

p. 498). This conceptualisation has been widely used in studies, also beyond the UK context, as it conveys general ideas of what constitutes or should constitute CRE in many parts of the world. While it seems to be well formulated and useful, the definition does not necessarily reflect the empirical reality – social desirability being one possible explanation. Therefore, one can expect to find a certain range of openness and participatory structures and practices in empirical investigations.

Conceptually, community energy can be linked to “energy democracy” (Becker and Naumann, 2017; Burke and Stephens, 2017; Szulecki, 2018). This term is connected with certain policy goals ("resist the dominant energy agenda, reclaim the energy sector, restructuring the energy sector") and described in more detail in the form of new alliances of actors, public control, energy access, new ownership models and companies as well as community power and control over the energy system (Burke and Stephens, 2017, p. 38). Civic communities such as social movements, from which community energy initiatives can emerge, play a key role (Hess, 2018). The basic idea is based on a deeper notion of material democracy, which is established in addition to associative, deliberative and participatory democracy (Marres, 2012; Veelen and Horst, 2018, p. 24). They see energy democracy in form of participation in technical equipment as an extension of an “extra dimension to political theory debates on democratic governance” (Veelen and Horst, 2018, p. 25) and as a complement to the theory of civic engagement. Therefore, an analysis of community energy projects could show, first, in which way and, second, in which intensity a form of material energy democracy exists. The legitimacy of community energy thus stems from its (supposed) democratic, i.e. participatory and open character.

A second strand of the literature that we resort to are works on “energy justice”. Since the transformation of the energy system requires compromises from all parts of society, increasing attention is paid towards questions of social justice and fair and equitable distributions of benefits and burdens of the technology shift (Heindl et al., 2014). A changing focus away from individual towards collective practices in this regard over recent years has increased the interest in CRE activities as means of more appropriate, participatory and inclusive forms of actions (Bulkeley and Fuller, 2012). This is emphasised since these initiatives hold the promise for engaging communities and thus sharing responsibilities, risks and benefits of the low carbon transition more evenly (Bulkeley and Fuller, 2012, p. 1). The notion of justice has been conceptualised in the context of renewable energy deployment as comprising a distributional and procedural dimension (Bulkeley and Fuller, 2012; Forman, 2017; Gross, 2007; Jenkins et al., 2016; Wüstenhagen et al., 2007). Distributive justice refers to the way costs and benefits are shared, procedural justice is concerned with the decision-making process (e.g., planning and implementation of renewable energy systems) and how inclusive, participatory and fair it is perceived to be and handled by all stakeholders (Gross, 2007; Schlosberg, 2007).

In her 2007 study, Gross analyses the community response to a proposed wind farm consisting of 69 turbines in regional Australia and finds that the perception of fairness and opportunity to participate influence the legitimacy and acceptance of the project. While commercially developed renewable energy projects show large deficits in distributional and procedural justice, CRE projects are considered to be better equipped to address and deliver on both dimensions. Indeed, studies have shown that local ownership, participation and control in the development and implementation process positively contribute to the success of renewable energy projects (Cumbers and McMaster, 2012; Musall and Kuik, 2011; Schweizer-Ries et al., 2011; Toke et al., 2008; Walker and Devine-Wright, 2008; Warren and McFadyen, 2010). Hence, justice perceptions are usually included in social acceptance frameworks (Huijts et al., 2012). In a qualitative and quantitative analysis of wind, biomass and solar PV projects in Germany, Zoellner et al. conclude that "the involvement of residents in the decision-making and planning process" is of particular importance since the "fairer an implementation process is perceived, the higher is the degree of reported acceptance" (Zoellner et al., 2008, p. 4140). The discourse on just transition in the context of CRE and participation has just started. The question is if CRE projects can play the anticipated inclusive role for the social and economic transition towards a fairer energy system.

From a corporate perspective, justice arguments culminate in the question of whether certain business practices or concrete arrangements are legitimate. These issues are being discussed under the term "Social Licence to Operate" (Melé and Armengou, 2016; Moffat et al., 2016). The concept has been transferred from the mining to the renewable energy sector, especially the wind energy sub-sector with its questions around social acceptance and acceptability of projects (Colvin et al., 2016; Hall et al., 2015; Hall, 2014a). Companies use community benefit payments (Kerr et al., 2017), respond to societal concerns through participatory approaches and dialogue with stakeholders (Gallois et al., 2017), try to regain legitimacy and credibility and build trust with stakeholders (Jijelava and Vanclay, 2017). The concept is used as management tool to describe corporate action that goes beyond legal requirements (Hall, 2014b).

Kuch and Morgan (2015) illustrate the relevance of such a "social licence" for a community energy initiative in Australia as a necessary basis to gain support locally – vitally important due to the business and technical skills brought in by different stakeholders. Here, the open and participatory character of the initiative functions as justification of the community energy business.

5.2.2 What Do We Know about Citizen Participation?

Besides these normative and ethical questions, there is considerable evidence on which citizens make use of opportunities to participate in political decision-making and on determinants of investment behaviour, which we can link with in our empirical investigation. Participation in the case of community energy is a form of material-based civic engagement. The concrete

form of participation cannot be clearly defined: First, it is not a conventional financial investment. Second, it is not a political or social engagement in a narrow sense. And third, it can vary widely between a local environmental protection community and a more profit-oriented company. In empirical participatory research, it is known that there is no significant difference between the forms of political participation and civic engagement in terms of the social structure of the volunteers or members (Alscher et al., 2009; BMFSFJ, 2017; Simonsen et al., 2017). However, forms of participation and engagement are intensifying beyond conventional structures such as political parties, and there is a trend towards project-oriented civic engagement or participation in the context of local problem-solving strategies (Barrett and Zani, 2014; Klie and Klie, 2018; Levine, 2011; Theocharis and Deth, 2018; Woolard, 2017).
The common standard explanatory model refers to individual resources in the form of the socio-economic status related to the level of education, income, or occupation, based on the rule: “Citizens of higher social and economic status participate more in politics” (Verba and Nie, 1972, p. 125). This basic rule was augmented by the civic voluntarism model, in which further factors play a role that explain non-participation: resources, motives and social networks (Verba et al., 1995). This is concretised through the criteria gender, age, education, income, household size, political interest and political attitudes. However, the type of activity must be differentiated: based on giving time, donating money, or voting: "Each requires a different configuration of resources resulting in different patterns of stratification across various political acts” (Brady et al., 1995, p. 271). Meanwhile, current studies supplement these factors with other variables: marital status, political attitude in the form of a commitment in local politics in the sense of a civic virtue (duty) and political attitude by evaluating an ineffectiveness of political commitment, self-tracking in the political left- or right-wing spectrum, democracy satisfaction and party credibility (Deth, 2014; Lange, 2014; Rottinghaus, 2016; Westle, 2001). In the case of community energy, it would be evident to include the factor of engagement in the local community, which is considered to be highly significant (Deth, 2014). Besides this, there are also people who perceive politics to be ineffective and protest against perceived deficits and drawbacks. This participatory potential of “critical” citizens is included in current studies (Norris, 2011). These indicate that western democracy has a considerable potential for dissatisfied citizens, who regard democracy and established politicians and parties as negative factors in their own commitment (Hart and Youniss, 2018). This can also create entrepreneurial activity (Lewis, 2019). Summing up, socio-economic resources form a kind of basis for engagement (*conditio sine qua non*), but other individual and personal factors lead to the turn into concrete action. Accordingly, several thresholds have to be taken into account in a ladder of community energy participation: from silent “chequebook participation”, active membership in an energy cooperative, culminating to additional voluntary tasks, for example in the board of management.

In addition to the literature on citizen participation, we can also resort to the empirical investment literature: Community energy means financial participation, often in the form of equity capital (Holstenkamp, 2014), i.e. a comparatively risky type of investment, even if minimum investment amounts are usually relatively small. Hence, general findings of "household finance" (Campbell, 2006; Guiso and Sodini, 2013; Renneboog and Spaenjers, 2012) should hold in this field of application as well. Principally, private households tend to show a risk-averse investment behaviour (Arrow and Lind, 1970; Breuer et al., 2014; Guiso et al., 2018). Apart from this general trend, they form a very heterogeneous group of investors. Individual investment behaviour of private households is influenced by various demographic, cultural factors and personal traits (Barber and Odean, 2001; Guiso and Sodini, 2013; Ricciardi, 2008; Riley, Jr. and Chow, 1992; Schooley and Worden, 1999):

- Gender: Women tend to be less financially literate (Fonseca et al., 2012; Grohmann, 2016), more risk averse and less overconfident than men (Guiso and Sodini, 2013, p. 1439; Schubert et al., 1999). Investment decisions are more often delegated by women to men than the other way around (Kenney, 2006); (Fonseca et al., 2012). In addition, there is a gender wealth gap (Sierminska et al., 2010), which in turn effects risk attitudes.
- Age: Portfolio choice varies during the life-cycle as a consequence of building wealth and changing risk attitude (Fagereng et al., 2017; Guiso and Sodini, 2013).
- Education: Higher education has a positive effect on risk-taking. However, it could also be wealth and income affecting risk preferences rather than education per se, which is highly correlated with wealth and income (Riley, Jr. and Chow, 1992).
- Income and wealth: Higher income and wealth correlate with less risk aversion (Riley, Jr. and Chow, 1992).
- Religion: Renneboog and Spaenjers, 2012) find evidence for differences in investment behaviour between religious and non-religious households and Protestants vs Catholics.
- Cognitive ability: Dohmen et al. (2010) show that cognitive abilities influence risk-taking and (im)patience.

While we focus on socio-demographics in our analysis of community energy investment, there are some dynamic aspects to be mentioned in this context: Hong et al. (2004) and Brown et al. (2008), among others, have demonstrated the relevance of social interaction and peer effects. Other authors point at the importance of inertia in asset allocation (e.g. Brunnermeier and Nagel, 2008).

5.2.3 *Implications for the Empirical Analysis and Policy Implications*

These two overviews of a normative perspective on social inclusiveness of community energy and empirical findings from participation and investment research culminate in a certain tension between normative demands and descriptive expectations: On the one hand, the normative democracy theory and energy democracy, energy justice, and "Social Licence to Operate" literatures all provide for arguments for why community energy companies should be open and social inclusive. On the other hand, descriptive participation research and investment literature give reasons for expecting biases in membership towards citizens better equipped with financial and educational resources, elder people and men rather than women. While we would expect similar socio-demographic patterns in the community energy sector as identified by general participation research, we argue that such evidence could undermine the legitimacy of these initiatives and companies in the medium or longer term.

At the same time, results from participation research indicate that there is a need for differentiation. Hence, we have to go beyond general sector overviews and look for determinants of social inclusiveness or a lack of it.

5.3 Methodology and Data

For the empirical analysis, we apply a mixed methods design as form of inquiry (Creswell, 2014, 2009; Johnson and Onwuegbuzie, 2004). The study includes three major steps:

- An Australian case study targeting one specific operating CRE project: Repower Shoalhaven in New South Wales;
- An overview of studies on the socio-demographic composition of the membership base in different German cases;
- Tests of differences between groups of German community energy companies surveyed in 2012, 2014 and 2016, respectively.

For the Australian case study, the process involved the collection of qualitative and quantitative data at roughly the same time (Creswell, 2014), their interpretation and integration in the analysis of the case study. The quantitative data collection included an online questionnaire sent to 95 members and investors of Repower Shoalhaven. As the response rate can vary significantly (Leedy and Ormrod, 2015), two main steps were taken to encourage the recipients to reply: the questionnaire was kept concise and the link to the survey was sent via e-mail by the project lead. Recipients returned 23 complete questionnaires (2 leaders, 14 members and 7 shareholders), which means a response rate of 24%.

For the quantitative analysis, we use data from three different online surveys:

(1) A survey among 85 German CRE initiatives, including two companies that issued profit-participation certificates, conducted in 2012 and 2013 (Radtke, 2016, 2014). Informants

were approached indirectly via board members. Therefore, it was not possible to calculate response rates where no membership numbers are known. In most cases in which numbers are available, response rates at the level of the individual initiative/company varied between 20% and 30%. Overall, members returned 2,826 complete questionnaires. The distribution between different legal structures of the initiatives are depicted in Table 1.

(2) A similar, but shorter survey among different community energy companies, i.e. equity investments only in different legal structures (Holstenkamp and Kahla, 2016). The survey was conducted in the first half of 2014. We addressed 375 community energy companies and asked them to distribute the link to the questionnaire to their members. Using an own database, we selected companies randomly, stratified by data groups (regions, technologies, legal forms and age classes). Due to missing membership data for some of the companies, it was not possible to calculate total response rates. Overall, members from 92 initiatives responded, giving a response rate of 24.5% at the company level. For the analysis at hand, we exclude data of companies with less than 15 responses as to ensure response rates larger than 10% in each case.

(3) In 2015 and 2016, we purposefully selected two energy cooperative in different parts of Germany that hold shares in their local municipal utility (Holstenkamp and Kowallik, forthcoming). The questionnaire was similar to the second survey, so that it was possible to merge the datasets from the two surveys. An overview of the resulting sample is given in Table 11.

Tab. 11: German Survey (1) – Distribution of Responses according to Legal Structures

Legal structure		Number of	
English description	**German term**	**Initiatives**	**Respondents**
Registered cooperative	eingetragene Genossenschaft (eG)	67	1,872
Limited liability company	Gesellschaft mit beschränkter Haftung (GmbH)	2	615
Limited partnership with limited liability company as general partner [wind parks only]	GmbH & Co. KG	5	178
Civil society association	Gesellschaft bürgerlichen Rechts (GbR)	8	117
Registered society	eingetragener Verein (e.V.)	1	22
Association	Verband	1	22

Source: Own compilation from (Radtke, 2016).

Tab. 12: German Surveys (2) and (3) – Distribution of Responses

Legal structure		Number of	
English description	**German term**	**Initiatives**	**Respondents**
Registered cooperative	eingetragene Genossenschaft (eG)	5	266
Limited partnership with limited liability company as general partner [wind parks only]	GmbH & Co. KG	2	119
Type of Technology/Asset			
Photovoltaics		1	31
Wind energy		4	151
Shares in municipal utility		2	203

Source: Own compilation based on data from (Holstenkamp and Kahla, 2016) and Holstenkamp and Kowallik (forthcoming).

In all three surveys, most of the data are given in nominal or ordinal scales. Variable dependencies are analysed using the chi-squared test or Fisher's exact test, respectively, if requirements for the chi-square test are not fulfilled (Elliott and Woodward, 2007). We use Cramér's V to test the strength of dependencies (Raab et al., 2018). We perform the statistical analysis using STATA/IC 12.1.

The Australian single case is compared with results from the literature overview on Germany. Here we compare two countries at different stages of development of the community energy sector and the transition towards a more decentralised, renewables-based energy system. The responses in the Repower Shoalhaven survey were complemented by five semi-structured interviews, which provided a richer picture of CRE drivers. Through these interviews it was possible to identify some of the mechanisms that lead to the socio-demographic patterns identified in the case. The quantitative analysis in the last step serves the purpose of deepening and differentiating general findings from the German community energy sector as depicted by the literature overview in Step 2.

5.4 Results of Empirical Investigations

5.4.1 Australian Case

Community Energy in Australia

Driven by favourable economics and availability of non-hydro renewable energy technologies, ageing fossil-fuelled generation infrastructure, excellent renewable energy resources and above all the need to accelerate efforts to mitigate climate change, the electricity sector in Australia is changing. Since the 2000s a new movement has been emerging that can help to address those issues.

The national renewable energy policy has long overlooked the potential of CRE promoting only large or small household-scale projects. However, large scale installations in particular have created local tensions, since corporate developers did not or too little consider local communities' concerns and a mechanism for community co-ownership was (still) missing. This contributed to local conflicts and ultimately to tightening of state-level planning laws, e.g. a 2 km ban for wind farms in Victoria and New South Wales (NSW). However, state governments mainly led by the Labour Party are committed to renewable energy deployment to differentiate from the Liberal Party which governs on national level. Community energy has a very positive image with increasing interest from local communities. More than 105 groups are currently developing local initiatives in the country. Hence it can be suggested that Labour Party support for CRE stems from the dilemma between its general commitment to renewable energy and the conflict-burdened large-scale renewable energy deployments. A community-driven approach promises the allegiance of voters and helps to alleviate some challenges with corporate developers through e.g. community co-ownership. State governments promote CRE mainly in form of grant funding and institutional support. The NSW government recently announced an AUD 30 million funding package for regional community energy projects (NSW Government, 2018). Hence, the legitimacy of CRE in Australia seems to rest on a certain degree of social inclusiveness and representation and its ability to function as a vehicle for "voice" in Hirschman's (1970) terms.

While there is only a little academic research on CRE in Australia (Cameron and Hicks, 2014; Hicks et al., 2014; Hicks and Ison, 2011; Ison, 2009; Mey et al., 2016), this case study attempts to fill the gap to better understand the Australian CRE field development from sociological and political viewpoints, especially with regard to the socio-economic composition of the membership. We will then compare the situation with the state of the CRE sector in Germany.

The growth of the CRE field has been enabled by a number of what theorists refer to as "skilled social actors" or "institutional entrepreneurs". Those people were able to support collaboration and influence institutional framework conditions by mobilising people, creating shared identities and framing lines of collective actions (Crossley, 2002; DiMaggio, 1988; Fligstein, 2001, 1996; Fligstein and McAdam, 2012). The CRE field actors in Australia can be generally divided into two groups: those progressing and leading individual CRE projects, and those active in support organisations facilitating specific but also field-wide development. The former group comprises individuals with good local networks (e.g. members of Repower Shoalhaven), and also a fair understanding of and skills in renewable energy technology as well as (even more importantly) economic business planning. This has been shown in the analysis of different interviews with CRE project leaders of operating CRE projects.

Repower Shoalhaven Case Study

Repower Shoalhaven is a CRE project in the area of Shoalhaven, a south-eastern coastal region in New South Wales with a population of 99,650 people. The project was established by a local entrepreneur and economist who was keen to establish a community-owned solar PV project in his local area (Repower Shoalhaven Association).

Repower Shoalhaven is a member-based not-for-profit association founded in May 2013, which aims to develop community solar projects for the benefit of local people and organisations. The project activities started small with its first project funded by donations and installed on a community centre and ambulance station with a generation capacity of 9 kW. The second project of the organisation is “Repower One”, which is considered as the first community investor-owned solar powered system in Australia with a 99 kW array installed on the roof of the Shoalhaven Heads Bowling and Recreation Club. This project is based on an investor model using a proprietary limited company Special Purpose Vehicle (SPV) legal structure to enable up to 50 community members to co-invest in a project (yet no more than 20 per year). The financing of the project was enabled through 19 local community investors who funded 80% of the system (AUD 119,800 which equals AUD 6,305 per investor), while the remaining 20% were provided by Shoalhaven Heads Bowling and Recreation Club. Hence, there is a differentiation between the role of association members, who pay a small membership fee and can participate in the association’s meetings and events, and investors (members and non-members), who contributed financially by buying a share from the asset. The Association has added four more projects since the first investor project was installed.

Sec. 708(1) of the Corporations Act 2001 stipulates that a – costly and time-consuming – disclosure document is not required if a person makes a personal offer of securities to not more than 20 persons with a total investment of not more than AUD 2 million in any rolling 12 month period (“20/12 rule”). This rule effectively limits the number of investors in small CRE projects. In addition, no public advertising of the investment opportunity was allowed due to the legal form of a private company. This effectively limits the group of investors to those with close ties to the initiators. Therefore, both regulations have a direct impact on the socio-economic composition of the association.

The analysis of the survey data shows that the individual membership mirrors general CRE field features in terms of motivations and drivers. Furthermore, it also shows similarities with socio-demographic structures and participation patterns of CRE membership in Germany (see next sub-section):

- The majority of members and shareholders are male (70%) and older than 55 years (65%).
- The majority of members are little-to-not active in the day-to-day business of the CRE project, while investors are more active. Both members and investors have considerable trust in the leadership of the organisation.

- The engagement by both surveyed groups is driven by motivations of emission reduction and the energy transition (91.3%), opportunity for immediate action on climate change (87%) while providing an ethical investment opportunity (87%).
- The majority of shareholders consider that they will continue investing in CRE projects of the organisation.

Conclusions from Australian Case

Based on participant observation in the absence of quantitative data about the socio-economic structure of other CRE initiatives in Australia, it is found that the Repower Shoalhaven demographics is relative representative for other CRE groups – which are older male dominated. It can be suggested that the reasons are their time availability and potential resources, as well as an interest in technologies and the development of business models. In addition, in many CRE projects local solar suppliers and other local renewable energy traders are engaged and offer their support – presumably in hope for additional business. CRE also recruits from established or ceased climate action groups, which usually make the composition of the group more diverse. There is a particular group in Sydney (Pingala) that has a very mixed demographic, which can be explained by a more diverse urban community.

In the Australian case, banks are only starting to lend to CRE projects. Given the 20/12 rule, this means that the minimum investment required from community investors tends to be relatively high (AUD 1,500 – AUD 5,000). Overall, this illustrates that it is necessary to also look at the interaction of CRE with financial market and regulation (Hall et al., 2018; Hall et al., 2016). Moreover, it means that member selection is mainly based on personal networks and communication at CRE events.

In summary, the Australian CRE sector enables a greater actor diversity in the energy system. However, participation is limited to a specific group of people that have the time, finances or a certain business related interest. Nonetheless, more research into the diversity among different initiatives and concrete selection mechanisms in specific cases is needed.

5.4.2 Social Composition of Community Energy in Germany

Review of Existing Evidence

While the community energy sector in Australia is still in its infancy, Germany has a more mature, well-developed and heterogeneous segment, that is called “Bürgerenergie” (citizen energy) in German. Several studies have looked into the social composition of the community energy sector in Germany (see Table 13) with varying focus (member of a single company, energy cooperatives, community energy companies of different legal structure, wind energy investors) and different operationalization of socio-demographic variables, e.g. age or income classes. These studies give some first insights into the structure of the German community energy sector.

Tab. 13: Studies on Socio-Demographic Characteristics of Members of German Community Energy Companies

Study *[Focus]*	**Method** *(respon-dents)*	**Sex** *f [%]*	*m [%]*	**Age** *Group [years]*	*Share [%]*	**Social Structure** *Share UE*	*Income [€]*	*Share [%]*
(Radtke, 2016, 2014) [Community Energy Companies]	Survey (n = 2,826)	20	80	<35	10	57	≥ 3,500 (gross)	49.0
				35-55	47			
				>55	42			
(Rauschmeyer et al., 2015b) [single company: Netz-kauf EWS]	Survey (n = 865)	21	79	Ø 55		74	> 2,500 (net)	66.3
(Rauschmeyer et al., 2015a)	Survey	26	74	Ø 59				
- PV/Wind	(n = 229)					70.3	> 2,500 (net)	65.6
- District Heating	(n = 258)					37.7		49.6
(Gamel et al., 2016) [wind energy investors]	Choice Experi-ment (n = 725)	37	63	18-29	7	41	2,000 – < 2,600	16
				30-39	17		2,600- < 3,600	24
				40-49	24		3,600- < 5,000	22
				50-59	28		≥ 5,000	17
				60-69	19			
				≥ 70	5			
(Holstenkamp and Kahla, 2016) [community energy companies]	Survey (n = 337)	21	79	20-34	8	46.6	n.d.	
				35-49	36			
				50-64	38			
				>64	18			
(Holstenkamp and Kowallik, in prep.) [shares in municipal util-ities]	Survey							
- Urban	(n = 54)	19	81	<20	2	89.8	n.d.	
				20-34	8			
				35-49	12			
				50-64	37			
				>64	41			
- Rural	(n = 167)	22	78	<20	0	34.4	n.d.	
				20-34	1			
				35-49	25			
				50-64	40			
				>64	34			

Abbreviations: f = female, m = male, n.d. = no data, PV = photovoltaics, UE = university education.
Source: (Holstenkamp et al., 2018, p. 1069).

While there seems to be a great variety among community energy companies with regard to their socio-demographic composition, the studies suggest that there are some general tendencies (Holstenkamp et al., 2018, p. 1073), which resemble patterns reported for the Shoalhaven case above:

- Principally, it is rather older people that engage financially in community energy projects. This finding is not surprising, considering that in order to make these investments people must have a certain disposable wealth.
- Men are overrepresented; significantly fewer women engage financially in community energy projects (Fraune, 2018).
- The surveys demonstrate that a relatively high share of better-educated persons with higher income can be found among community energy investors. Compared with the concentrated ownership structure of the old centralized energy system, this still means a wider distribution of market power, though.
- The above-mentioned tendencies seem to be (slightly) more pronounced in an urban context compared with community energy companies in rural areas (Holstenkamp and Radtke, in press).

While these insights correspond with findings from general public participation research as depicted in Section 2.2 above and with results from the Shoalhaven case study described in Section 4.1, the authors of the studies summarised in Table 13 do not investigate differences in socio-demographic composition between different types of initiatives in more detail. The study by (Rauschmeyer et al., 2015a) already indicates that large differences may exist as they contrast electricity generation with district heating cooperatives.

Own Empirical Analyses

In order to identify factors that determine such differences, we use the datasets from surveys described above in Section 3. We analyse if the composition according to various socio-demographic variables (gender, age groups, occupation, education) differs along several structural variables (type of legal structure, asset class, founding year/phase according to RES Act period, accentuation of the profit motive). Following empirical findings from studies reviewed in Section 2.2, we link age groups with life cycle investment considerations, take occupation as measurement of time resources and education level as operationalisation of human capital. The merged datasets (2) and (3) include two different legal structures, three asset classes and companies founded in the years 2009 to 2014, i.e. in three different phases of the Renewable Energy Sources Act (up to 2009, 2010 to 2013, since 2014).

As a result, none of the models used shows any significant difference with regard to gender: Men are overrepresented in community energy companies whatever subgroups we compare (see Table 14 in the Annex). Most of the other differences are statistically significant, even if in a majority of cases only a weak to lower medium relation, measured by Cramér's V, exists:

- In Germany, as in Australia, older people are overrepresented among members of community energy companies. This effect is less pronounced in limited partnerships compared with the cooperatives in the sample, community wind compared with shares in utility companies and especially solar PV and in older companies. Overall, there seem to be significant differences between single companies.

- These differences are less pronounced with regard to occupational groups. Regarding different characteristics, we observe similar relations as in the case of composition according to age groups.
- The statistical analyses produce strongest relations with regard to the educational level. Overall, well-educated people are overrepresented in community energy companies as expected. However, there are strong differences across cases. The share of well-educated people seems to be especially high for those community energy initiatives founded in the years 2010 to 2013, whereas no significant differences can be observed regarding technologies or types of investments and only weak associations with legal structures (less pronounced in limited partnerships, but weakly so).

As illustrated elsewhere, several of the characteristics of community energy companies are highly correlated (Holstenkamp and Kahla, 2016). In addition, the same must be said of the socio-demographic variables and their influence on participation or investment behaviour respectively (see Section 2.2). More importantly, there are only seven cases represented in the dataset. So, statistically significant differences may result from specifics of the selected sample rather than the structural characteristics reported here. Results from survey 1 point in this direction: We cannot find any significant and strong relationship between different types of investments and most of the variables also studied for surveys 2 and 3. The only variable with Cramér's V values > 0.2 for different specifications of investment types is the number of academics, i.e. the educational level (see Table 15).

Despite of this, our results may show directions for further research with larger samples and additional qualitative studies to identify social mechanisms behind proposed relations. Besides social networks as exemplified in the Australian case, the level of education and its links to specific types of community energy seems to be a candidate.

5.4.3 Policy Initiatives to Address Less Affluent and Disadvantaged People

Mieterstrom and Solar Gardens

As social inclusiveness of the transition in general, partly also of CRE specifically, is perceived as a problem, there are attempts to address less affluent people, especially in urban areas, through initiatives like "Mieterstrom" (tenant's electricity) in Germany and "solar gardens" in Australia. In June 2017, the German legislator adopted the Tenant's Electricity Supply Act ("Mieterstromgesetz"). Operators pay only a reduced renewables surcharge for electricity from their solar or bioenergy installation if it is installed on or affixed to a building and the electricity is supplied to a third party for use within this building. In addition, operators may get surcharges between 2.2 ct./kWh and 3.8 ct./kWh under certain conditions (Yildiz et al., 2018). There are some energy cooperatives that have developed or are planning to develop such kind of projects.

"Solar gardens" are a new concept in Australia (for the US: see e.g. Brownson, 2013; Hess, 2013; Noll et al., 2014), which seeks to enable access to solar PV to people currently locked out due to a lack of resources, unsuitable roofs and/or being a renter. Participants buy shares or subscribe to a solar farm, and subsequent savings are credited directly on their electricity bill. While there is no operating solar garden in the country yet, a collaborative research project led by the Institute for Sustainable Futures at the University of Technology Sydney and Community Power Agency together with local governments, community energy groups and energy retailers are investigating options how to make them work (UTS, 2018).

Indigenous Community Energy

Indigenous Community Energy

In several countries, specific forms of CRE are used to address indigenous people. In Canada, indigenous ownership is one of the five forms of CRE identified by scholars (Lipp et al., 2016; McMurtry, 2018). While some projects with shared ownership of indigenous people and developers or utilities exist in other provinces and territories, as for instance under the FiT programme in Ontario, British Columbia seems to be at the forefront in this regard. Remote indigenous communities often rely on diesel generators as source of electricity supply – systems that are associated with high operating costs – and on provincial or territorial utilities. Hence, self-sufficiency and political independence are main motivations of indigenous communities to develop their energy projects, which are in many cases co-owned by utilities/developers (Krupa et al., 2015; Rezaei and Dowlatabadi, 2016).

Similar to the situation in Canada, indigenous people in New Zealand more often rent low quality houses and are more affected by fuel poverty than the national average. Hence, local economic development and employment generation are main motivations for Maori community energy as well, besides environmental concerns (MacArthur, 2018, p. 939). Legal structures that are set out in the Maori Land Act 1994 (Te Ture Whenua Maori Act 1993) differ. Often trustees act on behalf of the Maori communities.

In South Africa, community energy trusts have been introduced through the REIPPP programme. However, it seems that private developers lack competences in development planning, which are needed to make these community benefit schemes become a success (Wlokas, 2017; Wlokas et al., 2017).

At the second Australian Community Energy Congress in February 2017, an Alliance of First Nations representatives has been established to foster and promote aboriginal communities to participate in the community energy sector in the country. There is also a strong push to build a narrative of community energy of energy justice debate by support organisations, e.g.

the Coalition for Community Energy. However, more concrete results are still pending and are additionally hampered by the institutional environment.

5.5 Conclusions and Policy Implications

Community energy, on the one hand, offers quite a different mode of participation compared with conventional forms of organised civic engagement or self-organization. On the other hand, the comparison of empirical data shows that more affluent and better educated people are much more represented and that there is an enormous gender disparity. These general trends seem to exist across countries; we find evidence for this in Australia as an example of a nascent as well as in Germany as a more mature community energy market. The Australian case indicates that reasons can be seen in specific mobilisation strategies along social networks, aggravated by financial market rules. As described in more details elsewhere (Holstenkamp, 2014), this interplay of energy policy and financial market regulation needs attention when analysing policy options. Some initiatives undertaken in Australia ("solar gardens"), Germany ("tenants' electricity") and several Commonwealth countries ("indigenous community energy") illustrate potential approaches to address less affluent communities. They may help the community energy sector to better meet expectations and preserve its legitimacy.

At the same time, the results from our surveys illustrate that there are some differences between community energy initiatives. While gender imbalances seem to exist across the community energy sector, age, occupational and especially educational groups seem to be differently represented depending on the type of initiative/company. Overall, community energy is a very heterogeneous phenomenon. As with other organisations in the energy sector, economic feasibility of community energy business models is dependent on governments' regulatory choices. The community energy sector has blossomed under feed-in tariffs or direct state support. It has been instrumental in early phases of technology development (e.g. modern wind energy), but become less important with the establishment of the respective technology and growing investment requirements. In the recent past, governments in several countries have been advocating for shared ownership structures or made them mandatory. Our empirical results, even though preliminary, indicate that any changes in these regulations should not only be evaluated with regard to their effects on community energy in general (Grashof, 2019), but also on specific forms of this type of governance. Lastly, further research on determinants of socio-demographic composition, the respective social mechanisms behind it and on other initiatives that address less well represented groups of the population (e.g. "Unisolar" in Germany) is needed.

Acknowledgements

This contribution uses data collected in two research projects funded by Bündnis Bürgerenergie e.V. and B.U.N.D. Friends of the Earth Germany, and Osterholzer Stadtwerke GmbH & Co KG, respectively.

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Appendix: Statistical Results (Tables)

Tab. 14: Statistical Results on Differences in Socio-Demographic Composition among Different Types of Community Energy Companies in Germany (Surveys 2+3)

	Legal Structure		Asset Class		Founding Year (model 1: year)		Founding Year (model 2 = 3 phases)		Founding Year (model 3 = 2 phases)		Single Company	
	value (degrees of free-dom)	sample size (Cramér's V)	value (degrees of free-dom)	sample size (Cramér's V)	value (degrees of free-dom)	sample size (Cramér's V)	value (degrees of free-dom)	sample size (Cramér's V)	value (degrees of free-dom)	sample size (Cramér's V)	value (degrees of free-dom)	sample size (Cramér's V)
Gender	0.7642	352	0.7600	352	1.2548	352	0.8291	352	0.3573	352	2.4759	352
	(1)	0.0466	(2)	0.0465	(4)	0.0597	(2)	0.0485	(1)	0.0319	(6)	0.0839
Age	26.6051***	385	28.4180***	385	37.0439***	385	26.7997***	385	3.3331*	385	37.5784***	385
	(1)	0.2629	(2)	0.2717	(4)	0.3102	(2)	0.2638	(1)	0.0930	(6)	0.3124
Occupa-tion	22.5925***	374	29.7520***	374	29.5294***	374	22.7264***	374	3.0299*	374	30.7134***	374
	(1)	0.2458	(2)	0.2820	(4)	0.2810	(2)	0.2465	(1)	0.0900	(6)	0.2866
Education	16.6515***	381	9.6501***	381	52.8510***	381	48.2326***	381	46.6172***	381	76.2835***	381
	(1)	0.2091	(2)	0.1591	(4)	0.3724	(2)	0.3558	(1)	0.3498	(6)	0.4475

significant at the: * 10% level; ** 5% level; *** 1% level

Source: Own calculations.

Tab. 15: Statistical Results on Differences in Educational Level among Different Types of Community Energy Companies in Germany (Survey 1)

	Legal Structure		Equity vs Certificates		Coops vs Certificates vs LPs		Coops & LPs vs Certificates		Coops vs Certificates & LPs	
	value (degrees of freedom)	sample size (Cramér's V)	value (degrees of freedom)	sample size (Cramér's V)	value (degrees of freedom)	sample size (Cramér's V)	value (degrees of freedom)	sample size (Cramér's V)	value (degrees of freedom)	sample size (Cramér's V)
Full Sample	89.3108*** (5)	2,824 0.1778	73.1669*** (1)	2,824 0.1610	84.9286*** (2)	2,824 0.1786	79.2867*** (1)	2,824 0.1725	77.0123*** (1)	2,824 0.1700
Reduced Sample (n>30)	85.7888*** (3)	2,082 0.2030	74.5982*** (1)	2,082 0.1893	85.0730*** (2)	2,082 0.2037	80.3454*** (1)	2,082 0.1979	76.1515*** (1)	2,082 0.1927

significant at the: * 10% level; ** 5% level; *** 1% level

LP: Limited Partnerships (German: GmbH & Co. KG)

Source: Own calculations.

6 What are community energy companies trying to accomplish? An empirical investigation of investment motives in the German case

Abstract

Community energy has become an increasingly important issue in academia and in energy policy circles worldwide. Citizens jointly investing in and operating renewable energy installations have played an essential role in countries such as Germany or Denmark. Building on and extending previous studies, we collect survey data on investment motives for a stratified random sample of German community energy companies. Structural variables are selected using a socio-ecological-technical systems framework. This study aims to identify differences within the community energy sector to better understand investment behaviour and the effects of policy changes. Despite the small sample coverage at the individual member level, the preliminary results of this study suggest that, first, community energy forms a specific type of social investment and that, second, there are significant differences between community energy companies, especially regarding the assessment of the return motive. This motive plays a more prominent role in limited partnerships than in cooperatives and for community wind than for companies focusing on solar or biomass. While these and other factors are highly interrelated, our data indicate that the social setting and geographical and climatic conditions are the critical ones here. These findings may guide further research.

Keywords: Citizen participation, Community renewable energy, Energy cooperative, Joint investment, Social investment, Socio-Ecological-Technical System (SETS)

6.1 Introduction

Citizens jointly investing in and operating renewable energy installations play an essential role in some European countries, most notably Germany and Denmark (Bauwens et al., 2016; Yildiz et al., 2015). Community ownership has attracted some attention in several disciplines in academia and beyond, and as a result, it has been examined with the help of a wide range of methods and from many different theoretical perspectives (see e.g. Jeong et al., 2012; Seyfang et al., 2013) and under a plethora of different terms (Walker and Devine-Wright, 2008; Walker et al., 2010) like community renewable energy (Ruggiero et al., 2014), local community initiatives (Schoor and Scholtens, 2015) or local citizen-led initiatives (Yalçın-Riollet et al., 2014). The positive influence of community ownership on the acceptance of projects has been an important issue in many studies (e.g. Barry and Chapman, 2009; Fast, 2013; Graham and Rudolph, 2014; Maruyama et al., 2007; Musall and Kuik, 2011; Warren and McFadyen, 2010). Despite several attempts in the literature to describe citizen organisations, this topic has not been thoroughly investigated. There are only a few studies that present quantitative empirical data on the motives of citizens who financially contribute to renewable energy installations (Bauwens, 2016; Gamel et al., 2016; Radtke, 2014; Volz, 2012, 2011). Bauwens (2016) and Gamel et al. (2016) focus on wind energy and Volz (2012, 2011) on energy cooperatives only, a sector which has developed much since Volz has conducted his survey. Radtke (2014) provides some descriptive statistics, but does not test for differences between groups, which is at the centre of this article.

Using a descriptive, explorative approach, this article contributes to the still fairly small body of studies on community energy investments (Dóci and Vasileiadou, 2015). The case of Germany is used here because of the relative importance of its community energy sector and its characteristic heterogeneity. According to the market research company trend:research, community-owned wind farms with different legal statuses represent an estimated 20% share of installed capacity in the onshore wind subsector (trend:research and Leuphana, 2013). Overall, the German transition process called "Energiewende" (energy transition) has been characterised by a diversity of actors building renewable power plants. This distinctive feature of the German renewable energy sector has developed through the introduction of fixed feed-in tariffs. The protection of this diversity of actors has become a political goal (see sec. 2 para. 5 sentence 3 of the Renewable Energy Sources Act of 2014). Discussions about this goal had started with the reductions of feed-in tariffs for photovoltaics (PV) in 2012 and the introduction of a mandatory market-premium system in 2014. It has been intensified since because of the proposed change from feed-in tariffs to a tender-based system (Hauser et al., 2014; Leuphana and Nestle, 2014). There is a considerable concern that an increasing professionalisation and the related decrease in involvement of the community will lead to a lower social acceptance of these kinds of projects. Therefore, people have sought to protect community initiatives against policy changes, e.g. through exemption clauses. However, the argumentation is usually based on the assumption that the different community energy investors behave in the same or in a similar way. Identifying patterns, i.e., differences between groups of community energy companies, can be a first step to better understand investment behaviour in this subsector and reactions to policy changes.

Also drawing on the insights of environmental psychology and the literature on investment motives, this article addresses the question of how community energy in Germany can be systematised with regard to the investment motives of members. For the selection of differentiators at firm level and the description of respective results, we use a socio-ecological-technical system (SETS) framework (Cayford and Scholten, 2014; McGinnis and Ostrom, 2014). The Socio-Ecological Systems framework (Ostrom, 2005; Poteete et al., 2010) – and, as an offset, also SETS – is an established framework for describing and analysing institutional diversity related to human-ecological and technical systems. The use of an established framework may help to compare results from different countries and disciplinary perspectives at a later stage.

The remainder of this article is structured as follows: after a short description of the methodology, the results of our survey and data analysis are presented. A discussion of the findings follows. The paper ends with some concluding remarks concerning the implications of these findings for energy policy and further research.

6.2 Methods

6.2.1 Hypotheses

Since the study aims to categorise community energy companies by investment motives of their members, we divided the sample into groups according to four structural variables. The outcome is used as an expression of what these organisations are supposed to accomplish. Two individual member characteristics were added to this set of variables mainly on methodological grounds (see below). We tested whether differences in the scores for investment motives between groups with different values for the respective attribute are statistically significant. By doing so, we aimed to identify patterns in the German community energy sector. In a three-steps process, hypotheses were developed.

The first step was to identify potential motives. Drawing on the literature on community energy (Bomberg and McEwen, 2012; Boon and Dieperink, 2014; Radtke, 2014; Rogers et al., 2008, 2012; Schweizer-Ries et al., 2010; Volz, 2012; Walker, 2008; see also Dóci and Vasileiadou, 2015), we identified seven motives:

- return motive (i.e., the expectation to receive return on investment),
- energy supply motive (i.e., the goal to secure supply of electricity or heat from local or own sources),
- generation of regional added value (i.e., the aim to keep benefits in the region),
- nature conservation (i.e., the ambition to protect the environment, including climate change considerations),
- advancing the energy transition in Germany (i.e., the goal to support this political project),
- participating in the production of electricity or heat (i.e., actively taking part in the generation of electricity or heat), and
- being a member of the community (i.e., the identification with the neighbourhood through joint investment).

Considering some of these motives, we take findings from the fields of environmental psychology and political science into account, which both emphasise that motives are not only tied to

material benefits and also include hedonistic and normative goals including the desire to influence policy outcomes (Lindenberg and Steg, 2007; Verba et al., 1995).
The second step was to identify the distinct structural aspects of the community energy companies included in the sample. SETS research posits that there are six first-tier contextual components that need to be considered when analysing institutional diversity: the technological system; technical units; governance system; actors; social, economic and political settings; and the related ecosystems. Applying this framework, we operationalised the contextual factors by using four measurable indicators for which data were available: The legal status frames property rights, operational and collective-choice rules within the organisation and therefore is a vital element of the governance system. The technological system differs between the cases with regard to the technology used in the projects. Social, economic and political settings change with location (here: the region where community energy companies are located) and year of formation. Location is also an indicator of the geographical conditions and hence the related ecosystem. The four structural characteristics are not independent of one another, but highly interrelated. Therefore, we tested them separately. In addition, two individual member level characteristics, investment sum and type of the member, are used mainly on methodological grounds (see discussion in 3.1): The former variable is highly correlated with the structural variables mentioned above. Therefore, it is included to analyse these interrelations. The type of stakeholder (with/without managerial function) is included to adjust for potential biases due to the disproportionally high number of officeholders in the sample.
In a third step, we related the seven investment motives to the values of the contextual variables and formulated the following alternative hypotheses to be tested:

- Hypothesis 1: Scores attached to investment motive differ between investment classes. More specifically, the higher the amount invested in the community energy company, the higher the weight placed on the return motive.

Actors differ in terms of disposable income and hence ability to invest in community energy. Due to recent technological advancements in alternative energy, the financial requirements that must be met to build increasingly large and sophisticated power plants have grown considerably. These changes in the technological and institutional environment may lead to a crowding-out of specific types of investors and/or attract others who most probably differ in their investment motives. In accordance with previous research (e.g. Radtke, 2014), we assume that the relevance of traditional financial investment criteria increases with growing financial commitments.

- Hypothesis 2: There is a difference in the appraisal of different investment motives between different kinds of shareholders, specifically between those with managerial function and ordinary members.

We created two categories of members: those with managerial functions (managing board, supervisory board) and those without functions, who are subsequently referred to as “ordinary members”. Managers may be salaried or work voluntarily for their community energy company. While only seldom systematically explored, these distinctions may be of relevance (Dóci and Vasileiadou, 2015; Rogers et al., 2012), especially in studies in which managers are overrepresented in the sample – as they are in our study – or in cases in which questionnaires are sent only to managers. Therefore, differences in the appraisal of investment motives between the two groups are tested.

- Hypothesis 3: The legal status of community energy companies influences the motive for financial investment.

Each business entity has its own governance structure (property rights, operational and collective-choice rules, monitoring and sanctioning processes) according to law and/or through the company’s statute.

- Hypothesis 4: There is a difference in investment motives between technologies used by community energy companies.

Each community energy company is classified based on the technology it uses in its projects. In case more than one technology is involved, we categorised a given company based on its main activities. Four types of projects were identified: biomass-fired district heating (“bioenergy”), photovoltaics, wind turbines and the operation of distribution grids (“grid”). Further differentiations would be possible, especially between rooftop and ground-mounted installations in the photovoltaics sector or between community wind farms vs. community investment companies holding shares in wind farm special purpose vehicles. However, if one were to consider even more categories or specific types of projects, these would lead to smaller groups, and these, in turn, could be too small for further statistical analysis.

- Hypothesis 5: The regional location of community energy companies influences the motive for financial investment.

We divide Germany into three regions: North, South and East. The North-South divide is used here due to differences in terms of solar radiation and wind intensities. Hence, we get a rough indicator for the quality of the location. The differentiation between West (consisting of North and South) and East is made due to the differences in historical development and economic background. Regions are coded according to the federal state where the community energy company is located.[79]

- Hypothesis 6: The year of establishment influences the motive for financial investment.

[79] North: Schleswig-Holstein, Hamburg, Bremen, Lower Saxony, North Rhine-Westphalia; East: Mecklenburg-Western Pommerania, Saxony-Anhalt, Brandenburg, Berlin, Thuringia, Saxony; South: Hesse, Rhineland-Palatia, Saarland, Baden-Württemberg, Bavaria.

The age of the company may have an influence on the motivation of investors, i.e., the motivation has been different between phases of technology development and in different regulatory environments. Since the dataset does not contain many responses from companies predating the EEG, only three groups are used here: (1) companies registered before the 2009 amendment of the EEG, (2) companies registered during the period 2009-2011 and (3) companies registered since 2012, when the EEG was amended two times and feed-in tariffs for PV were cut significantly.

Hypotheses 1 and 2 are related to internal management issues, while Hypotheses 3-6 point to differences between community energy companies. The distribution of characteristics in the sample indicates that several factors used in the different tests are highly correlated, e.g. legal status and technology. We try to disentangle, at least to some extent, these relations below.

6.2.2 Data selection and methodology

The sample for this study is taken from a database that is currently being developed at Leuphana University's Department of Finance and Financial Institutions.[80] In this context, community energy comprises all companies investing in renewable energies (electricity, heating) or related infrastructure and that meet the following criteria:

- Citizens acquire shares in the company. Thus, they receive voting rights in accordance with legal and/or statutory provisions. Other financial instruments such as bonds or subordinated loans may be used in addition to equity.
- Citizens constitute a majority of shareholders. They hold more than 50% of the voting rights.
- Citizens are connected by a common regional identity ("community of locality").

The database collects information on companies based on publicly available sources (electronic registry, by-laws, company websites). A random selection of community energy companies was made, which was stratified by data groups (Schnell et al., 2005), namely regions, technologies, legal statuses and year of establishment. Each of the selected community energy companies received a link to a questionnaire by e-mail intended to be forwarded to all members of the company. As a result of the two-stage process in the survey, we obtained variables at two different levels, namely company and member levels (see Table 16 for an

[80] At the time of writing, the database is still incomplete: Only few civil law associations with unlimited personal liability (*Gesellschaften bürgerlichen Rechts*) are included. While all registered cooperatives are, to the best of our knowledge, part of the database (but see different numbers despite same methodology in Debor 2014), it is much more difficult to find community energy companies with other legal statuses. It is estimated that only approximately half of the limited partnerships with a limited liability company as general partner (German: *GmbH & Co. KG*, in the following: limited partnership) have been identified. For the purpose at hand, this should not pose a problem since all types are very likely to be included in the sample. No systematic bias in this respect could be identified. Descriptive statistics should not, however, be mistakenly interpreted as exact data for the German community energy sector in its entity.

overview). The basic idea was to determine types of community energy companies by analysing their firm-level characteristics and characteristics at individual member level with scores given to predefined investment motives (from 1 = no relevance to 5 = highly relevant).[81] To illustrate the distribution of responses boxplots are used.

Tab. 16: Overview of Variables

Variable	Level of Measurement	Level	Availability / Assignability
Legal status	Nominal	Company	All companies / non-ambiguous
Technology	Nominal	Company	All companies / partly ambiguous
Region	Nominal	Company	All companies / non-ambiguous
Year of establishment	Classes	Company	All companies / non-ambiguous
Investment (amount)	Classes	Member	All members / non-ambiguous
Role in the company	Dichotomous	Member	All members / non-ambiguous
Honorary vs. salaried appointment	Dichotomous	Managerial members	All members / non-ambiguous
Score return motive	Ordinal	Member	All members / non-ambiguous
Score other motives: • Energy supply • Regional added value • Conservation • Energy transition • Participation • Member in community	Ordinal	Member	All members / non-ambiguous

Most of the data in the sample are given in nominal or ordinal scales. Due to the heterogeneous measurement levels of the variables, variable dependencies were analysed using the chi-square test (Freund et al., 2010). The results were checked again with the Fisher's exact test, if the requirements for the chi-square test were not fulfilled (Cochran, 1954; Elliott and Woodward, 2007). With this kind of analysis, the stochastic dependency of the variables was tested. With data in nominal and ordinal scales, causality cannot be defined. However, it is possible to explain potential directions of causality. To test the strength of dependencies, Cramér's V was used (Raab et al., 2009). Finally, the robustness of the results was tested by bootstrapping (Efron, 1979; see also discussion in Section 4.1).

6.3 Results

6.3.1 Descriptive statistics of the sample

A descriptive analysis of the data leads to initial findings concerning community energy companies and their respective features. There were fewer responses at the firm level by civil law associations and limited liability companies (GmbH/UG). For the other legal statuses, i.e., cooperatives and limited partnerships, the response rate is much higher. Unfortunately there was

81 Data are analysed using STATA MP 13. STATA do-files are available from the authors upon request [see also Annex].

very little public information on civil law associations since they are not registered. Therefore, the database used for the sampling listed very few companies of this type. Hence, we will focus on cooperatives and limited partnerships that can be used for an analysis of community energy companies. These are the primary types of renewable energy companies in Germany. We will focus on these two groups when analysing the data in greater detail, because the response on member level was much higher with 175 and 148 persons, respectively (see Tab. 18) The distribution of community energy companies in the sample shows the same structure such as the distribution for Germany in its entity.[82]

The number of responses concerning the relationship between legal statuses and technology of community energy companies indicate that cooperatives are particularly popular if people intend to use photovoltaics and bioenergy. The limited partnership structure is mostly used for citizen-owned wind farms. The distribution is similar to that in the primary database. Due to same distributions concerning the responses in the sample and the entity in the former database and even the distribution between legal statuses and technologies, there seems to be no bias in the sample, in this respect.

6.3.2 Relationship between level of investment and investment motives

Investment sums differ considerably depending on the legal status of the companies. This difference is due to the fact that cooperatives mostly operate photovoltaic and bioenergy facilities and limited partnerships run wind farms, which require greater financial investments. Individual investments made in cooperatives are, in general, below €5000. In contrast, the capital expenditure in limited partnerships is, on average, higher and the quantity among investments in the enterprise differs considerably. Limited partnerships often allow individuals to invest much higher sums than the other legal types (Kaler and Kneuper, 2012) whereas cooperatives sell smaller shares so that every citizen can afford an investment. The legal status of cooperatives reflects a democratic approach: Every member has a vote irrespective of his or her investment sum. In limited partnerships, the share of one's investment determines the number of votes. Therefore, the sum can have an influence on possibilities for participation.

With regard to investment sums, the amounts, given as survey responses, differ considerably across persons, from under €5000 to over €50,000. In terms of motives and investment, only two dependencies were observed: First, the relation between investment and return motive showed a significant but weak dependency, tested with a chi-square test and Cramér's V. The results for Hypothesis 1 (listed in Tab. 17) suggest rejecting the null hypothesis with an error probability of zero. The deviation between the value and the degrees of freedom indicated a significant dependency of the variables. The causality between these variables can only be

[82] Authors' compilation from the database currently being developed at Leuphana University's Department of Finance and Financial Institutions.

argued on descriptive overviews such as the one in Tab. 18. The mean for the return motive show higher values for increasing investment sums. Therefore, citizen who invest higher sums are more likely to do so in order to receive a return on investment. A similar but weak dependency can be observed between investment and what we refer to as participation motive. The more money citizens invest in community energy companies, the more likely it is, that they are motivated to do so by the aspect of participation.

6.3.3 Managers versus ordinary members

It is important to note that there is a difference in terms of motivation by members who have a managerial function (working voluntarily or salaried) and the ordinary members of the community energy companies. As can be seen in Tab 18, the generation of return and local supply of energy are, on average, less important to members with managerial functions (with means of 2.88 for the return and 2.41 for the supply). For ordinary members, the values are slightly higher at 3.43 and 2.82. Even so, the variance (see Figure 12) in the answers differs greatly for the return and supply motives. The motive to be a member in the community is, however, less important for ordinary members. The other outcomes reveal a similar pattern for both types of shareholders.

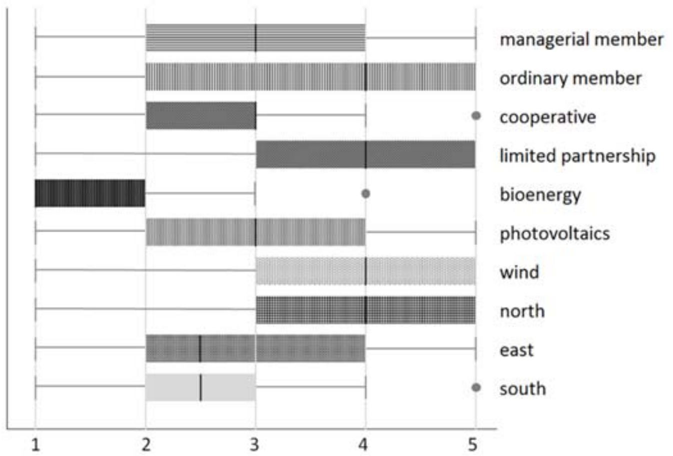

Abb. 12: Distribution of return motive over different variables

Figure 12 shows the distribution of responses at the individual member level. It can be observed that some motives have a wider variance (such as return motive for ordinary members) than others (for example energy transition motive for managers). The difference between the two shareholder groups of community energy companies is significant, because there is a weak dependency between members with managerial function and ordinary members in terms of the return motive. Regarding the return motive the null hypothesis of Hypothesis 2 can be rejected. In this case, members with managerial functions are less likely to be motivated by return in investment than ordinary members. This pattern can also be observed when it comes to the motive of local energy supply. Participation and the membership in the community are

also highly significant and depend weakly on the two types of shareholder. The members with managerial functions regard these motives to be more important than ordinary members.
Dividing the members with managerial function into two groups (one working voluntarily, the other salaried), the salaried group has a greater interest in a return on investment (with means of 2.74 for the voluntary managers and 3.46 for the salaried). If one were to divide the members who have a managerial function into salaried and voluntary managers, one can see that the null hypothesis, i.e., the motives for financial investments are independent for this subgroup, cannot be rejected. The results of chi-square random variables are near the expected value and the probability of an alpha error exceeds the confidential levels. When it comes to the financial investment of salaried and voluntary managers, the correlation, suggested by the hypothesis, cannot be described as significant. In terms of motive, there is therefore only a difference between ordinary members and members with managerial functions with a value that clearly exceeds the degrees of freedom (see Tab. 17).

6.3.4 Legal status and technology

Motives may also be examined in relation to legal status and technology. Only cooperatives and limited partnerships are considered here due to the limited numbers of responses to our survey for limited liability companies and civil law associations. For each legal status, there is a different set of motives for investing in community energy companies. More specifically, there are differences when it comes to the descriptive analysis of the return motive: In limited partnerships, the motive of return on investment is, with a mean of 3.96, more important than in cooperatives (mean of 2.62 from Tab. 18). This relation in particular needs further examination. Testing Hypothesis 3 with respect to the return motive, the null hypothesis is rejected due to a high chi-square random variable and a low probability of an alpha error. A similar statistical outcome can be observed for the participation motive, which is more important when it comes to cooperatives, and the energy supply motive, which is more important for limited partnerships. Descriptive data point in this direction, but the difference between the values for the legal statuses is not as big as the one for the return motive (Tab. 18). The legal status of community energy companies is, as suggested by our data, related to motivation: people with a strong interest in return on investment are more likely to be found in limited partnerships.
There are distinct differences in terms of motivation of citizens to invest in specific technologies and the return and energy supply motives. For example, Figure 12 and Tab. 18 show that those who invest in bioenergy projects are less likely to be motivated by the desire to generate return on investment than wind energy investors (means of 1.67 for bioenergy companies versus 3.82 for wind energy companies). This pattern is reversed when it comes to the motive for local energy supply. Most bioenergy facilities are used to distribute heat directly in the region, whereas the photovoltaic and wind projects produce the energy to sell it to the grid for a fixed feed-in tariff.

If one considers the descriptive outcomes, the influence of technologies (Hypothesis 4) concerning the return motive should be tested. The null hypothesis can be rejected because the chi-square variable shows a significant medium dependency (see Tab. 17). The value is much higher than expected by the given degrees of freedom. The energy supply motive reveals a similar outcome.

6.3.5 North versus South

The third firm-level characteristic to be considered is location. One can observe a major difference between the northern, southern and eastern parts of Germany in terms of return in the descriptive data. Similarly, the participation and membership motives show differences concerning their distribution. The other motives have nearly the same distribution for the three regions.

The dependency of the region is tested due to the main differences shown in Tab. 18. For example, the results of the chi-square test suggest that the energy supply motive is not correlated to region. Nevertheless, the regional location of community energy companies is weakly, but significantly dependent on the motive to increase the regional added value. Testing Hypothesis 5, we observed that the return motive and region are highly correlated with a medium dependency. There are significant differences when it comes to companies that have the same legal status and that use the same kind of technology. For this reason, for community energy companies and their members, the regional component could be an important dimension taken into account, as seen in Figure 13.

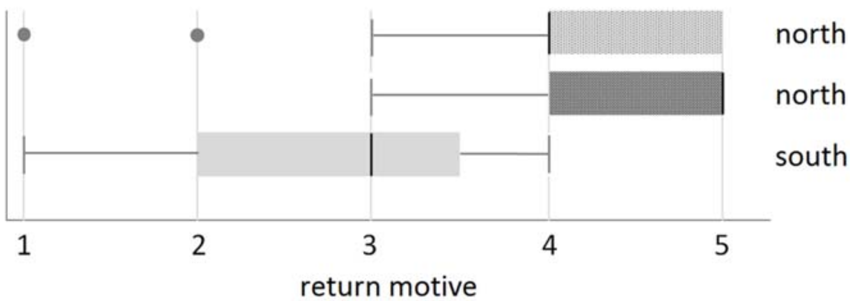

Abb. 13: Return motive of wind energy limited partnerships in comparison

This figure illustrates that, holding legal status of the community energy company and technology constant, the return motive is less important for South German community energy companies compared to those in the North. In this subsample, community energy companies with more than five responses are included. By doing so, we deal with multiple correlations between variables for structural characteristics. These results will be discussed further in Section 4.

6.3.6 Investment motives across time

It is possible to derive a trend if one considers the year when community energy companies were registered and their respective legal statutes. This trend can also be observed in the primary database. Many citizen-owned wind farms built in the 1990s are organised as limited partnerships. Cooperatives, however, have become more and more popular in recent years due to new regulations and cooperative laws.[83]

The sixth hypothesis focuses the dependency between motives and the year of establishment. The return motive correlates significantly with the year of establishment due to a major difference between the realized and the expected value. Especially for companies founded between 2009 and 2011, the return motive is very important. This can be confirmed with a descriptive data analysis (see Tab. 18). Moreover, the motive to be a member in the community shows a significant but weak dependency.

All these results illustrate that members have different motives for financial participation. The two groups of members pursue different objectives in line with their positions and investments. When it comes to the legal status, the region and the technology used by community energy companies, this pattern is reversed, especially concerning the return motive.

6.4 Discussion

6.4.1 Potential limitations of the survey and provisions to meet them

There are several limitations that have to be considered when interpreting the results. First, a total representative dataset of all the members of all the companies in Germany cannot be given due to self-selection, undercoverage and non-response (Kaczmirek, 2009). To quantify these kinds of circumstances is rarely possible due to a lack of information (Kent, 2001). For our analysis, we assume that there is no systematic bias due to non-response. Potential biases because of more responses by board members and people with similar functions in the community energy companies are mitigated through separate analyses of the two groups.

Second, response rates at the member level were relatively low (4.23% for cooperatives on average, in some cases above 10%; for limited partnerships, there were no membership numbers available). It was, however, sufficient at company level (21.10%). We tried to cope with this problem by testing the robustness of results with bootstrapping, as explained in Section 2.2. We stratified subsamples with 200 items of data each from the sample and again tested the dependencies of the variables. The results showed the same significant results as for the entire sample before. Still, some subcategories for groups (like legal statuses of civil law associations and LLC) are too small for any meaningful analysis. In order to determine the existence and extent of a potential bias, a triangulation with qualitative interviews at company level would be necessary. Doing this in a separate survey for two other energy cooperatives, each of which is holding shares of the respective local municipal utility, we could not find evidence

83 Results from authors' database. The numbers given in Volz (2012) and Agentur für Erneuerbare Energien e.V. (2015) differ slightly from our outcomes.

for the existence of a considerable bias. For example, scores for the return motive were significantly higher in the case of the cooperative whose members were reported in the interviews to vote accordingly during general assemblies. Taken together, these findings could indicate that there is not a systematic bias due to non-response which strongly affects our findings. Nevertheless, replications of our tests with more data are needed to reassess our results.

Third, it seems that bank-initiated cooperatives are under-represented in the sample. Building on informal talks with representatives from the cooperative sector, we cannot rule out that answers from members of these cooperatives would have been systematically different. This systematic under-representation may therefore constitute a bias which may have influenced the results. For instance, the differences between cooperatives and limited partnerships may be more pronounced in our results than they actually are. We assume that several of these bank-initiated community energy companies belong to the category "financial-investment oriented," which was proposed by Volz (2011). In this case, financial motives play the most important role when it comes to investment decisions. Hence, it is likely that cooperatives are divided into at least two subcategories, and one of these – Volz's "financial-investment oriented" group – might be similar to the limited partnership model. There clearly is a need for further research in this respect, even if empirical data will be hard to obtain. For this reason, it has to be kept in mind that our findings related to "cooperatives" are only valid for grassroots or bottom-up initiatives with this legal status.

Fourth, studies based on in-depth interviews of members may provide richer and more nuanced answers and may help to identify causal mechanisms which quantitative tests such as the tests applied in this article cannot. However, it will be impossible in most cases to conduct in-depth interviews with many members of one community energy company. Hence, our study may be complemented by and/or complement existing and further qualitative studies.

6.4.2 Classifying community energy investments

Overall, the survey results reveal that irrespective of the type of community energy company, investments are motivated mostly by environmental (nature conservation) and political (participation, energy transition) considerations. Many respondents place less emphasis on financial return, but even when it is not predominant, this motive plays a role. It is possible that some respondents may have downplayed financial returns as investment motive. There are, however, no indications that any systematic bias in this respect exists.

On average, we do not find support for the assertion that German community energy investments are mainly driven by economic or financial motives (Schreuer and Weismeier-Sammer, 2010), as it has been reported for the case of Denmark (Oteman et al., 2014). At the same time, we would not characterise German community energy as being "non-commercial" (Oteman et al., 2014). Rather, it seems to constitute a specific form of social investment, and for this reason, community energy companies can be regarded as specific types of social enterprises (Huybrechts and Mertens, 2014). There are, however, differences in this respect within the community energy sector, which we will discuss below.

6.4.3 *Investment motives and member characteristics*

In the previous section, the following two main results with regard to characteristics at individual member level and investment motives were presented:

- a positive correlation between size of investments and strength of the return motive
- the difference between members with managerial function and ordinary members

First, we confirm the result of previous studies that have shown that the strength of the return motive increases with the amount invested in the project (Radtke, 2014). Since the size of investments is usually higher in the case of wind energy compared to solar PV, this may at least partly explain the differences in terms of technology used.
Second, in contrast to Dóci and Vasileiadou (2015), we find a statistically significant difference between members with managerial function and ordinary members of community energy companies. If confirmed by other studies, this result has implications, on the one hand, for survey design and, on the other hand, for the management of these companies. Volz (2011), for instance, sent his questionnaires only to cooperative managers. Building on the responses from them, he identified four clusters of energy cooperatives in Germany. Hence, his typology is a representation of how board members see their cooperative. Since our data suggest that there is indeed a difference between valuations by ordinary members and members with managerial function, Volz's conclusions have to be carefully revisited. It is e.g. possible that his "financial-investment oriented" group is in reality larger than he suggests. Besides, this finding also holds implications for the management of community ownership firms, because there might be a potential for principal-agent conflicts. Our findings concerning the return motive seem to be relatively robust, even if most, but not in all subsamples during the robustness test reveal a significant relation.
Dóci and Vasileiadou (2015) reported gender differences with regard to motives of participation. Since women make up only a small group within the sample, we did not specifically test these differences here. An initial analysis shows statistically significant results for environmental (for women stronger than for men) and participation (for men stronger than for women) motives. However, these relationships warrant further investigation.

6.4.4 *Groups of community energy companies*

Using a socio-technical systems perspective, we identified four structural variables that may influence the character of a community energy company and which can be used for a typology of these firms: legal status, technology, region and year of establishment. The results, as described in the previous section, show significant differences mainly with respect to the return motive (see Tab. 17 and 18). Accordingly, this is used as the major variable for the typology developed here. Considering the first three variables separately, we identified the following patterns:

- Legal status: Members of limited partnerships tend to place greater emphasis on the return motive than those in cooperatives. Participation in the energy transition plays a slightly more important role in cooperatives compared to limited partnerships. In addition, we observed a significant difference in terms of the energy supply motive. Limited partnerships seem to put (slightly) more emphasis on this motive. The latter finding warrants further investigation in order to explain it, and for this reason, we cannot discuss it to a greater extent here. That said, our results concerning the legal status suggest that there are primarily two models: a more economically oriented limited partnership model and a more normatively or politically oriented cooperative model.
- Technology: The return motive plays the most prominent role in the case of community wind compared with photovoltaics and bioenergy. Moreover, we observed a difference with respect to the energy supply motive, which is more important for investors in bioenergy projects. In summary, we identified three groups: financially and environmentally oriented community wind, more normatively oriented community photovoltaics and autarky-aspiring community bioenergy.
- Region: Community energy in the northern part of Germany seems to be more profit-oriented than in the East and South. Besides, a significant difference between the East and the rest is observed regarding the regional added value motive albeit only for a small group in the sample.

The difference between limited partnerships and cooperatives may be taken as an indicator that members use both forms for different types of projects. Even if environmental and political motives seem to dominate the return motive, as suggested by our data, the observation made by Schreuer and Weismeier-Sammer (2010) that community energy is more economically or profit-orientated in Germany compared with other countries seems to be valid only for one specific type of community energy, namely the limited partnership model.

It is not surprising that the energy supply motive plays the most prominent role for biomass heating cooperatives: These are “traditional cooperatives,” whose members are identical with their customers, who have looked for a way to organise the heating grid infrastructure and energy supply. Our findings in this regard are in line with the literature. Not surprisingly, there is a difference in terms of the importance of the return motive as appraised by members from local heat cooperatives or electricity retailers vis-à-vis members of community energy firms, which function more like investment vehicles, albeit with motives beyond financial return. Volz showed that dividend payments are more important for photovoltaic cooperatives compared to local heat cooperatives (Volz, 2012). Similarly, Bauwens found a statistically significant difference between Belgian wind cooperatives with electricity supply to members and those without electricity supply (Bauwens, 2016).

In contrast, wind and photovoltaic cooperatives used to be collective investment vehicles providing access to this investment segment to non-High Net Worth Individuals (HNWI), i.e., people with US$ 1 million or more in financial or investable wealth or assets under control (OECD, 2009). The situation may change, though, when local actors are given the chance to market the electricity produced in their plants as local "green electricity," which is not yet possible due to current regulations. There are several attempts to establish regional electricity products (e.g. in Thuringia) or umbrella companies supporting community energy firms to offer local electricity products (e.g. by Bürgerwerke eG). Since other investment motives seem to be stronger than the return motive, at least on average, community wind and community photovoltaics can be classified as "public benefit companies" or, if this legal status applies, as "public benefit cooperatives" (Mori, 2013). Differences in scores for the return motive in the case of community wind as opposed to community photovoltaics coincide with higher investments in wind energy plants.

With regard to location, there is a significant difference between North, East and South in terms of two motives: return and regional added value. It seems that the return motive plays a more prominent role in the North than in the East or in the South. This may be explained by the historical experiences made in the North with community wind: There has been a concentration of wind installations near the coast at the beginning of wind energy development in Germany. This pattern reflected geographical conditions in the different regions. Community ownership has been common in north and north-western Germany. Since windfarms have generated considerable returns for their owners in the past, this may have raised expectations in these localities. Community wind in the south has been developed at a later stage of technological development, in a different economic situation and under a different legal context. Yet, further research on the specific social contexts of the respective community energy companies would be needed to give a clearer picture of why differences are observed.

Findings regarding the regional added value motive are preliminary due to the small number of respondents from the East. Moreover, the differences are smaller than in the case of the return motive (East: 4.6, South: 4.3, North: 4.2, on average). Nevertheless, the East vs. South/North divide may, in this respect, reflect differences in disposable income and wealth which is, on average, significantly lower in the East. This is often given as an explanation why foreign investors dominated the wind energy market in the East. The perception that "others" benefit from these developments may have furthered community energy models based on the motivation to keep a larger part of the value added within the region where the power plant is located.

In order to at least partly disentangle the interrelations between our independent variables, we tested differences in terms of the return motive for a subsample of community wind projects in the North and the South. As reported in the results section, the data suggest that it is the location, at least in the case of community wind, which is the key independent variable here. Further investigations with larger samples are certainly necessary. Therefore, we would take our findings as a first indication of a relationship between location and type of organisation emerging in this field. Moreover, qualitative case studies need to be conducted in order to reveal the factors and modes of action behind this relationship, since location could be an indicator of physical resources, i.e., an ecosystem variable, or of the institutional environment, i.e., a variable for the social, economic and political setting in the socio-technical system framework.

6.4.5 Shifting motives over time

Contrary to our expectations, our sample reveals a significant difference between classes of community energy companies in terms of the year of establishment, even if the means differ not that much in absolute terms. Still, we observe a significantly higher emphasis on the return motive during the years 2009 to 2011, when feed-in tariffs were relatively high and prices for photovoltaics modules were dropping. As a result, photovoltaics projects were economically very attractive. Thus, regulatory framework conditions seem to have an influence on the type of community energy company being established. To put more bluntly, one could speak of a "gold rush" in the period 2009-2011 even within the community energy sector.

The economics of PV projects markedly changed afterwards: Feed-in tariffs for PV were cut down significantly. Under the regulations of the Renewable Energy Sources Act of 2012, PV plants of more than 10 kW installed capacity received remuneration only for 90% of the electricity produced annually ("market integration model", abolished with the 2014 amendment). Since 2014 owners of PV power plants of more than 10 kW installed capacity and 10,000 kWh annual generation have to pay 40% of the Renewable Energy Source Act levy (6.354 ct/kWh in 2016) for the part of the electricity produced by their own plants that they consume themselves. Exemption from the levy is restricted to those cases where the owner of the plant is identical with the consumer. As a result, it became much more difficult to develop economically feasible PV power plants on a community level with a reasonable risk-return profile. This may explain the change in average scores for the return motive in the case of the community energy companies that have been founded since 2012. Many community photovoltaics companies seem to search for new business models. We would therefore expect the new community PV firms to be, on average, more innovative and/or less risk-averse. In addition, this approach also seems to involve a smaller emphasis on the return motive. We do not observe any significant difference in terms of other investment motives. Interestingly, it seems that the return expectations in the community energy sector have not fallen since 2009/10 even if interest rates generally have (Holstenkamp and Ulbrich 2010; Kowallik and Holstenkamp, 2016; Leuphana and Nestle, 2014). Rather, return expectations seem to stay at 3-4% p.a. on average for PV cooperatives or investments in municipal utilities. This corresponds with realised returns on equity which have been, on average, 4% for all community energy companies older than two years in 2013 (ca. 4% for cooperatives and 6% for limited partnerships).

For a thorough analysis of the effects of policy changes, it is certainly necessary to look at more variables than investment motives. More specifically, the number of community energy companies established during different phases and the predominant type of project and/or business model applied would be relevant here. However, the findings still indicate that regulatory framework conditions have a significant impact on either the type of investor attracted or the type of organisation established, or both. An alternative explanation would be that regulatory changes stimulated a shift of investment preferences. Our data suggest that this is true even for a specific subsector or class of investment. However, to investigate these interactions of system structure and cognition more deeply, further studies with a different research design are needed. These studies should be used to first validate findings and second compare institutional and socio-psychological explanations for the shifts observed.

6.5 Conclusions and Policy Implications

Overall, our survey of community energy companies' shareholders and their investment motives shows that environmental concerns and social/political goals seem to dominate. In a sense, community ownership companies constitute "social investments". The return seems to be less important for members of a community ownership company than other motives, even though it is not a negligible factor.

At the same time, we find several significant differences between German community energy companies regarding

- Governance (legal status): Members of limited partnerships tend to place higher value on the return motive than those of (bottom-up) cooperatives.
- Technology: Return on investment plays a higher role for community wind compared with community solar or bioenergy villages. In the latter case, supply with energy is a major investment motive besides environmental and political considerations.
- Ecosystem and social setting (region): There seems to be a North-South divide with higher emphasis placed on the return motive by community investors in the North.
- Economic and political setting (year of establishment): Our data suggest that relatively high feed-in tariffs during the period 2009-2011 triggered a shift either in the predominating type of investor or in the preferences of the same type of investor.

- Function within the company: Contrary to findings in previous studies, we find a significant difference between ordinary members' and mangers' assessment of the return motive.
- Level of investments: We confirm results from previous studies regarding the relationship between level of investments and relevance of the return motive.

Understanding the motives of community investors and the inner logic and functioning of these organisations is essential for policy design, because social investors may act differently compared to other types of investors (Derwall et al., 2011). We did not test reactions of community energy companies to policy changes. Nevertheless, our findings may be used to set up a theory of community energy investment which considers the different types of community ownership. This, in turn, can be used to evaluate policy changes such as the proposed change from feed-in tariffs to a tender-based system in Germany and its implications for different types of community ownership. Despite previous statements that not specific groups of actors were to be supported, but rather the "diversity of actors" as such sustained, the draft for the amended Renewable Energy Sources Act includes preferential treatment of community energy companies in wind energy auctions. However, it is not fully clear on which grounds this exemption is introduced. Moreover, it is unclear how the changes will affect different types of community energy companies. We argue here that if there are significant differences in investment motives as those reported here, it will be worthwhile to analyse impacts of policy changes such as those in Germany currently (as well as those in 2012 and 2014) not only on the community energy sector as a whole, but on the various segments of the community energy sector. We assume that amendments have and will change the composition of the community energy sector.

Moreover, the typology developed can be used for further qualitative and quantitative research on the community energy sector, even if some of the results certainly are country-specific and cannot be transferred directly to other institutional contexts. Results from our analysis of differences across time indicate that changes in the regulatory framework may not only have an effect on the overall investment level of community energy, but also on the composition of investors within the sector or on the stability of preferences. Further research is needed to explore which of these two explanations proves true.

Finally, our findings on members' investment motives may inform future studies on the management of community energy companies, e.g. analyses of firm-level decision-making processes. Differences in the motivational base of managers compared with ordinary members may mean an inherent potential for principal-agent conflicts, especially in times of pressure on current business models.

Acknowledgments
Previous versions of the paper have been presented at the 2014 International Cooperative Alliance Committee on Cooperative Research (ICA CCR) international research conference, Pula, Croatia, 25-28 June 2014, and at the 1st Community Energy Symposium in Lille, France, 3 October 2014. The authors thank participants for helpful comments. Data analysed in this paper have been collected for a study commissioned by the 100 prozent erneuerbar stiftung for the Bündnis Bürgerenergie e.V. (community energy association) and the BUND Deutschland e.V./Friends of the Earth Germany. The authors thank Heinrich Degenhart, Sebastian Neuring, Miriam Quell and Nils Rückheim for their support during data collection and analysis phases and five anonymous reviewers for their helpful comments. The usual disclaimer applies.
Financial support by Wissenschaftsförderung der Sparkassen-Finanzgruppe e.V. (research support of savings banks) and internal university funding in the case of the co-author is gratefully acknowledged.

Tab. 17: Statistical Results Concerning Dependencies of all Motives

	return		energy supply		regional added value		conservation		energy transition		participation		member of community	
	value	sample size	value	sample size	value	sample size	value	sample size	value	sample size	value	sample size	value	sample size
	(df)	V	(df)	V	(df)	V	(df)	V	(df)	V	(df)	V	(df)	V
legal status	74.9330***	312	19.2928**	283	10.3791	311	8.4478	312	15.2516*	317	26.1786***	302	6.5143	306
	(8)	0.3465	(8)	0.1846	(8)	0.1292	(8)	0.1164	(8)	0.1551	(8)	0.2082	(8)	0.1032
technology	85.6819***	315	50.0308***	286	15.9161	314	9.5245	315	10.6156	320	10.8759	305	13.6871	309
	(12)	0.3011	(12)	0.2415	(12)	0.1300	(12)	0.1004	(12)	0.1052	(12)	0.1090	(12)	0.1215
region	75.7567***	315	7.5131	286	16.6214**	314	9.4242	315	9.8752	320	14.6676*	305	3.1373	309
	(8)	0.3468	(8)	0.1146	(8)	0.1627	(8)	0.1223	(8)	0.1242	(8)	0.1551	(8)	0.0712
year of establishment	33.8851***	315	11.3444	286	11.1252	314	6.2024	315	4.7950	320	6.3566	305	14.9848*	309
	(8)	0.2319	(8)	0.1408	(8)	0.1331	(8)	0.0992	(8)	0.0866	(8)	0.1021	(8)	0.1557
ordinary members/ managers	12.2950**	306	9.0885*	278	8.9328*	305	2.2922	305	2.9596	310	13.0677**	296	14.1807***	300
	(4)	0.2004	(4)	0.1808	(4)	0.1711	(4)	0.0867	(4)	0.0977	(4)	0.2101	(4)	0.2174
investment sum	50.3294***	281	9.0189	255	9.1864	281	12.1145	281	13.3510	286	24.1071**	273	11.3066	278
	(12)	0.2443	(12)	0.1086	(12)	0.1044	(12)	0.1199	(12)	0.1247	(12)	0.1716	(12)	0.1164

significant at the: * 10% level; ** 5% level; *** 1% level; df = degrees of freedom; V = Cramèr's V

Tab. 18: Overview of Means for Different Variables

		quantity of responses	mean of motives						
			return	energy supply	regional added value	conservation	energy transition	participation	member of community
legal status	cooperative	175	2.62	2.59	4.24	4.50	4.54	4.32	3.40
	limited partnerships	148	3.96	2.93	4.31	4.60	4.59	4.13	3.37
technology	bioenergy	35	1.67	4.03	4.74	4.57	4.49	4.33	3.76
	photovoltaics	135	2.95	2.28	4.26	4.56	4.59	4.36	3.42
	wind energy	163	3.82	2.73	4.14	4.54	4.55	4.09	3.26
year of establishment	till 2008	13	3.15	1.92	4.62	4.69	4.62	4.38	4.00
	2009-2011	230	3.49	2.79	4.28	4.52	4.53	4.20	3.32
	since 2012	94	2.64	2.55	4.15	4.61	4.64	4.27	3.43
region	north	181	3.83	2.86	4.19	4.57	4.58	4.06	3.38
	east	8	2.88	2.25	4.63	4.43	4.75	4.88	3.25
	south	148	2.54	2.52	4.31	4.54	4.53	4.39	3.40
members	manager	109	2.88	2.41	4.35	4.62	4.65	4.54	3.78
	ordinary member	210	3.43	2.82	4.20	4.51	4.52	4.09	3.23
investment sum	<5,000	127	2.73	2.54	4.18	4.53	4.54	4.23	3.34
	5,000-9,999	34	2.88	3.00	4.53	4.55	4.39	4.47	3.58
	10,000-24,999	93	3.72	2.72	4.23	4.60	4.62	4.14	3.36
	25,000-49,999	24	3.26	2.68	3.90	4.43	4.61	4.05	3.30
	>=50,000	16	3.87	2.76	4.45	4.57	4.60	4.30	3.45

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F Fazit und Ausblick

1 Zusammenfassung und Diskussion der Erkenntnisse

1.1 Adaptiertes SES Framework

1.1.1 Überblick über Anpassungen

Die Fachartikel zeigen, dass sich das SES *framework* grundsätzlich für die Analyse institutionell-organisatorischer Fragen im Kontext der Nachhaltigkeitstransformation des Energiesystems eignet (siehe Fachartikel *E1, E3, E6*). Dazu muss es insofern angepasst werden, als dass die Ursprungsversion auf CPR ausgerichtet war und die technischen Infrastrukturen lediglich als ein Element des Ressourcensystems beinhaltete. In diesem Zusammenhang wird die Integration als eigenständiges Element (TS) neben den „natürlichen" Ressourcensystemen vorgeschlagen. Dann erscheint auch die Bezeichnung „social-ecological-technical system" (SETS) angemessen, mindestens sofern technologische Frage adressiert werden. Darüber hinaus enthalten die Fachartikel eine Reihe von weiteren Anpassungsvorschlägen, insbesondere zur Integration anderer frameworks und Konzepte, namentlich *nodal governance* und *contestation* (*siehe Fachartikel E2*), *energy justice* und Legitimität (*siehe Fachartikel E4, E5*) sowie *varieties of capitalism* (*siehe Fachartikel E4*). Tab. 19 enthält eine Übersicht über die einzelnen Konkretisierungs- und Erweiterungsvorschläge. Auf einige wird im Folgenden näher eingegangen (Typisierung der Organisationsformen und methodische Fragen: Dynamisierung, Abgrenzungen, Verdichtung), andere seien hier nur kurz skizziert:

Tab. 19: Erweiterungen des SES **framework**

Bereich	Erweiterung *framework*	Konzepte/*frameworks*	Element im *framework*	Abschnitt/ Fachartikel
	Anwendung auf Energiesektor	SETS	RS4 = TS	1,3,6
SETTINGS	Polity: Funktionsweise des Staates, lokale politische Kultur		S3	1
	Integration des Finanzsektors			
	- Gestalt des Finanzsektors		S4‘	1,4
	- Wechselwirkungen Finanz-/Energiesystem		S4‘/GS[2]	4,5
GOVERNANCE-SYSTEM	Organisationsformen			
	- Einordnung in *welfare mix*	*welfare mix*	GS5	C,1
	- Differenzierung Genossenschaften		GS5, GS9	1,6
	- Gemeinschaftsunternehmen		GS5, GS9	1,3
	- Intermediäre		GS9	1
	- *nodes*	*nodal governance*	GS9	2
	Kongruenz mit traditionellen Institutionen		GS10/A7	1
	Stärke der Umweltbewegung		GS8/A7	3
AKTEURS-MERKMALE	Normen		A6	
	- Gerechtigkeitsnormen	*energy justice*		4,5
	- Legitimität	*social license to operate*		5
	Wissen, mentale Modelle			
	- Einstellung zu Genossenschaften/ Image		A7	1,3
	- *sense of ownership*		A7 [A5]	1
METHODISCHE FRAGEN	Dynamisierung			
	- technologische und organisatorische Pfade	Pfadabhängigkeit, -bruch	GS10	B,1,2
	- Geschichte der Regulierung		GS10	1
	- Mehrebenendynamik	*contestation*	S4/GS	2
	- Anpassungen Organisationsformen	*double movement*	GS5/9	3
	Abgrenzungen zwischen Elementen des sozialen Systems			
	- Abgrenzung S vs. GS			C,2,4
	- Abgrenzung GS vs. A: Interaktionen A7-GS8, A7-GS6/7			3
	Verdichtung			
	- institutionelle Umwelt	*varieties of capitalism* *bank- vs market-based financial system*	S/GS	4

- Die Zusammenfassung der Erkenntnisse über genossenschaftliche Ansätze der Elektrifizierung im Globalen Süden haben gezeigt, dass Funktionsweise des Staates und lokale politische Kultur, beides der Variable S3 zugeordnet, einen Einfluss auf die Funktionsweise von Elektrizitätsgenossenschaften haben (*siehe Fachartikel E1*). Als Beispiel diente u. a. der Fall der Philippinen. Hier wird vorgeschlagen, unterhalb der zweiten Ebene des *framework* weitere Variablen aufzunehmen, die Informationen zur politischen Kultur und zur Funktionsfähigkeit des Staates enthalten. Dabei kann an entsprechende Stränge in der politikwissenschaftlichen Literatur angeknüpft werden (zu politischer Kultur: Almond & Verba, 1989; Diamond, 1999; Gabriel, 2009; Pickel & Pickel, 2006; zur Funktionsweise des Staates in Afrika: Bayart, 2009; Chabal & Daloz, 1999; Herbst, 2014; Sigman & Lindberg, 2017; Thomson, 2010; in anderen Regionen: Ademmer, Langbein & Börzel, 2019; Hagopian & Mainwaring, 2005; Helmke & Levitsky, 2006). Mit dieser Konkretisierung ist somit zugleich eine Ausdehnung des Inhalts von S3 verbunden, da die Variable bei E. Ostrom (2007) bzw. McGinnis und E. Ostrom (2014) mit „political stability" bezeichnet wird. Bei einer Konkretisierung müsste dann darauf geachtet werden, dass es wegen der Nähe zu Konzepten wie Sozialkapital (A6) – bei McGinnis und E. Ostrom (2014) folglich auf der individuellen Ebene und nicht den Governancesystemen (GS) oder Rahmenbedingungen (S) angesiedelt – nicht zu Überschneidungen kommt.
- In mehreren Fachartikeln wird auf den Zusammenhang zwischen Energie- und Finanzsektor eingegangen. Dabei wird auf den Entwicklungsstand *(siehe Fachartikel E1*), den Finanzsektortyp (*siehe Fachartikel E4*) und die Bedeutung der Finanzmarktregulierung (*siehe E5*) hingewiesen. Je nach Fokus der Analyse bildet der Finanzsektor entweder ein eigenes Governancesystem (GS^2) neben dem Energiesektor (GS^1) oder aber ein „sonstiges Governancesystem" (S4'). Wegen der Bedeutung dieses Sektors wäre zu überlegen, dem Finanzsektor für die Analyse der Organisation des Energiesektors eine eigene Variable auf der zweiten Ebene des *framework* zuzubilligen. Die drei genannten Dimensionen könnten dann Ausprägungen auf der dritten Ebene darstellen.
- Die Kongruenz mit traditionellen Institutionen („Genossenschaftstradition"; *siehe Fachartikel E1, E3*) und die Stärke der Umweltbewegung (*siehe Fachartikel E3*) werden als zwei Konkretionen des Repertoires an Normen und Strategien (GS8) bzw. historischer Kontinuität (GS10) angegeben. Wie die Ausführungen im Fachartikel E3 zeigen, gibt es dabei einen Zusammenhang zu den mentalen Modellen der Akteure (A7): Die Umweltbewegung kann je nach Art des Engagements das Bild bestimmter Technologien prägen, z. B. der Windenergie als Alternative zur Atomkraft (Anti-Atomkraft-Bewegung in Dänemark und Deutschland) oder als Beeinträchtigung des Landschaftsbildes (Landschaftsschutzbewegung in UK). Die „Stärke" der Umweltbewegung in einem

Land bzw. einer Region und der Genossenschaftstradition könnte wiederum als Eigenschaft von GS8/10 abgebildet werden.

- Als wichtige Normen (A6) wurden Gerechtigkeitsvorstellungen – mit Operationalisierungsvorschlag entlang von Prinzipien (*due process, transparency, intra-generational equity, affordability, local economic development, [financial sector] resilience; siehe Fachartikel E4*), deren Bedeutung für andere Kontexte empirisch zu prüfen ist – und Legitimität, d. h. die Erwartungen von Personen an bestimmte Organisationen (*siehe Fachartikel E5*), herausgestellt. Diese fügen sich als Spezifikationen der Variable A6 in das *framework* ein.
- Ähnliches gilt für die Variable A7 (mentale Modelle). Hier werden in den Fachartikeln für die vorliegenden Fragestellungen insbesondere die Einstellung zu Genossenschaften (*siehe Fachartikel E3*) und *sense of ownership* (*siehe Fachartikel E1*) hervorgehoben.

1.1.2 <u>Organisationsformen</u>

Da die Differenzierung der genossenschaftlichen Ansätze im Energiesektor eines der Ziele dieser Arbeit darstellt (*siehe Abschnitte A1.2, B3.4, C4.2*), wird etwas ausführlicher auf die Modifikationen an dieser Stelle eingegangen, die sich aus den Ergebnissen der Fachartikel ergeben. Sollen die Ansätze innerhalb des Dreiecks des *welfare mix* gemäß der Dimensionen Gewinnorientierung (*for-profit/non-profit*), Öffentlichkeit (*public/private*) und Formalisierungsgrad (*formal/informal*) verortet werden, so können bereits Unterschiede zwischen einzelnen genossenschaftlichen Organisationen damit markiert werden: Die Gewinnorientierung reicht von *non-profit* bis *for-profit* (*siehe Fachartikel E1, E6*). Grundsätzlich sind die genossenschaftlichen Organisationen der privaten Sphäre zuzuordnen. In einigen sind jedoch öffentliche Funktionsträger oder Kommunen bzw. lokale und regionale Gebietskörperschaften oder Organe als Mitglieder vertreten (*siehe Fachartikel E1*). Einzelne Genossenschaften können wesentlich von Gemeinden initiiert und geleitet werden, wie das argentinische Beispiel zeigt (*siehe Fachartikel E1*). Der Formalisierungsgrad der genossenschaftlichen Gruppen variiert (*siehe Fachartikel E1*). Allerdings werden auch einige Herausforderungen dieser idealisierten Darstellung deutlich:

- Die Motivationslage ist vielfältiger, als es eine eindimensionale Abbildung nach Grad der Gewinnorientierung einfängt. In Fachartikel E6 wird zwar festgestellt, dass sich die Bürgerenergiegesellschaften in Deutschland primär hinsichtlich der Bewertung des Profitmotivs unterscheiden. Zugleich zeigen die Umfrageergebnisse eine hohe Relevanz der übrigen von der Befragung erfassten gesellschaftlichen Ziele. Im Dreieck müsste man folglich z. B. die GmbH & Co. KGs wohl näher an den For-Profit-Unternehmen ansiedeln als die eingetragenen Genossenschaften. Zugleich wird dies möglicherweise den anderen von Bürgerwindparks in der Rechtsform der GmbH & Co. KG verfolgten Zielen nicht gerecht. Hier wäre mindestens eine zweidimensionale Darstellung (Gewinnorientierung, Verfolgung gesellschaftlicher Ziele) angezeigt.

- Die Darstellung im *welfare mix* lässt die Markierung von Grenzbereichen zu. Hier wäre ggf. zu überlegen, zu einer Darstellung mit Zwischenkategorien überzugehen, um beispielsweise der vorhandenen, aber ggf. schwächeren Gewinnorientierung einiger Bürgerenergiegesellschaften (*siehe Fachartikel E6*) oder den verschwommenen Grenzen zwischen öffentlich und privat bei Beteiligung von Kommunen oder in *village committees* (*siehe Fachartikel E1*) Rechnung zu tragen.

Insgesamt ist zu überlegen, ob anstelle von oder in Ergänzung zu der Benennung von Organisationsformen, die implizit einer Zuordnung zu bestimmten Merkmalsbündeln folgt, eine Explikation eben jener Bündel an Merkmalen erfolgen sollte. Dies würde es erlauben, die Kategorie der „hybriden Organisationen“ besser zu beschreiben und zu differenzieren.

Prinzipiell nicht mit den Organisationsformen verbunden sind die bei Kariuki und Schwartz (2005) zur Differenzierung verwendeten Merkmale Initialisierung und Finanzierung oder die bei der International Bank for Reconstruction and Development [IBRD] (2011) zugrunde gelegte zentrale Kontrolle. Dabei zeigt der Fachartikel E1, dass die Unterscheidung in *top-down* und *bottom-up* wesentlich ist.[84] Im bestehenden SES *framework* ließen sich solche Unterschiede als Spezifizierungen von Eigentums- und Kontrollrechten (GS7), Regeln (GS6) oder Organisationsführung (A5) darstellen, der Prozess der Initialisierung als eine Selbstorganisationsaktivität (I7). Vor dem Hintergrund der Befunde erscheint es aber sinnvoller, den Organisationsformen mindestens eine weitere Dimension – Initialisierung (*top-down*, *bottom-up*) – ggf. auch eine zusätzliche Dimension – Kontrolle (zentral, dezentral) – zuzuweisen. Letztere ließe sich möglicherweise auch als Spezifikation des Regimetyps (GS4) deuten, wobei hier dann ggf. verschiedene Ebenen zu unterscheiden wären: Der Energiesektor könnte beispielsweise grundsätzlich polyzentrisch organisiert sein, die Genossenschaften aber von einer zentralen Instanz kontrolliert werden.

Genossenschaftliche Organisationen im Energiesektor und mit ihnen verbundene bzw. die für sie Regeln setzenden Organisationen bilden in unterschiedlicher Weise Netzwerkstrukturen aus: auf der Makroebene in *governance nodes* (*siehe Fachartikel E2*), untereinander oder mit anderen in Form von Dachgesellschaften (*siehe Fachartikel E3*) oder Gemeinschaftsunternehmen (*co-ownership*; *siehe Fachartikel E1, E3*), sowie zwischen genossenschaftlichen Organisationen und unterschiedlichen Formen von Intermediären (*siehe Fachartikel E1*). Im letztgenannten Fall kann die Art der Beziehung je nach Modell variieren. Poteete et al. betonen mit

[84] Auch für die Bürgerenergiegesellschaften in Deutschland könnte eine solche Unterscheidung – hier nicht staatlich, sondern durch Genossenschaftsbanken oder Stadtwerke initiiert – Unterschiede in den Motivationslagen erklären. Solche Bürgerenergiegesellschaften waren in der Stichprobe im Fachartikel 6 allerdings unterrepräsentiert, sodass dahingehend keine Auswertung vorgenommen werden konnte.

Blick auf die Mehrebenenproblematik, dass ein „social-ecological system can be considered to function as a nested, hierarchical structure, with processes clustered within subsystems at several scales“ (Poteete et al., 2010, S. 244). In der vorliegenden Arbeit wird allerdings die hierarchische Natur solcher Governancestrukturen infragegestellt (*siehe Fachartikel E2*). Insofern könnten alle drei Elemente – *governance nodes*, Intermediäre und Gemeinschaftsunternehmen – als Ausprägungen der Netzwerkvariable (GS9) interpretiert werden.
Die Spezifikationen der beiden zuletzt dargestellten Erweiterungen des *framework* weisen gewisse Ähnlichkeiten zu den Governanceformen bei Williamson auf, denen in nachfolgenden Arbeiten weiter nachgegangen werden könnte. Schließlich sei darauf hingewiesen, dass die Zuordnung zu einer dieser Kategorien nicht statisch ist, sondern sich mit der Zeit ändern kann. In einigen Fällen ist eine solche graduelle Verschiebung sogar explizit in den Regeln festgehalten („graduation“; *siehe Fachartikel E1*). Auch der Formalisierungsgrad kann sich ändern; so sind Formalisierungs- wie auch Informalisierungsprozesse zu beobachten (*siehe Fachartikel E1*).

1.1.3 Methodische Fragen

Die Abbildung von dynamischen Prozessen ist eine der drei methodischen Fragen, die sich aus den Ausführungen in den Kapiteln B und C sowie den Fachartikeln ergeben, neben einigen Abgrenzungsproblemen und der Komplexität vs. Vereinfachung der Darstellung. Prinzipiell lässt sich das SES *framework* so verstehen, dass damit Zustände der Subsysteme zu einem bestimmten Zeitpunkt abgebildet werden – daher die Indexierung in der Abb. 9 in Fachartikel E1. Nun könnte man Prozesse als Übergänge von einem Systemzustand zu einem anderen modellieren (so im Prinzip: McGinnis & E. Ostrom, 2014, S. 10). Das ist allerdings einigermaßen umständlich und je nach zeitlicher Auflösung für viele Ansätze der Theorienbildung überkomplex. Insofern erscheint der Rückgriff auf einfacher strukturierte *frameworks* und Konzepte, wenigstens als Übergangslösung, sinnvoll. Dies wird mit Blick auf die Mehrebenengovernance in Fachartikel E2 als zyklischer Prozess von *contestation* und Koordination sowie die damit verbundenen Anpassungen an der Netzwerkstruktur (*node formation*) und bzgl. Normen und Regeln vollzogen und in Fachartikel E3 mit der Beschreibung als *double movement* mit Blick auf die Reaktionen von Bürgerwindparks auf veränderte regulatorische Rahmenbedingungen verfolgt. Das Konzept der Pfadabhängigkeit und der Pfadbrüche/-kreation (*siehe Kapitel B, Fachartikel E1, E2*) verbindet ebenfalls verschiedene Zustände zu unterschiedlichen Zeitpunkten. Die Geschichte der Regulierung (*siehe Fachartikel E1*) ließe sich demgegenüber vereinfacht als statischer Wert konzeptualisieren, sofern eine Typisierung unterschiedlicher Verläufe von (De-)Regulierungsprozessen vorliegt. Bei einer Erweiterung des *framework* ist allerdings darauf zu achten, dass die Vereinbarkeit mit dem handlungstheoretischen Kern – einem modifizierten Rational-Choice-Ansatz – gegeben ist. Wird davon abgewichen, muss zugleich auch der ursprüngliche Kern des Modells weiterentwickelt werden.

Das zweite methodische Problem in Verbindung mit dem SES *framework*, das hier kurz diskutiert werden soll, sind Abgrenzungsprobleme zwischen Rahmen (S) und Governancesystem (GS) sowie zwischen Struktur (Governancesystem, GS) und *agency* (Akteure, A). In Kapitel C wurden die Grundideen hinter beiden Differenzierungen dargelegt. Bei der erstgenannten betonen etwa McGinnis und E. Ostrom (2014) die Perspektive der Betrachterin/des Betrachters durch Ergänzung des Wortes „focal“. Die Diskussion in Kapitel B und in den Fachartikeln zeigt aber, dass im Energiesektor vielfältige Verbindungen zwischen institutionellem Rahmen, einschließlich „politischer Stabilität“ (S3) und „anderen Governancesystemen“ (S4), besteht. Damit ist ein Fokus allein auf das im Mittelpunkt stehende Governancesystem wenig sinnvoll; die Systemgrenze ist nicht immer eindeutig zu ziehen. S3 und insbesondere S4 müssen grundsätzlich relativ stark ausdifferenziert werden. Alternativ könnten alle institutionellen Variablen zu den Governancesystemen hinzugerechnet werden. Dies wird implizit mit der Modellierung der Multiebenendynamiken in Fachartikel E2 vollzogen. Bei der Unterscheidung zwischen Struktur und *agency* liegt grundsätzlich ein eindeutiges Unterscheidungsmerkmal vor. Hier weisen die Ergebnisse von Fachartikel E3 auf Interaktionen zwischen mentalen Modellen und historischen Erfahrungen bzw. dem Repertoire an Normen und Strategien hin, die bei der Abbildung eines konkreten Falls Schwierigkeiten bei der Zuordnung mit sich bringen können. Die konkrete Zuordnung hängt stark von der Betrachtungsperspektive ab.

Die Analysen zeigen darüber hinaus, dass es einen Bedarf an Vereinfachungen gibt. Denn der Vorteil der genaueren Abbildung aller relevanten SES-Elemente wird mit einer Komplexität der Darstellung erkauft, die Generalisierungen erschwert. Eine Verdichtung von Informationen zum Systemzustand bietet sich beispielsweise mit Blick auf die institutionelle Umwelt an, wie der Fachartikel 4 mit Rückgriff das Konzept von *varieties of capitalism* zeigt. Hier müssten weitere Forschungsarbeiten zeigen, beispielsweise mit Blick auf die oben genannten Fragen politischer Kultur und Funktionsweise des Staates in verschiedenen Regionen, welche Typisierungen zwecks Verdichtung von Informationen im jeweiligen Analysekontext sinnvoll sind.

1.2 Rolle genossenschaftlicher Ansätze in der Transformation des Energiesystems und ihre Entwicklung

1.2.1 Diskussion der Erkenntnisse aus den Fachartikeln bezüglich der Rolle genossenschaftlicher Ansätze

Neben der Adaption des SES *framework* für die Analyse der institutionell-organisatorischen Seite von Nachhaltigkeitstransformationen im Energiesystem ist es Ziel der vorliegenden Arbeit, zu einer Klärung der Rolle genossenschaftlicher Ansätze und ihrer Entwicklungen beizutragen. Bezüglich beider Aspekte – Rolle und Entwicklung – werden im Folgenden jeweils knapp die Erkenntnisse aus den Fachartikeln vor dem Hintergrund der aus der Literatur bekannten Zusammenhänge diskutiert.

Die einzelnen Fachartikel weisen auf verschiedene Rollen hin, die genossenschaftliche Ansätze mit Blick auf die Nachhaltigkeitstransformation des Energiesektors einnehmen können. Diese lassen sich unter Rückgriff auf theoretische Überlegungen wie folgt gliedern:

- „Failure Theories“

Versorgen andere private und staatliche Organisationen eine Region nicht bzw. nicht ausreichend mit Elektrizität, kann mit genossenschaftlichen Ansätzen diese „Lücke“ geschlossen werden. Ähnlich wird mit Blick auf die Entwicklung von Erneuerbare-Energien-Vorhaben argumentiert. Dabei zeigen die Ausführungen im Fachartikel E1, dass diese Lücke zumeist nicht von den genossenschaftlichen Organisationen allein, sondern mit Unterstützung durch Intermediäre und/oder den Staat, geschlossen wird. Eine Lücke kann auch dann entstehen, wenn sich der Staat zurückzieht (Israel, 1992; Theurl, 2011). Etwas anders, aber mit der gleichen Konsequenz, argumentieren Yadoo und Cruickshank (2010), wenn sie betonen, unterschiedlichen Organisationen werde unterschiedlich hohes Vertrauen entgegen gebracht. Dieses Vertrauen ist aber an bestimmte Erwartungen geknüpft, wie die Überlegungen im Fachartikel E5 illustrieren; insofern ist das Vertrauen keine statische, fixe Zuschreibung zu bestimmten Organisationsformen. Beide Argumentationslinien weisen Ähnlichkeiten mit den *public goods theories* und *trust-related theories* von Non-Profit-Organisationen auf (Anheier, 2014).
Barnes und Foley (2004) sehen eine besondere Rolle genossenschaftlicher Organisationen dann, wenn die institutionelle Umwelt (S3 und/oder GS4) insgesamt schwach ist. Der Überblick über die Erfahrungen mit genossenschaftlichen Ansätzen im Energiesektor im Globalen Süden (*siehe Fachartikel E1*) zeigt allerdings, dass diese nur dann erfolgreich agieren und in diesem Sinne „funktionieren“, wenn sie u. a. auf eine gewisse Genossenschaftstradition aufbauen können – die aber kein Erfolgsgarant ist (*siehe Fachartikel E3*) – und gewisse Ressourcen in der lokalen Bevölkerung vorhanden sind (S1: Entwicklungsstand). Letzteres scheint auch die potenzielle Rolle bei der Entwicklung erneuerbarer Energien in ärmeren Regionen zu begrenzen (*siehe Fachartikel E1*).

- Ressourcenmobilisierung

Es werden finanzielle Ressourcen, „sweat equity“ und lokales Wissen mobilisiert, um gesellschaftliche Ziele (Zugang/Aufbau des Elektrizitätssystems, ökologische Nachhaltigkeit/Umbau des Elektrizitätssystems) zu erreichen (*siehe Fachartikel E1, E6*).

- Genossenschaften als Innovatoren

Die Überlegungen im Fachartikel E2 zu *contestation* zeigen, dass hybride Organisationen, die in einer „konstruktiv-pragmatische[n] Wende“ (Mautz et al., 2008, S. 43) des Protests entstehen, als Innovatoren tätig werden können. Bei geringem ökonomischem Entwicklungsstand einer Region ist aber eher davon auszugehen, dass die genossenschaftlichen Organisationen als Nachahmer fungieren, also in einem zeitlichen Nachlauf etwa auf erneuerbare Energien umstellen (*siehe Fachartikel E1*). Insofern wirken sie partiell verstärkend bei der Etablierung im Markt. In dieser Rolle könnte die diskutierte katalytische Wirkung (*siehe Kapitel B*) eintreten.

- Partizipation und Akzeptanz

In mehreren Fachartikeln wird auf die Frage nach Partizipation und Akzeptanz eingegangen: auf den Einfluss, den die Organisationsform auf einzelne Gerechtigkeitsdimensionen gemäß Interviewpartner hat, v. a. mit Blick auf lokale ökonomische Entwicklung und intra-generationale Gerechtigkeit (*siehe Fachartikel E4*), die Öffnung wenigstens für einen Teil der Bevölkerung (*siehe Fachartikel E5*) und die Bedeutung, die das Motiv, an der Energiewende teilzuhaben, bei der Investitionsentscheidung spielt (*siehe Fachartikel E6*). Man kann das Engagement im Sinne von contestation auch als eine Form des Protests, der Entwicklung von Alternativen und damit als „voice" im Sinne von Hirschman (1970) sehen. Hier klingt mithin die politische Rolle partizipativer Organisationsformen an, die in verschiedene Gesetze zur verpflichtenden Teilhabe mündete (Maly, Meister & Schomerus, 2018; Olsen, 2014; *siehe auch Fachartikel E3*) – in Hirschmanscher Terminologie zwecks Erzeugung von „loyalty" (Hirschman, 1970).

1.2.2 Diskussion der Erkenntnisse aus den Fachartikeln bezüglich der Entwicklung genossenschaftlicher Ansätze

Neben der Rolle adressieren die Fachartikel auch verschiedene Phasen der Entwickung genossenschaftlicher Organisationen im Energiesektor. So wird im Fachartikel E2 die Hypothese aufgestellt, dass es insbesondere (späte) Phasen von *contestation* sind, in denen sich hybride Organisationsformen bilden. Diese Hypothese gilt es, in nachfolgenden Arbeiten empirisch zu prüfen. Die oben bereits genannten Ausführungen zur Schließung einer von staatlichen und privaten Organisationen belassenen „Lücke" betreffen ebenfalls die Gründungsphase.

Wird diese Lücke geschlossen und tritt Konkurrenz zu genossenschaftlichen Organisationen auf, sind zudem höhere Investitionssummen aufzubringen und regulatorische Rahmenbedingungen so verändert worden, dass sie das Risiko für die Teilnehmer erhöhen, wie etwa in der Weiterentwicklung des Windenergiesektors in Europa, so erhöht sich zwar der Druck auf die Genossenschaften. Sie finden aber – wenigstens partiell – Kooperationsstrategien („double movement"; *siehe Fachartikel E3*), um zu überleben und sich weiterzuentwickeln. Damit verändert sich die Governancestruktur dieser Organisationen. Sie verschwinden damit nicht, wie vielleicht die Überlegungen Hanisch (2006) nahelegen würden. Für ein abschließendes Urteil hierzu ist allerdings die betrachtete Zeitspanne zu kurz, wenn man dies mit den Untersuchungen zu historischen Elektrizitätsgenossenschaften vergleicht (Holstenkamp, 2018b).

Drei weitere Aspekte der Entwicklung des genossenschaftlichen Energiesektors werden in den Fachartikeln ausgeführt:

- Die Entwicklung ist an Möglichkeiten der Finanzierung, damit an die Entwicklung eines entsprechenden Segmentes des Finanzsektors gebunden – die an verschiedenen Stellen bereits angesprochene Koevolution von Energie- und Finanzsektor (*siehe Fachartikel E4*).
- Entsprechen die realisierten Partizipationswirkungen nicht den Erwartungen der Stakeholder, kann dies die Legitimität genossenschaftlicher Beteiligungsformen beeinträchtigen. Zugleich liegt es nahe, dass staatliche und nichtstaatliche Akteure in diesem Fall nach alternativen Möglichkeiten der Einbindung andere Bevölkerungsschichten suchen (*siehe Fachartikel E5*). Die Form der Beteiligung ändert sich mithin. Das gilt beispielsweise auch für die als Reaktion auf die verpflichtende finanzielle Teilhabe entstandenen organisatorischen Gebilde etwa in Dänemark und vermutlich die in Mecklenburg-Vorpommern entstehenden (*siehe Fachartikel E3*).
- Veränderte regulatorische Rahmenbedingungen können dazu führen, dass sich die Motivlage in genossenschaftlichen Organisationen verändert – so beobachtet für die Bürgerenergiegesellschaften in Deutschland in der Zeit hoher Fördersätze für die Photovoltaik (*siehe Fachartikel E6*).

Zusammengenommen ergibt sich daraus das Bild eines zyklischen Verlaufs der Entwicklung genossenschaftlicher Organisationen, mit großer Bedeutung in frühen Entwicklungsphasen (Zugang und ökologischer Umbau), insbesondere bei der Verbreiterung der Basis, und wiederkehrender Bedeutung im Zuge von Strategien, die politische Legitimität des Transformationsprozesses zu erhalten. Auch wenn daraus noch keine geschlossene (einzelne) Theorie genossenschaftlicher Ansätze im Energiesektor folgt, werden damit doch einzelne Bausteine beschrieben, die es mit weiterführenden Arbeiten und Erkenntnissen zur Geschichte (Berka; Holstenkamp, 2018b) und zu aktuellen Entwicklungen in unterschiedlichen Ländern, auch über die in der vorliegenden Arbeit betrachteten hinaus (Berka & Creamer, 2018; Hoicka & MacArthur, 2018; Kooij et al., 2018), abzugleichen und weiterzuentwickeln gilt.

2 *Weitergehende Forschungsfragen und Einbettung in übergeordnete Forschungsprogramme*

2.1 Offene Einzelfragen

Nach dieser Zusammenfassung und Diskussion wesentlicher Ergebnisse mit Blick auf die Anpassung und Anwendung des SES *framework* zwecks Analyse institutionell-organisatorischer Fragen einer nachhaltigen Energieversorgung wird im Folgenden ein Ausblick auf weitergehende Forschungsfragen gegeben. Dabei wird die Einbettung der Erkennntnisse in übergeordnete Forschungsprogramme diskutiert. Bei den Ausführungen in dieser Arbeit sind an verschiedenen Stellen einzelne Fragen aufgeworfen worden, die an der jeweiligen Stelle nicht vertieft werden konnten. Diese werden hier zunächst im Überblick dargestellt.

- Ergänzung der interdisziplinären Institutionenanalyse um einen transdisziplinären Ansatz

Die in der Arbeit vorgelegten Ergebnisse tragen insbesondere dazu bei, Systemwissen zu generieren, nämlich ein besseres Verständnis der Entwicklungen und Funktionsweisen von genossenschaftlichen Lösungen im Energiesektor in unterschiedlichen Kontexten. Dabei werden in den Fachartikeln einzelne Fragen zum Management solcher genossenschaftlichen Organisationen aufgeworfen, u. a. mit Blick auf mögliche Agency-Probleme angesichts signifikant unterschiedlicher Motivlagen der Vorstände und Aufsichtsräte bzw. Geschäftsführer im Vergleich zu einfachen Mitgliedern (siehe *Fachartikel E6*). In ähnlicher Weise lässt sich aus dem Befund steigenden Drucks auf den Bürgerwindparksektor (*siehe Fachartikel E3*) ein Bedarf an Handlungswissen ableiten. Hierzu wäre ein transdisziplinärer Forschungsansatz naheliegend (Schaltegger et al., 2013). Dazu kann der in dieser Arbeit vorgelegte interdisziplinäre institutionenökonomische Ansatz genutzt werden. Er müsste im Sinne des betriebswirtschaftlichen Leitbildes des „vernünftigen Gestaltens“ (D. Schneider, 2001) zur Entwicklung von Empfehlungen für das Management genossenschaftlicher Organisationen genutzt werden.

- Ausweitung der empirischen Basis

Die empirische Basis in den Fachartikeln sollte in nachfolgenden Arbeiten ausgeweitet werden. Für die Frage nach den Motiven von Mitgliedern von Bürgerenergiegesellschaften liegen inzwischen weitere Arbeiten vor (neben Bauwens, 2016, u. a.: Ebers Broughel & Hampl, 2018; Fleiß, Hatzl, Seebauer & Posch, 2017), mit denen die vorliegenden Erkenntnisse verglichen werden können. Eine Metaanalyse dieser Studien könnte Hinweise auf die Ursachen für einige Abweichungen liefern. So deuten bereits die Ergebnisse im Fachartikel E6 bezüglich der Unterschiede zwischen Genossenschaften und GmbH & Co. KGs darauf hin, dass zwischen beteiligungs- und eher investmentorientierten Formen unterschieden werden müsste (so dann auch: Hatzl, Seebauer, Fleiß & Posch, 2016).
Mit Blick auf genossenschaftliche Elektrifizierungsansätze im Globalen Süden könnten regional- und länderspezifische oder thematisch vertiefende Untersuchungen durchgeführt werden, um die vorhandenen Lücken zu schließen. Eine Ausdehnung der Betrachtungszeiträume und Erhöhung der Zahl an Vergleichsländern könnte weitere Erkenntnisse mit Blick auf die Entwicklung von genossenschaftlichen Windparks und der Prinzipien von *energy justice* liefern. Zudem sind weitere qualitative und quantitative Untersuchungen notwendig, um ein besseres Verständnis der Mitgliederselektion von Bürgerenergiegesellschaften zu entwickeln.

- Politökonomische Analyse

Bei der Analyse der Regulierung von Energiemärkten liegt es nahe, politökonomische Ansätze zu integrieren und entsprechende Fragestellungen zu vertiefen. Dies beinhaltet auch die Frage von Machtverschiebungen im politischen Prozess (Avelino & Wittmayer, 2016). Zudem könnte das von Polanyi (1944) entlehnte Konzepte des *double movement* mit Blick auf die Veränderungen im genossenschaftlichen Windenergiesektor weiter ausgeführt werden (*siehe Fachartikel E3*).

- *sense of ownership* bei unterschiedlichen finanziellen Arrangements

Für den Entwicklungsländerkontext wurde ausgeführt, dass es nicht zwingend nur, vielleicht nicht einmal primär, auf Eigentum (GS7: *property rights*), sondern vielmehr auf „sense of ownership" (A7: mentale Modelle) – sozialpsychologisch gewendet könnte man mit Bandura (1979) von Selbstwirksamkeit sprechen – ankomme (*siehe Fachartikel E1*). Diese Hypothese bedarf der weiteren Prüfung. Sollte sie nicht widerlegt werden, könnte man hieran auch für Fragestellungen zu den Akzeptanzwirkungen finanzieller Beteiligung von Bürgerinnen und Bürgern oder von Kommunen anknüpfen (Holstenkamp, 2018a).

Zwei weitere über die vorliegende Arbeit hinausweisende Fragen werden im Folgenden erörtert: die eine betrifft Aspekte, die mit dem Vergleich verschiedener alternativer Organisationsformen zusammenhängen, die andere Querbezüge zu anderen Forschungsfeldern.

2.2 Genossenschaftliche Ansätze im Vergleich zu anderen Organisationslösungen

In der vorliegenden Arbeit wird mit genossenschaftlichen Ansätzen eine spezifische Gruppe von Organisationslösungen adressiert (*siehe Übersicht in Abschnitt F1.1*). Sowohl im Kontext der (ländlichen) Elektrifizierung im Globalen Süden als auch mit Blick auf eine (ökologisch) nachhaltigere Versorgung im Globalen Norden stellt sich die Frage nach einer adäquaten, an den jeweiligen Kontext angepassten Organisationsform. Die Erkenntnisse aus dieser Arbeit können damit in einen solchen Vergleich unterschiedlicher Organisationsformen einfließen. Dafür müssten sie um eine Analyse der Erfolgskriterien für genossenschaftliche Ansätze im Sinne von „design principles" (Agrawal, 2001; M. Cox, Arnold & Villamayor Tomás, 2010; E. Ostrom, 1993; Wilson, E. Ostrom & Cox, 2013) erweitert werden. Hierzu liefert die vorliegende Arbeit Hinweise auf relevante Kontextbedingungen und Einflussfaktoren. Ähnliche Kriterien der Angemessenheit müssten für andere Organisationsformen entwickelt werden. Daraus ließe sich ein „diagnostic tool" (Estache, 2016) entwickeln, also eine Heuristik, die eine Aussage darüber erlaubt, in welchem Fall und unter welchen Bedingungen welche Organisationsform erfolgversprechend ist. Insgesamt fehlt es für eine solche Analyse bislang an hinreichend empirischen Daten. So zeigen zwar Gollwitzer et al. (2018) die Anwendbarkeit eines solchen Vorgehens anhand einer angepassten Liste an Prinzipien. Die Zahl der betrachteten Fälle ist mit zwei Anwendungen in Kenia aber gering; eine Überprüfung anhand eines Datensatzes einer mittleren oder großen Zahl an Fällen analog zu den Arbeiten über CPR wäre notwendig (Baggio et al., 2016). Solche Designprinzipien können nicht nur für die Evaluation von politischen Maßnahmen, sondern auch zur Gestaltung konkreter Projekte genutzt werden (Acosta et al., 2018).

Schließlich sei die Diskussion um die Evaluationskriterien, die in Kapitel B anklang, wieder aufgegriffen: Sollen unterschiedliche Organisationsformen, beispielsweise die Leistungsfähigkeit unterschiedlicher Formen hybrider Organisationen, miteinander verglichen werden, so ist zu klären, nach welchen Kriterien dies erfolgen soll. Dabei ist in Kapitel B bereits diskutiert worden, dass das Kriterium der (statischen) Pareto-Effizienz aus vielerlei Gründen nicht adäquat ist. Vielmehr legen die hier vorgelegten Arbeiten zu *energy justice* und sozialer Inklusivität nahe, dass auch diese beiden Aspekte Berücksichtigung finden sollten – beispielsweise in der vorgelegten Operationalisierung anhand der identifizierten sechs Prinzipien (*siehe Fachartikel E4*). Eines dieser Prinzipien, die Resilienz, wäre dafür weiter zu konkretisieren (Grashof et al., 2019). Die damit zusammenhängenden Fragen stehen den Überlegungen nahe, die North dazu bewogen haben, das Konzept der Anpassungseffizienz zu formulieren. Genossenschaftliche Ansätze können möglicherweise im Zusammenspiel mit anderen Formen der Organisation dazu beitragen, dass die Resilienz des Energiesystems erhöht wird. Dies kann als Hinweis darauf gesehen werden, dass bei einem Vergleich von Organisationsformen eine isolierte Betrachtung einzelner Formen nicht hinreichend für die Beurteilung der Gesamtwirkungen ist.

2.3 Erkenntnisse als Beitrag zur Sozialunternehmensforschung und zu *Sustainable Finance*

2.3.1 Soziale/nachhaltige Unternehmen und soziales/nachhaltiges Unternehmertum

Neben der sozialwissenschaftlichen Energieforschung, in die sich die Erkenntnisse aus der vorliegenden Arbeit einfügen und der auch der zuvor behandelte Vergleich unterschiedlicher Organisationsformen zuzurechnen ist, können die vorliegenden Untersuchungen auch als Teil zweier anderer übergeordneter Forschungsprogramme angesehen werden, zu denen Brücken geschlagen werden können: *social/sustainable enterprises* und *social/sustainable entrepreneurship* auf der einen sowie *sustainable finance* auf der anderen Seite. Soziales Unternehmertum und Ansätze sozial motivierter Investition und Finanzierung werden in der sozialwissenschaftlichen Literatur als organisatorisch-finanzielle Mittel zur Erreichung von Nachhaltigkeitszielen beschrieben und analysiert. In der entwicklungspolitischen Diskussion, aber auch im Kontext begrenzter staatlicher Ressourcen im Globalen Norden, werden unter den Schlagwörtern von „blended finance“ und „leveraging private capital“ hybride finanzielle Arrangements diskutiert.

In der vorliegenden Arbeit wurden genossenschaftliche Ansätze im Energiesektor als soziale Unternehmen bzw. soziale Investitionen klassifiziert. Sie stellen damit ein Teilsegment dar. Insofern liegt es nahe, Querbezüge zur Literatur von *social/sustainable enterprises* und *social/sustainable entrepreneurship* herzustellen (Hein & Kappel, 2015; Schaltegger, Beckmann & Hockerts, 2018a). So konstatiert Beckmann (2011) beispielsweise, dass Sozialunternehmen insbesondere dort gegenüber gewinnorientierten Unternehmen komparative Vorteile aufwiesen, wo die institutionelle Rahmenordnung fehlerhaft oder schwach ausgeprägt sei. Zudem könnten Sozialunternehmen als institutionelle Innovatoren fungieren. Dies korrespondiert mit den obigen Ausführungen zur potenziellen Rolle genossenschaftlicher Ansätze (*siehe Abschnitt F1.2*). Hier kann die Betrachtung einzelner institutioneller Arrangements weitere Hinweise liefern, wovon die Eignung konkreter Organisationslösungen abhängt. Dies führt auf den unter F2.2 diskutierten Vergleich institutioneller Arrangements zurück.

Ein anderes Beispiel für eine solche Brücke zwischen der vorliegenden Arbeit und der Literatur zu Sozialunternehmen ist das als „mission drift" (Ebrahim, Battilana & Mair, 2014; Fowler, 2000; Jones, 2007) bezeichnete Phänomen, d. h. die formulierte Mission der Organisation existiert noch formal, nicht aber im alltäglichen Handeln. Im sechsten Fachartikel wurde gezeigt, dass unter bestimmten Rahmenbedingungen gesellschaftliche Zielsetzungen von Investorinnen und Investoren gegenüber Gewinnorientierung zurücktreten kann. Man könnte dies ebenfalls als einen Fall von *mission drift* kennzeichnen. Zu fragen ist ferner, ob es im Zuge der Professionalisierung von Bürgerenergiegesellschaften ebenfalls zu solchen Prozessen kommt.

2.3.2 Nachhaltigkeitsfinanzierung (sustainable finance)

In ähnlicher Weise können Verbindungslinien zur Sustainable-Finance-Literatur gezogen werden. Ein Beispiel ist die Arbeit von Kahla (2019) zur Finanzierungsstruktur von Bürgerenegiegesellschaften, in der sie teilweise auf Literatur zur Finanzierung von Sozialunternehmen zurückgreift (auch: Holstenkamp, Kahla & Degenhart, 2018). Die Erkenntnisse der vorliegenden Arbeit bieten zwei verschiedene Ansatzpunkte für eine Integration in die Forschung zu *sustainable finance*:

- in theoretischer Perspektive lassen sie sich als ein Beitrag zur Weiterentwicklung der (klassischen und) institutionalistischen Finanztheorie verstehen, die als theoretische Basis für die Analyse von *sustainable finance* dienen kann;
- in anwendungsbezogener Perspektive ergänzen sie aktuelle Überlegungen zur Integration privatwirtschaftlicher Investorinnen und Investoren bei der Finanzierung von Vorhaben, die zu einer nachhaltigen Entwicklung beitragen sollen – vielfach unter dem Begriff „blended finance" diskutiert.

Die in der Arbeit betrachteten Zusammenhänge zwischen Energie- und Finanzsystem sowie die Betrachtung der institutionell-organisatorischen Zusammenhänge aus der Finanzierungsperspektive („finanzielle Arrangements") verweisen auf das „institutionelle[.] Netz" (Schmidt & Terberger, 1997, S. 461) finanzieller Beziehungen. In der finanzwirtschaftlichen Forschung lassen sich grob vier theoretische Zugänge mit teilweise unterschiedlichen Untersuchungsgegenständen unterscheiden (Barberis & Thaler, 2003; Perridon, Rathgeber & Steiner, 2017; Schmidt & Terberger, 1997; Wang, 2008):

(1) die klassische Finanztheorie (Analyse von Finanzierungsformen, Entwicklung von Kennzahlen, Finanzplanung);
(2) die moderne neoklassische Kapitalmarkttheorie (Bewertung bestehender Finanztitel, *financial engineering*);
(3) die neue Institutionenökonomik (Existenz von Finanzintermediären und optimale Ausgestaltung von Finanzverträgen) und
(4) die verhaltensökonomische Finanztheorie oder *behavioral finance* (Analyse des Entscheidungsverhaltens von Akteuren auf den Finanzmärkten).

Institutionelle Fragen werden in der klassischen und der neoinstitutionalistischen Finanztheorie untersucht. Die vorliegende Analyse geht über die in neoinstitutionalistischen finanzwirtschaftlichen Arbeiten üblicherweise betrachteten Informations- und Anreizprobleme hinaus. Sie greift dabei überwiegend auf institutionenanalytische Ansätze aus anderen Teilbereichen der Wirtschaftswissenschaften und aus anderen Disziplinen zurück. Der hier verfolgte Ansatz könnte damit einen Beitrag zur Weiterentwicklung der theoretischen Basis von *sustainable finance* leisten.

Demgegenüber betrifft der zweite Ansatzpunkt eine überwiegend anwendungs- bzw. policy-orientierte Literatur, diejenige zu „blended finance“ (Clark, Reed & Sunderland, 2018; OECD, 2018) bzw. zu Ansätzen, öffentliches Kapital durch Kombination mit privatem zu „hebeln“ (Kharas & McArthur, 2014; Lindenberg, 2014). Auch Arbeiten zu strukturierten Fonds im Bereich der Stadtentwicklung können zu dieser Literatur gezählt werden (Degenhart, Clausen & Holstenkamp, 2011; Nadler & Nadler, 2018). In diesen Arbeiten wird explizit eine institutionell-organisatorische Perspektive auf solche finanziellen Arrangements eingenommen. Wie bei den Sozialunternehmen können auch solche institutionellen Arrangements den hier diskutierten genossenschaftlichen Ansätzen als Teilsegmente des Universums hybrider Organisationsformen gegenübergestellt werden. Zudem sind Querbezüge erkennbar, wo Genossenschaften aufgrund begrenzter Managementkapazitäten und finanzieller Ressourcen staatliche Mittel in Anspruch nehmen bzw. Gemeinschaftsunternehmen mit staatlichen Akteuren gründen. Solche *public-community partnerships* bzw. *public-citizen partnerships* finden sich nicht nur im Globalen Süden (Allan, 2012), sondern werden auch im Globalen Norden diskutiert (R. Lang, Rößl & Weismeier-Sammer, 2013; Wessel, 2016) – u. a. zur Erhöhung der Legitimität oder Stärkung einzelner Dimensionen von *energy justice* (Holstenkamp, 2014). Bei der Diskussion um *blended finance* stehen zumeist große Organisationen und hohe Investitionsbeträge im Fokus. Mag dies angesichts der global benötigten Investitionsbeträge auch nachvollziehbar sein, so geraten damit doch kleine, an lokale Kontexte angepasste finanzielle Arrangements aus dem Blick – u. a. die in der vorliegenden Arbeit betrachteten genossenschaftlichen Ansätze als eine mögliche Alternative.

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EnWG. Gesetz über die Elektrizitäts- und Gasversorgung (Energiewirtschaftsgesetz - EnWG) vom 07.07.2005 (BGBl. I S. 1970, 3621), das zuletzt durch Artikel 3 des Gesetzes vom 17.12.2018 (BGBl. I S. 2549) geändert worden ist

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Anlagen

Anlage zum Artikel 1

Appendix C: Overview of literature – document type, methodology, journal, and countries

Ref	Document type	Data	Meth	Journal	Country/countries	Comments	Year
1	WPR	E,O,N	CS/D		Burkina Faso, Cambodia, Mali, Nepal, Philippines, Sri Lanka		2009
2	WPR	N			Ethiopia		2017
3	WPR	E	S		Bangladesh		2010
4	WPR	E	D,I		Bangladesh	evaluation of support for sector	2003
5	JA	E	CS	Technological Forecasting and Social Change	Bangladesh		2009
6	WPR	E	S		Bangladesh		2002
7	WPR	E	S		Bangladesh	socio-economic impact evaluation	2011
8	WPR	E,O	I		Bangladesh	REB/PBS, case study: CEWDC	2004
9	WPR	O,N			Argentina, Bangladesh, Bolivia, Brazil, Chile, Costa Rica, Ecuador, India, Nicaragua, Philippines, Vietnam		2004
10	WPR	N			Argentina	power sector reform	2001
11	WPR	O			Argentina		2005
12	JA	O		Monthly Labor Review	Argentina	cooperative sector development	1941
13	WPR	O,N			Bangladesh	CEWDC case, gender focus	2005
14	WPR	E	CS		Dominican Republic	cooperative law focus, here: example	2006
15	Th	O			Bangladesh	focus on Grameen Shakti	2012
16	BC	O			Costa Rica		2017
17	WPR	O,N			Argentina, Bangladesh, Bolivia, Brazil, Cambodia, Costa Rica, India, Philippines, South Africa, South Sudan, Uganda	DIV	2013
18	WPR	N			Burkina Faso		2005
19	CP	E	CS/I		Costa Rica		2016

20	WPR	O			Costa Rica		2017
21	WPR	O			Burkina Faso		2017
22	JA	N			Chile		2016
23	WPR	E	CS		Bangladesh		2006
24	WPR	E	CS		Dominican Republic	project final report	2008
25	JA	E	PO	European Journal of Development Research	Burkina Faso	institutional capture by local elites with refs to Bierschenk & Olivier de Sardan	2008
26	JA	E	CS	Energy Policy	Bangladesh	unclear if own data	2013
27	JA	N		Annals of Public and Cooperative Economics	Argentina	public services	1996
28	WPR	E,N	CS/D		Burkina Faso, Democratic Republic of Congo	mini-grid initiative	2017
29	JA	O		Energy for Sustainable Development	Bangladesh	cooperatives mentioned	2004
30	Th	N			Bangladesh	theoretical exploration of REC model	2003
31	IT	O			Democratic Republic of Congo	Genema project description	
32	JA	E	R	Energy Policy	Bangladesh	DEA analysis+Tobit	2009
33	BC	E	CS		Bangladesh		2007
34	WPR	E	CS		Cambodia		2007
35	IT	E	CS		Brazil	background for awards; CRERAL	2008
36	IT	E	CS		Bangladesh	background for awards; CEWDC	2009
37	IT	E	CS		Brazil	background for awards; CRELUZ	2010
38	JA	N		Annual Review of Energy and the Environment	Bangladesh, India	Pura case	1996
39	WPR	N			Argentina, Bolivia, Brazil, Chile		2003
40	WPR	O,N			Kenya, South Africa, Zambia, Zimbabwe		2017
41	WPR	N			Argentina		2009
42	WPR	N			Bangladesh, Indonesia		1986
43	WPR	O			Bangladesh		2009
44	CP	O,N			Argentina, Bolivia, Brazil, Chile		2000
45	WPR	N			Bangladesh, China, India, Indonesia, Philippines, Vietnam, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Nicaragua		1992

46	M	N			Bangladesh, India, Indonesia, Philippines, Argentina, Bolivia, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Nicaragua, Peru, Venezuela		1999
47	WPR	O,N			Bangladesh, India, Indonesia, Philippines, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Peru		1990
48	Th	O			Argentina		2015
49	WPR	N			Bangladesh		2004
50	JA	E	CS	Energy for Sustainable Development	Bangladesh	CEWDC	2003
51	JA	O		CIRED-Open Access Proceedings Journal	Brazil	regulation	2017
52	WPR	N			Brazil	energy sector Brazil (incl. rural coops)	2005
53	WPR	O,N			Bangladesh, Philippines, Sri Lanka, Bolivia		2006
54	JA	O,N			Indonesia, Sri Lanka		2013
55	WPR	E,N	CS		Zimbabwe, Zambia	Chipendeke, Himalaya; Mpanta	2016
56	JA	O		Energy and Environment Research	Uganda	BECS, PACMECS	2013
57	IT	N			Uganda	BECS, PACMECS	2017
58	WPR	E,O	CS/D,I		Tuvalu, Fiji	TSECS evaluation study; see Annex 1 for other experiences	1999
59	JA	N		Mitigation and Adaptation Strategies for Global Change	Sri Lanka		2011
60	JA	O		Refocus	Sri Lanka	2 cases	2004
61	Th	E,N	PO, I		Thailand, China		2004
62	JA	N		Tourism Planning & Development	Thailand	Mae Kampong case	2014
63	Th	O			Thailand	Mae Kampong case	2010
64	WPR	E	S		Thailand	Mae-ton-luang, Pang-bong cases; CBA of forest protection	1998
65	JA	O		Energy Policy	Tanzania	Urambo, Mbinga	2002
66	WPR	O			Tanzania		2005
67	WPR	O,N			Tanzania, South Africa	Urambo case	2008
68	WPR	E,O	CS/I		Tanzania	LUMAMA, Leganga; general: community-owned mini-grids	2017

69	CP	E	Eng		Tanzania	Urambo, Mbinga	2013
70	WPR	O			Mali, Tanzania	MFPs, Urambo case	2005
71	NA	E	CS	Renewable Energy for Development (SEI, Energy Program)	Tanzania	Urambo case	2004
72	M	N			Bangladesh, India, Fiji, Philippines		1992
73	WPR	E,N	I,S,PO		Tanzania, Colombia, Nicaragua, Ecuador, Costa Rica, Bolivia, India, Nepal	UECCO focus	1999
74	WPR	E	CS		Kenya, Tanzania	Tungu-Kabiri, UECCO	2004
75	JA	E	CS	Energy Policy	Tanzania	Urambo	2005
76	JA	O		Energy Policy	Solomon Islands	Voko case	1997
77	JA	O		Renewable and Sustainable Energy Reviews	PACIFIC	refs to coops, community-based systems	2014
78	JA	N		Renewable Energy	Tuvalu	TSECS	2000
79	JA	O		Journal of Environmental Management	Solomon Islands	Voko case	1997
80	WPR	O			Fiji		2009
81	WPR	O			Fiji		2013
82	WPR	E	CS		Tuvalu	TSECS	2005
83	WPR	O			Tuvalu		2013
84	WPR	O			Tuvalu	TSECS	2006
85	WPR	O,N			Tuvalu, Fiji	TSECS	1994
86	Th	E	I		Indonesia		2007
87	WPR	N			Indonesia		1982
88	M	O			Indonesia		2012
89	M	O,N			Indonesia, Bangladesh, Costa Rica, Philippines	general overview + KLPSSM	2016
90	JA	N		Renewable Energy	Indonesia	Cooperative Village Unit (KUD) mentioned	2001
91	JA	O		Energy for Sustainable Development	Indonesia	private investments, RE-based village grids	2013
92	JA	E	CS	Refocus	Indonesia	E7 project	2001
93	JA	N		Renewable and Sustainable Energy Reviews	Bangladesh, Nepal, Tanzania, Costa Rica	references to literature on co-operatives	2014
94	WPR	O,N			Kenya, Burkina Faso, Ethiopia, Nepal, Costa Rica, Indonesia, Solomon Islands, Kenya, Mozambique, Tanzania, Liberia		2013
95	PP	N			Liberia		2015
96	NA	N			Liberia		2014
97	IT	N			Liberia		2015

98	WPR	N			Liberia	Yandohun	1984
99	JA	O		Boiling Point	Zimbabwe, Mozambique, Malawi	Chipendeke, Ndiriri, Bondo	2010
100	WPR	O,N			Liberia, Costa Rica, Bangladesh, Philippines, Nepal	Yandohun	2011
101	WPR	N			Uganda, Costa Rica, Kenya, Tanzania, Liberia, Dominican Republic, Bhutan, Nepal, Solomon Islands		2016
102	PR	N			Liberia	presentation style	2013
103	PR	N			Liberia		2012
104	PR	N			Liberia		2013
105	WPR	N			Ethiopia		2009
106	JA	N		Energy Policy	India	Sagar Dweep; technical study, not much about organization	2002
107	JA	E	I,FG	Energy Policy	India	Village Energy Security Programme -> village energy committees (VECs)	2013
108	JA	E	CS	Renewable and Sustainable Energy Reviews	India	Sagardeep Island	2009
109	WPR	O,N			India, Bangladesh, South Africa	Gujarat focus	2003
110	CP	O			India	Uttarakhand: community ownership	2007
111	JA	O		Economic and Political Weekly	India		2005
112	CP	O			India	Sundarbans	2006
113	BC	E,O			China, India	Orissa-China comparison	2007
114	WPR	N			Bangladesh, Philippines, India		2010
115	WPR	E	CS		India		2007
116	BC	N			Bangladesh, India		2007
117	WPR	O,N			India, Nepal	Sundarbans, ARECS cases	2004
118	WPR	E	PO		India	Sagar Island/Mritunjoynagar	2008
119	JA	E,O	CS	Energy Systems	India	HRECS case; overview of other RECs	2012
120	WPR	E	PO,I,FG		India	mini-grids: WBREDA,CREDA	2014
121	BC	O,N			India, Nepal	Gosaba, DESI Power, Sagardweep cases	2010
122	JA	E	PO,I	Energy for Sustainable Development	India	Sundarbans	2012
123	CP	N			India		2011

124	WPR	E,O	CS/PO		India	different cases; India general overview	2014
125	WPR	E,O	CS/I		India, Bangladesh, Nepal, Sri Lanka	Sircilla, Singur Haripal, Lamjung, South Lalitpur; Orissa, WBREDA, incl. Gosaba	2002
126	JA	E	CS/PO	Energy Policy	Malawi	MVP: Mswaswa	2010
127	JA	E	CS/S,I	Renewable Energy	Malaysia	ownership not directly addressed	2013
128	JA	E	I?	Renewable and Sustainable Energy Reviews	Myanmar	ownership unclear	2016
129	WPR	O			Nepal		2011
130	CP	N			Nepal		2014
131	JA	O		Hydro Nepal: Journal of Water, Energy and Environment	Nepal		2009
132	WPR	O			Nepal		2014
133	JA	E	CS/I,FG,PO	Energy Policy	Nepal	Pokhari Chauri (+ Nepal in general)	2011
134	JA	O,N		Renewable and Sustainable Energy Reviews	Nepal, Bangladesh		2012
135	JA	O		Energy Policy	Nepal		2012
136	JA	O,N		Tata Loka	Nepal, Bangladesh		2015
137	JA	E	CS/PO,I	Energy for Sustainable Development	Nepal	WBG: NPDP	2011
138	JA	E	CS/I,FG,S,D	South Asian Journal of Policy and Governance	Nepal	South Lalitpur: Pyutar VDC	2014
139	IT	N			Bolivia		2017
140	IT	N			Costa Rica		2017
141	IT	N			Haiti		2017
142	IT	N			Guatemala		2017
143	IT	N			Liberia		2017
144	IT	N			Uganda		2017
145	IT	N			South Sudan		2017
146	IT	N			Philippines		2017
147	WPR	O,N			Costa Rica, Argentina, Bangladesh, Brazil, China, Philippines, Haiti	Haiti: Pignon mentioned	2004
148	PR	N			Bolivia, El Salvador		1997
149	WPR	N			El Salvador, Chile, Bangladesh		2004
150	CP	N			Bolivia	CRE, Riberalta	1998
151	NA	N			Haiti	Pignon	2002

152	WPR	O			Philippines, Bangladesh, India	India: Hulkeri, Lucknow cases	2002
153	WPR	N			Bangladesh, Philippines, Costa Rica, Bolivia, Argentina, Brazil		2016
154	WPR	O			Bangladesh, Philippines, Argentina, Bolivia, Brazil, Chile, Costa Rica, India, Nicaragua, El Salvador, Dominican Republic, Vietnam		2016
155	WPR	N			Bangladesh, Philippines, Bolivia, El Salvador		2007
156	WPR	E	CS		Bolivia, Bangladesh	CRE, Comilla I	2005
157	NA	N			Philippines		2012
158	NA	N			Philippines		2012
159	NA	N			Philippines		2013
160	NA	N			Philippines		2014
161	NA	N			Philippines		2013
162	NA	N			Philippines		2013
163	NA	N			Philippines		2015
164	NA	N			Philippines		2013
165	NA	N			Philippines		2012
166	NA	N			Philippines		2012
167	WPR	O			Philippines		2002
168	JA	N		Philippine Review of Economics	Philippines		2001
169	JA	O		Energy Economics	Philippines		2002
170	JA	O		Asian Social Science	Philippines		2012
171	JA	E	CS	Energy Policy	Philippines		1987
172	BC	N			Philippines		2003
173	WPR	N			Philippines	Pampanga	2012
174	BC	O			Philippines	RECs, SIBAT	2012
175	WPR	O			Philippines		2009
176	WPR	O			Philippines	Mindanao	2012
177	JA	E	DEA	International Business and Economics Research Journal	Philippines	few informations on institutional setup	2007
178	JA	E	DEA	Philippine Management Review	Philippines	few informations on institutional setup	2012
179	WPR	E	DEA		Philippines	few informations on institutional setup	2004

180	WPR	E	CS/I		Philippines	CENECO, ALECO, PELCO II, SORECO II, CEBECO III, PALECO	2011
181	WPR	E	S		Philippines	4 cooperatives Luzon	2002
182	WPR	O			Philippines		2000
183	JA	O,N		Community Development Journal	Kenya, Bangladesh, Costa Rica, Philippines	self-help associations	2015
184	WPR	O			Kenya		2016
185	CP	O			Kenya		2014
186	WPR	O			Kenya		2014
187	WPR	E	CS/I		Kenya		2010
188	JA	E	CS/S,I,PO	World Development	Kenya	Mpeketoni	2009
189	JA	O		Academic Journal of Suriname	Brazil	Amazon	2010
190	JA	O		International Journal of Energy Sector Management	Brazil		2008
191	JA	O		Energy Sources, Part B: Economics, Planning and Policy	Philippines		2016
192	JA	E,N	CS/MM	Energy Policy	Nepal, Kenya, Bangladesh, Costa Rica	Pokhari Chauri, Thiba	2012
193	JA	N		Refocus	Mexico, Sri Lanka, Bangladesh	Xcalak	2003
194	CP	E	CS		Mexico	Xcalak	1999
195	Th	O			Costa Rica, Philippines		2014
196	WPR	N			Philippines		2013
197	WPR	N			GENERAL		2008
198	JA	N		Energy Policy	Nepal		2012
199	WPR	O,N			Sri Lanka, India, Nepal, Brazil		2013
200	BC	O,N			Venezuela, Argentina, Costa Rica	reference to MTEs	2012
201	BC	O,N			Burkina Faso, Ethiopia, Kenya, Tanzania, Sudan, Uganda, Cameroon, Gambia, Zambia, Mali	Mali: MFPs	2012
202	WPR	N			Cambodia, Nepal, Bangladesh, Sri Lanka		2007
203	WPR	N			Brazil, South Africa	status/ownership of ILITHA unclear	2010
204	M	O,N			Bangladesh, Philippines, Sri Lanka, Vietnam, Costa Rica, Uganda		2014
205	BC	N			Costa Rica, Kenya		2013
206	BC	O,N			Bangladesh, Nepal, India, Sri Lanka		2013
207	BC	O,N			Tanzania, Kenya		2013

208	BC	O			Indonesia, Philippines	BANPRES SHS program, AMORE off-grid	2013
209	BC	O,N			Bangladesh, India, Nepal, Sri Lanka, Argentina, Philippines, Costa Rica, Bolivia	South Lalitpur, Gosaba, Sunderbans, VECs, incl. CREDA	2013
210	WPR	O,N			Argentina, Chile, Brazil	COAGUA, SCPL; Metahue	2002
211	WPR	O			Bangladesh, Philippines, India	Ceneco, Sundarbans	2008
212	WPR	O,N			Indonesia, Philippines, Tuvalu	BANPRES SHS program; SEP; TSECS	1996
213	WPR	O			Indonesia, Philippines, Tuvalu	BANPRES SHS program, GTZ, TSECS	1995
214	JA	N		Renewable and Sustainable Energy Reviews	Philippines		2013
215	PR	E,O	CS/E		Rwanda, Tanzania, Kenya, China, Thailand, Sri Lanka	data for Nyamyotsi I, Kinko, UNIDO Energy Kiosks, ref to Graecen, Tungu Kabiri, Kathamba	2010
216	PR	E	CS/E		Kenya	Tungu-Kabiri	2001
217	WPR	O			Philippines		2006
218	WPR	E	CS		Kenya	Thima	2002
219	WPR	E	CS		Kenya	Kathamba	2002
220	BC	O			Bangladesh, India	Sagar Island	2007
221	WPR	E	CS/E		Kenya	Tungu-Kabiri	2002
222	M	O			Philippines	CENECO	2007
223	WPR	N			Kenya	Tungu-Kabiri	2009
224	WPR	N			Bangladesh, Nepal, China, Argentina, Bolivia	incl. South Lalitpur, Punta Alta	2015
225	CP	N			Bangladesh, Costa Rica, Nepal		2014
226	CP	O			Nepal	2 cases	2013
227	WPR	N			Philippines		2014
228	WPR	N			GENERAL		2005
229	JA	E,O	I		Nepal, Bangladesh		2010
230	JA	O			India		2013
231	JA	E	I	Energy for Sustainable Development	India	Sundarbans	2011
232	Th	O,N			Bangladesh, Philippines, Costa Rica, Bolivia, Argentina, Brazil, Ecuador, Peru, Colombia, Chile, El Salvador		2001
233	WPR	O			Bangladesh, India, Nepal, Sri Lanka		2002

234	WPR	N			Kenya, Philippines, Brazil, Burkina Faso, Nepal, Indonesia	mini-grids, Creluz, MFPs, I-BEKA	2012
235	WPR	E	CS		Sri Lanka, Nepal, Zimbabwe		2000
236	CP	O			Philippines, Bangladesh		2012
237	JA	O		Energy for Sustainable Development	Bangladesh, Nepal, Sri Lanka, India	India: VECs	2011
238	JA	N		Annual Review of Environment and Resources	Nepal		2012
239	JA	N		Journal of International Development	Nepal		2000
240	M	E,O			Cambodia, Brazil	biomass gasifier case	2011
241	WPR	E,O,N	CS		Ethiopia, Burkina Faso, Nepal, Mali, Chile, Côte d'Ivoire		2008
242	WPR	E,O	CS		Côte d'Ivoire, Laos, Dominican Republic, Philippines	GECO, Ban Nam Thung, El Limón; focus on technical issues	2000
243	M	E,N	CS/MM		Kenya, Nepal, Bangladesh, Costa Rica, Philippines	Thiba, Pokhari Chauri	2012
244	M	E,N	CS		Bolivia, India, Nepal, Colombia, Nicaragua, Ecuador, Costa Rica	CEY, CEM, CSEC, CRE; CESS; AUO, GVEC, SCECO	1997
245	BC	O,N			Bangladesh, Philippines		2012
246	Th	E			Argentina		2009
247	JA	E,N	CS		Costa Rica, Nepal, Bangladesh, Sri Lanka, Kenya, Burkina Faso, Bolivia, Gambia, Malawi, India, Malaysia, Indonesia, Tanzania, Chile	Coopeguanacaste	2017
248	BC	O			Brazil		2009
249	WPR	E	S/FG		Kenya		2017
250	JA	O		Renewable and Sustainable Energy Reviews	Brazil		2012
251	JA	E	I/MM	South Asia: Journal of South Asian Studies	Nepal		2013
252	JA	N		Energy	Nepal	on financing, not cooperatives	2011
253	JA	N		Energy for Sustainable Development	Nepal		2012
254	JA	E	S	Energy for Sustainable Development	India	Sagar Island	2014
255	JA	E	S,D	Energy for Sustainable Development	Bangladesh	coop model	2003
256	JA	E	I,S	Renewable and Sustainable Energy Reviews	Philippines	Pangan-an Island	2012
257	BC	O			India		2007

258	BC	O			Bangladesh, India	Orissa	2007
259	BC	O			India		2007
260	BC	O			India		2007
261	BC	O			India, Bangladesh, Sri Lanka, Nepal		2007
262	BC	O			India, Bangladesh	Hukeri, Anakapalli, Mula Pravara, Goasaba, Sagard-wip, Orissa, WBREDA, Putsil	2007
263	BC	O			India	cooperatives, Orissa, BASIX-Verve	2007
264	BC	O,N			India, Bangladesh, Philippines		2007
265	BC	O			India		1998
266	JA	E	CS/I,PO,D	Local Environment	Indonesia	IBEKA: Cinta Mekar, Kamanggih	2018
267	BC	E	CS/N		Philippines	MORESCO, VRESCO, BAT-ELEC 1, BANELCO, FICELCO	2007
268	BC	E	I,PO		Philippines	anonymized	1994
269	BC	E	CS/N		Costa Rica		2007
270	JA	O		Internationale genossenschaftliche Rundschau	Argentina		1971
271	BC	E	CS/N		Chile		2007
272	M	E	CS/I		Nepal, Sri Lanka		2016
273	M	E,O	CS/PO,S		Colombia, Nicaragua, Ecuador, Costa Rica		1972
274	JA	N		Energy Policy	China, Sri Lanka, Vietnam	references to community-owned projects	2009
275	JA	E	CS	Energy for Sustainable Development	Chile	ESUSCON/Cóndor	2011
276	JA	E	CS	International Journal of Low-Carbon Technologies	Tanzania		2010
277	WPR	E	CS/I		Pakistan	AKRSP	2007
278	JA	E	CS	Energy Research and Social Science	Kenya	Kitonyoni	2018

Codes:

1) Document types: BC = book chapter, CP = conference proceedings, IT = internet document/webpage, JA = journal article, M = monograph, NA = newspaper articles, PP = (powerpoint) presentation, PR = project report, Th = thesis, WPR = working paper or report
2) Data: E = empirical, O = overview, N = (short) notes/mentioned

3) Methodology: CS = case study, D = descriptive, DEA = data envelopment analysis, E = evaluation, Eng = engineering (simulation/model), FG = focus group, I = interviews, MM = mixed methods, N = narrative, PO = participant observation, R = regression, S = survey

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Anlagen zum Artikel 4

Supplementary Material #1: Interview list

Interview Number	Date	Coded by	Interviewee type
1	Jan 13	KR	Institutional investor UK
2	Jan 13	KR	Utility Investor UK
3	Jan 13	KR	Alt finance UK
4	Jan 13	KR	Utility Investor UK
5	Feb 13	KR	Institutional Investor UK
6	Feb 13	KR	Institutional investor UK
7	Feb 13	SH	Alt Finance UK
8	Feb 13	SH	Institutional Investor UK
9	Feb 13	SH	Institutional Investor UK
10	Feb 13	SH	RE Developer
11	Feb 13	SH	Institutional finance professional UK
12	April 13	SH	Institutional Finance professional UK
13	April 13	SH	Utility Investor UK
14	June 13	SH	Civil Servant UK
15	Aug 13	SH	Civil Servant UK
16	June 14	SH	German [mutual] bank DE
17	June 14	SH	Academic DE
18	June 14	SH	Energy co-operative DE
19	June 14	SH	Banking institution [Savings] bank DE
20	June 14	SH	Stadtwerke executive DE
21	June14	SH	Stadtwerke executive DE
22	June 14	SH	Banking Institution Landesbank DE
23	June14	SH	NGO DE
24	June 14	SH	NGO DE
25	June 14	SH	Legal professional DE
26	Nov 2015- March 2016	KR	Alt finance UK
27		KR	Alt finance UK
28		KR	Alt finance UK
29		KR	Alt finance UK
30 31		KR	Alt finance UK
32		SH	Alt finance UK
33		SH	Alt finance UK
34		SH	Alt finance UK
35		SH	Alt finance UK
36		SH	Alt finance UK
37		SH	Alt finance UK
38		KR	Alt finance UK
39	Aug 17	SH	Impact investor UK
40	Aug 17	SH	Alt finance UK
41	Aug 17	SH	Alt finance DE
42	Aug 17	SH	Alt finance UK
43	Aborted		Aborted
44	Aug 17	LH	TSO DE

45	Aug 17	LH	TSO DE
46	Sep 17	LH	TSO DE
47	June 17	LH	Energy Cooperative DE
48	June 17	LH	Utility Professional DE
49	June 17	LH	Civil servant DE
50	June 17	LH	Utility professional DE
51	June 17	LH	Developer DE
52	June 17	LH	Developer DE
53	Aug 17	LH	Manufacturer DE
54	June 17	LH	Developer DE
55	June 17	LH	Developer/Service company for community wind DE
56	June 17	LH	RE Developer DE
57	July 17	LH	Civil Servant DE
58	July 17	LH	German financial institution Development bank Federal DE
59	July 12	LH	utility (Stadtwerk) DE
60	Aug 17	LH	German co-operative confederation DE
61	Aug 17	LH	German Banking institution Value-based bank DE
62	Aug 17	LH	German Banking institution Landesbank (subsidiary) DE
63	Jan 17	LH	Developer: Community wind manager DE
64	Jan 17	LH	Regional public agency
65	Jan 17	LH	Community wind manager

Supplementary Material #2: UK case report

This case report explores the institutional context of energy finance in the UK from circa 2008-2018. Over this period UK energy policy explicitly pursued different types of capital and was designed around the needs of institutional investors in particular. This case report explores the justice impacts of these forms of finance, and uses the alternative finance sector in the UK to empirically explore how justice impacts change when the form of finance pursued or used for renewable energy projects changes.

Institutional context

Prior to the 2008 financial crisis, low carbon energy finance in the United Kingdom was predominantly composed of project finance from banks and balance sheet financing by utilities [[86]]. Our interviewees described a pre-crisis situation in which capital was easily accessible and loaned over long periods. Pre-crisis, the UK energy finance landscape enjoyed the high liquidity of capital markets, and capital surplus. At this time, there was little need to craft energy policy around the needs of capital:

"…the wind farms, the first one got funded in 2007-8 so just before the kind of climate got tough and it was pretty straight forward, you know it was an onshore windfarm with nice high wind-speed. AES the American utility were putting up the equity, Barclays Bank put up the debt, in those days Barclays Bank were prepared to lend 18 year term money and it was a sort of

beautiful world in many ways because banks were interested in lending to projects; ***which they are not interested in doing any more."***

Source #10: Renewable Energy Project Developer UK, 2013, [emphasis added]

"…every one of these big projects has secured finance from international, or at least FTSE100 banks, and they are a core component of almost every one of these projects, so that already takes place; but as you can probably guess, a bank does not lend 100% finance. Back before 2007, Northern Rock would happily do something like that, but those days are long gone. So, a bank will typically lend to a solar farm, maybe 50%, maybe 60% of the total capital required to acquire that asset, or to build that asset, and that leaves a huge chasm."

Source #40: Alternative Finance Platform Respondent UK, 2017.

Post financial crisis, our interviewees pointed to a change in the mix of actors funding projects. This does not mean that capital is was not available, only that the gearing (ratio of debt to equity in a project) requirements of bank loans decreased, and the composition of actors willing to lend to the sector also changed. This change in actors and lending practise is explored below, but note that for some time the UK has retained a high rating as one of the most attractive places in the world for renewable energy investment [[85]]. Key areas of exploration in this case report are: how did the UK retain a high rating for renewables investment post-crisis? How does this affect the cost of that capital? And do the forms of finance pursued by energy policy have demonstrable justice impacts?
The UK enjoys a high ranking for international investors in-part due to the financialisation of the subsidy mechanism for renewables:

"Q: To what extent is policy being developed with investors in mind and different types of investors?

*A****: It is,*** *it's a straight answer. And there are sort of collected groups of experts including on the financial side with whom policy is tested and when policy comes out that commercial team I just mentioned go out and about and discuss in the city and go to other capitals to go to try to sell the policy that's been developed."*

Source #15: Civil Servant UK, 2013 [Emphasis added]

In this sense, 'financialisation' is the increasing degree to which the needs of investors and capital are inscribed into the functioning of various systems such as energy, water, rail etc. The civil servant above is describing how the needs of market-based finance are directly prioritised when creating policy, these needs animated the cornerstone of UK electricity policy,

[85] EY (2017) Renewable Energy Country Attractiveness Index, EY, Accessed October 2017 Available at: https://emeia.ey-vx.com/4864/94232/landing-pages/recai-50-pp10-11-index-dps-view.pdf

the Electricity Market Reform (EMR) package introduced by UK Government in 2013. This package was a response to the volume of investment signalled by Climate Change Act (2008) targets, and subsequent analysis that showed investment needs for the power sector were beyond the capacity of post-crisis utility balance sheets [86]. The low-carbon support mechanism of Renewables Obligation Certificates was also seen to be too risky and opaque for market based financiers, only calculable to energy specialists [87]. These pressures justified a move to a new subsidy system: feed in tariff type arrangements with contracts for difference (CfDs) [88], designed to 'crowd-in' institutional investors (pension, wealth, insurance funds etc) on the basis of easily calculable cash flows [89]. The EMR package also included capacity payments for flexible (often fossil fuelled) generators, and a carbon price floor. The aim of the package was to provide 'investment grade policy' [89,90] and reduce the average cost of capital for the low carbon transition in the UK, an outcome it largely achieved between 2014 – 2017 [88,91].
The investor provisions of EMR were also bolstered with an interim investment guarantee mechanism that was designed to provide certainty to investors in the transition between the two subsidy regimes [92], and a further government de-risking support in the Enterprise Investment Scheme and Venture Capital Trust tax relief [93]. This level of financialisation of energy policy in the UK, meant that by 2013 the access to capital problem was being solved via a change in the investor mix. The mix moved away from a simple bank/equity relationship to a more heterogeneous landscape, in which the forms of finance being accessed began to have wider implications for the energy system and beyond.

"there was a lot of money went into energy on the back of things like the venture capital trusts and EIS [enterprise investment] schemes which frankly, should not have happened. […] That was using up allowance for – the ***capital that should have been properly at risk*** *not put into,*

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86 Blyth, W., McCarthy, R. and Gross, R., 2015. Financing the UK power sector: Is the money available?. Energy Policy, 87, pp.607-622.

87 Wood G, Dow S. What lessons have been learned in reforming the renewables obligation? An analysis of internal and external failures in UK renewable energy policy. Energy Policy 2011;39(5):2228–44. http://dx.doi.org/10.1016/j.

88 Newbery, D.M., 2016. Towards a green energy economy? The EU Energy Union's transition to a low-carbon zero subsidy electricity system–Lessons from the UK's Electricity Market Reform. Applied Energy, 179, pp.1321-1330.

89 Bolton, R., Foxon, T.J. and Hall, S., 2016. Energy transitions and uncertainty: Creating low carbon investment opportunities in the UK electricity sector. Environment and Planning C: Government and Policy, 34(8), pp.1387-1403.

90 Sullivan R (2011) Investment-grade climate change policy: Financing the transition to the low-carbon economy. Report for Institutional Investors Group on Climate Change (IIGCC), the Investor Network on Climate Risk (INCR), the Investor Group on Climate Change Australia/New Zealand (IGCC) and the United Nations Environment Programme Finance Initiative (UNEP FI).

91 Energy UK, (2017), Investment in the Future Energy System, Energy UK, London.

92 Grant Thornton, Poyry (2015) Independent evaluation of FID Enabling for Renewables Final Report to the Department of Energy and Climate Change 15 October 2015, Available online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/468258/Independent_evaluation_of_FID_Enabling_for_Renewables_-_Final_report_-_1....pdf

93 Tax relief of up to 30% for investing in small companies which until 2015 were used alongside RO Subsidy to further attract investment into UK low-carbon generation.

*you know, almost a guaranteed bet [94] on future energy prices connected to inflation. […]**It sucked out a lot of hot money.** It inflated the price of solar parks so that the returns were diluted and it – so, nobody won in that world. The government got a lot of solar installed at probably quite an expensive cost when it could have allowed the market to do it, you know what I mean, and it would have been a slower roll-out but it would have matched the cost coming down and you wouldn't have got this boom and bust."*

Source #42: Founder, alternative finance platform, UK 2017 [emphases added]

The first point to draw from this, is that investment capital is finite. When talking about 'hot money' and 'capital that should have been properly at risk' the respondent shows how investment money meant for ventures with a real risk of failure, would be better allocated to those ventures to support the wider productive economy. The 'hot money' in the sector is quick turnover, high return seeking capital which, as the interviewee explains, contributes to boom and bust investment cycles and poor system resilience. In 2014 UK Government recognised these investment schemes, when coupled with RO and CfD/feed in tariff schemes were not compatible, and made all energy generation schemes ineligible for EIS and Venture Capital Trust (VCT) in 2015 [95]. The second point, is that attracting the 'wrong' sort of capital means increased system costs and ultimately higher consumer bills. This affordability criterion is the main energy justice principal used by the majority of energy researchers to justify the financialisation of energy policy [88]. The logic being that the more energy policy reflects the needs of finance the cheaper that finance will be, and therefore the more affordable the final commodity [interview #7]. While affordability is one element of the 8 principles of energy justice, clearly there are wider systemic effects of financialisation that have justice impacts, such as boom and bust cycles, that affect and are partially produced by energy policy.

The effect of de-risking energy investment through financialisation of energy policy, which EMR and the various other capital supports clearly did, is that it must stay de-risked for the average cost of capital to continue reducing. Polzin (2017) notes that in tying energy policy closer to the needs of market-based finance capital, it becomes more dependent on and reflective of those needs. In a recent study, Energy UK, 'the voice of the [UK] energy Industry', calls for policies similar to the existing EMR package to be extended beyond 2020 to provide certainty for international investors, stating: *"The level of capital mobility in the international finance market means that overseas investors view the UK energy market as a much less attractive place*

94 After further clarification the 'guaranteed bet' was the UKs feed in tariffs with contracts for difference. Once this contract is awarded future revenues are much more predictable than in the preceding renewables obligation scheme and therefore remove uncertainty as a priority matched with investor preferences.

95 HM Revenue and Customs (2015) Income Tax: exclusion of energy generation from venture capital schemes, Policy paper, Published 9 December 2015 accessed online October 2017 @ https://www.gov.uk/government/publications/income-tax-exclusion-of-energy-generation-from-venture-capital-schemes/income-tax-exclusion-of-energy-generation-from-venture-capital-schemes

for investment when the political messaging is negative." [91 p. 9]. This means the affordability criteria of energy justice, legitimises a financialisation process, without deeper reflection on whether this financialisation has any deeper systemic effects on energy transitions or the wider economy. These wider systemic risks are explored below, along with other justice themes, by using the case of alternative energy finance in the UK.

Alternative finance and energy justice

Previous work [89] has shown that the UK's EMR package targeted large insurance, pension and wealth funds as sources of capital, to the neglect of alternative finance. However this has not meant the alternative finance market in the UK as not thrived, nor has it shied away from renewable energy investments. The United Kingdom is now the largest alternative finance market in the European Union by a considerable margin and is generally considered to be the most mature. It had a total online market size of £3.2 billion in 2015 (circa US$4.5 billion allowing for currency fluctuations). To illustrate the size and scale of this activity, these figures need to be understood in relation to £53 billion lent by UK high-street banks to SMEs in 2015, as opposed to just £1 billion by peer-to-business lenders [96], although the latter provided almost 14 per cent of new loans in 2015 [97]. By 2015 the sector had a three year average growth rate of 52% [97]. Though alternative finance of renewable energy remains a fraction of overall sector lending, the fact that these platforms are challenging mainstream lending makes them an instructive counterpoint to commercial market-based narratives.

To explore the justice implications of energy finance we interviewed senior entrepreneurs from the alternative finance landscape in the UK to discover what justice criterion beyond affordability motivated them to establish such platforms. Our interviewees reported a range of founding motivations which have justice implications beyond the affordability criteria. Exploring these demonstrates that the form of finance and the source of capital used for energy transitions can have multiple justice impacts, impacts that go beyond basic cheaper capital = cheaper commodity 'affordability' justifications. The first of these, within the existing 8 principles of energy justice, was *intra-generational equity*. The intra-generational equity definition of justice is served by alternative finance in this case by was the ability to establish a platform that allows operators to attract a section of society that would otherwise be unable to directly invest in energy due to the high capital requirements of entering such schemes as EIS or VCT backed vehicles:

"normally, you have to have £25,000 to invest in a business, to make it really worth the time and the financial, loss, and so if you're thinking about having a diversified portfolio […] you're

96 British Business Bank (2016) Small business finance markets 2015/16. London: British Business Bank.

97 Zhang, B., Baeck, P., Ziegler, T., Bone, J. and Garvey, K. (2016d) Pushing Boundaries: The 2015 UK Alternative Finance Industry Report. Cambridge University. https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/pushing-boundaries/#.WaV0BTZwYdU

talking about having a few hundred thousand pounds to invest across different business. That's not really accessible to most people. So what we're doing is making it possible to really anyone, who can demonstrate that they understand the risks, to invest as little as £10 into the businesses that they believe in"

Source #33: Chair, Alternative finance platform, UK (2015)

"it wasn't as if there wasn't investment in energy before we came along, ***but as an individual, you would find it very hard to do that*** *and the main barrier was that the minimum amount that you could invest was quite high, around £5000 up to £0.5 million, sorry, and we wanted to do a minimum of £5. And when you do that, you do two things. Firstly, you open up the retail, you know, the market to retail investors, small investors"*

Source #42: Founder, alternative finance platform, emphasis added, UK (2017)

"One of the things we set out to do was to ***give the man in the street the chance to get the same returns on investment as a financial institution, for the same level of risk****. That's the nearest I can get to the democratisation of finance. So I think it does mean something."*

Source #32: Founder, alternative finance platform, emphasis added, UK (2015)

There was a strong intra-generational equity concern amongst the UK financial entrepreneurs we interviewed. They spoke often of the need to open up direct investment to a much broader segment of society. While clearly one can invest in savings accounts with banks [[98]], the relative concentration of the retail banking and particularly the asset management industries [[99],[100]] has led to poor price competition for fund management [[100]] meaning small scale investors face high transaction costs and a historic inability to invest directly in renewable energy. Alternative finance allows investors to circumvent this system and access the 5-7% returns on investment that were hitherto only available to more wealthy people. This intra-generational equity outcome has no effect on affordability of energy systems, as the cost of capital remains competitive. Thus it can be said that alternative energy finance fulfils a further justice outcome than market based finance in the UK.

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98 A key point to stress here is that traditional savings account investment involves a transfer of responsibility for 'where' money is invested. In handing over money to retail banks, citizens allow them to decide what that (highly leveraged) money can then fund. One of the attractions of AltFin to 'ethical investors' is precisely the capacity to ensure their investment reflects their ethics, so they retain some semblance of control over their money by positively investing in renewable energy in a transparent way, without the banks as intermediaries of the transaction nor as the final arbiter over what the investor's money helps to make happen – the investor retains that power, hence the framing of this process as "democratic finance". See https://baumaninstitute.leeds.ac.uk/research/fitter/report/

99 Financial Conduct Authority (2016), Competition Report 2013-16, FCA, London

100 Financial Conduct Authority (2017), Asset Management Market Study Final Report, Market Study MS15/2.3 FCA, London

On top of the intergenerational equity outcomes, we found a further founding motivation of these platforms related to broader system resilience and trust, especially post financial crisis.

"one other thing that's been healthy in the finance industry is all the challenger banks. I think everybody, I mean the Government, and a lot of the general public, are pretty desperate to see the big four banks having much, much less control over the country's finances."

Source #32: Founder, alternative finance platform UK, 2015."

"…resilience for me starts with diversity, and I know it's very trite but, this 5 banks that are too big to fail and too big to jail, that is the fundamental driver of the opportunity for crowdfunding. I don't think we'd be here if it wasn't for 2008…"

Source #28: Alternative finance platform chair UK, 2015.

"we saw a collapse in trust in the general public in the financial system, which also happened around that same time 2011-12, and was really, although it was sort of lurking under there it didn't really come directly out of the financial crisis of 2008-09, it was more out of Libor rigging and HSBC money laundering which was more like 2011-12, and at that time then you saw, then also coupled with Too Big To Fail, and people realising that a lot of the trouble was the control of finance by the big four, big five, big six you know whatever, and trying to address that."

Source #29: Alternative finance platform founder, UK (2015)

These quotes show alternative finance providers positioning their platforms and activity as a wider 'public good' as well as a useful extra financing option for renewables. This notion of energy finance as a contributing factor to financial system resilience and stability, we argue justifies it's inclusion as a form of energy justice. Particularly in a market based financial system in such as the UK, where the interconnectedness of the wider financial market is international. For example the International Monetary Fund claims financial sustainability in the UK is a global public good [[101]] the same report warns that this interconnectedness exposes the UK Financial markets to global risks and can have knock on effects on domestic credit cycles. This once again links to Polzin's observation [[102]] that tying energy policy to these markets and cycles exposes them to global credit risks. While the evidence of alternative finance's ability to contribute to overall system resilience is yet to be empirically verified [[103]], in part due to its

[101] International Monetary Fund, (2016) United Kingdom Financial Sector Assessment Program, Financial System Stability Assessment, IMF Country Report No. 16/167. IMF, Washington.

[102] Polzin, F., 2017. Mobilizing private finance for low-carbon innovation–A systematic review of barriers and solutions. Renewable and Sustainable Energy Reviews, 77, pp.525-535.

[103] Short, J. C., Ketchen, Jr., D. J., McKenny, A. F., Allison, T. H. and Ireland, R. D. (2017) 'Research on Crowdfunding: Reviewing the (Very Recent) Past and Celebrating the Present', Entrepreneurship Theory and Practice, 41 (2): 149-160. doi: 10.1111/etap.12270

relative newness [104], it is a consistent qualitative claim made by key actors in the sector and by our interviewees. As such, system resilience was very much part of the justice narrative of the alternative finance providers, both energy specific and beyond.

A further distinct justice concern raised by the alternative finance sector was the close relationship between transparency and due-process offered by different investment vehicles.

"people like you and I really, who might see something that, a business that we think, I really love that business, you know, I eat at that restaurant, or, I buy that brand of bicycle, or something. So we're seeing people who actually don't necessarily approach it as a way to diversify their portfolio, but they invest in something they believe in, and then they come back, they see other things, and then they start to develop their portfolio, maybe a bit smaller, dip their toes in and then realise the importance of, investing further"

Source #33: Alternative finance platform Chair, UK (2015)

"the bit that everybody is sort of trying to grapple with, […], is can that system be completely transparent or not? And what level of transparency is workable to deliver the amount of money that you want to deliver to make it happen? And the, you know, totally transparent, 100% ownership, go and meet them, sit in the AGM in the village hall, isn't going to do enough. But also, the sort of green bonds where you have no clue where they've come from, they've just got HSBC's brand on them, isn't the solution either because a lot of dross will get put in there that's got nothing to do with climate or energy or energy justice."

Source #42: Founder, alternative finance platform, UK 2017

"how the investment and the lending works is quite different, and from a legal point of view is quite different. So when you go and put your money in a bank, they then are the owner of that money and they can lend it to whoever they like. They can lend it to arms dealers in Indonesia, they can, finance a sweatshop in Burma, I'm not saying that's what they all do, but the point is you don't know where your money's gone, it's up to the bank. When you come to a platform in the peer-to-peer sector, you have a much better idea of where your money's going, and what's more, you never relinquish ownership of that money. So the contracts are between the lender, and the borrower directly, that's the legal status of it."

Source #35: Alternative finance platform respondent, UK 2015

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104 However one of the principal challenges facing the AltFin sector in the UK is the problem of "mainstreaming", i.e. ceasing to be alternative. This puts the justice potential of the sector in jeopardy, since it faces pressures from below from investors who want the platforms to behave more like banks, and form above by institutional money to help them scale; regulators wanting them to operate like everything that already exists. The idea that focussing on positive justice outcomes can help to mainstream alternative finance may be counter-productive; if by "mainstreaming" the result is losing the potential to create a fairer financial system.

The desire to find a transparently positive channel for citizens capital is linked to, but distinct from, the current fossil fuels divestment campaigns that have made substantial inroads into exploring the links between climate injustice and everyday institutional investing [105]. Here the alternative finance platform providers argue strongly that these avenues of capital have a direct and 100% transparent link to the projects that are being funded which bank intermediation cannot achieve. The green funds, green bonds and other bundled vehicles rely heavily on the ability of fund managers to assess sustainability or other characteristics to be permitted into any financial offer. In the peer to peer lending space this level of transparency is hardwired into the platforms and forms the third distinct justice element within the UK interviews. Transparency is one of the main elements of the 'good governance' justice categories identified by Sovacool and Dworkin [106].

The final noteworthy development in the UK case is the recent opportunity to diversify financial products and allow the sector to expand market share and further challenge incumbent finance providers. The growth of the alternative finance sector in the UK has led to the development of the innovative finance ISA [107]. ISAs are the UKs favourite retail savings product [99]. The development of a crowdfunding ISA has allowed small scale project bonds to be 'wrapped' by the ISA product and sold as project specific investments. Thus, on alternative finance platforms in the UK one can participate for low initial sums, gain transparency over where one's money is being invested, and receive tax free returns on investments over time periods more compatible with energy assets as opposed to the short holding periods of the EIS and VCT schemes. The ISA also means alternative finance can be offered to a much broader market of retail investors typically more conversant with the product:

"..things like ISA and pension are really additional permissions that we have sought to give people a different way of, or open up new pots of money which people have to the idea of energy investment. So, when we were just doing pre-ISA, we were talking to a relatively small group, probably 1 million people in the UK who've made some form of direct investment into a company whether through a share or a bond. And an even smaller group of those, probably only a third of a million who've actually made an investment into something in terms of green energy. When we opened that up to ISA, we're talking to a population of probably around 8 million that have made some form of investment that you would consider to be ethical or altruistic and those have been very much the drivers of volume for us over the last three years."

105 Ayling, J. and Gunningham, N., 2017. Non-state governance and climate policy: the fossil fuel divestment movement. *Climate Policy*, 17(2), pp.131-149.
106 Sovacool, B.K., Dworkin, M.H., 2015. Energy justice: Conceptual insights and practical applications. Appl. Energy 142, 435–444. doi:10.1016/j.apenergy.2015.01.002
107 An ISA is an Individual Savings Account that allows an individual to hold cash savings, shares, and other instruments free of taxation up to defined levels. ISAs are the most popular savings product for individuals in the UK.

Source #42: Founder, alternative finance platform, UK 2017

"I think next year we've got two really good opportunities. One of which is ISAs, so the chancellor has announced that peer-to-peer lending is eligible for ISAs. We've gone through a consultation phase, and in recognition of what we've achieved, the government has created a brand new kind of ISA, you've got cash, stocks and shares, and now there's the Innovative Finance ISA, the IF-ISA. Now hopefully we'll be on top of that from the 6th April, that's the earliest date that we can actually physically offer it from. And on the same day as that we also have the personal savings allowance, the PSA, which will mean that the first £1000 of interest that you receive is tax-free, £500 for higher-rate taxpayers. "

Source # 35: Alternative finance platform, UK 2015.

"I think ISAs obviously, the nation's favourite savings product, will increase awareness and it will expose us to a wider group of people"

Source #40: Alternative energy finance platform, UK 2017.

The creation of the alternative finance ISA allowed the platforms to offer direct routes for small scale investors to participate in financing the energy transition. It offered a transparent channel for investing in low-carbon transitions, and does so on a series of platforms that claim to offer broader financial resilience, somewhat removed from high turnover, risk seeking capital channels, contributing to the wider public good of system stability.

<u>Summary</u>

Post 2008 financial crisis the UK government recognised a need to invite broader sources of capital into UK energy transitions to deal with tighter lending criteria of commercial banks and weakness of incumbent utility balance sheets. This led to electricity market reform in 2013 which changed the subsidy system in the UK to one more aligned with the needs of asset managers and other non-specialist investors. This was a logical step given the UKs very large management of global assets, and linked a large investment need (new low carbon generation) with a sector with substantial capital to deploy. This had the effect of lowering the cost of capital for renewable energy projects and on energy system affordability in general. This is the first and clearest aspect of energy justice that should concern those investigating the energy/finance nexus.

However the depth of the financialisation of energy policy in the UK had some negative effects. Some argued the guarantees and tax breaks given to investors were too generous and led to crowding out of investment that should have been deployed in other sectors of the economy. This demonstrates the wider systemic effects energy policy can have on capital markets and vice versa.

In parallel, the financial crisis and subsequent banking scandals, led to an exponential growth in the alternative finance sector, which found productive investments in multiple sectors, from consumer credit to project finance, including renewable energy projects. Our UK case demonstrates the affordability principal is often the predominant justice outcome linked with low carbon energy finance. However, the alternative finance sector highlighted concerns over intra-generational equity, due process, transparency [good governance], and financial system stability.
From the UK case, our justice implications from within the 8 principles are:

- Affordability
- Due Process
- Transparency [good governance]
- Intra-generational Equity

From outside the 8 principles:

- Financial system resilience

Supplementary Material #3: German case report

This case report explores the institutional context of energy finance in Germany from circa 2008-2018. Over this period German energy policy evolved to accommodate a diversity of actors, owners and financiers. This case report explores the justice impacts of these forms of finance, and uses the three pillar banking sector in Germany to empirically explore how energy finance is closely linked to spatial economic development, the transparency of energy transitions, and the construction of intra generational equity.

Institutional context

There are several well-established financing models for most types of renewable energy projects in Germany, small and large-scale alike. In the case of onshore wind projects and medium to large-scale solar PV plants, project finance dominates [5,6,7]. Equity may come from different sources: farmers, (other) local citizens, private investors, institutional investors, or utilities; farmers, local citizens and private investors have a market share of around 50 % [8].
Debt capital is mainly provided by banks. Germany traditionally has a decentralized universal bank-based financial system [9,10]. The commercial banks form three "pillars":

- Private commercial banks, including four large banks ("Großbanken") and smaller regional banks, private banks, and branches of foreign banks. These are for-profit banks.
- The public banking sector, including (a) "Sparkassen", i.e. municipally-owned savings banks and (b) "Landesbanken", i.e. banks owned by federal states ("Länder") and regional savings banks associations. Due to public ownership and representation in supervisory boards, these banks have a less strong profit-orientation and are rather

bound to the common welfare. Municipal savings banks adhere to the “regionality principle”[108].

- Cooperative banks, including credit cooperatives, the cooperative central bank DZ Bank AG and specialised institutions. Most alternative banks have chosen the legal structure of a registered cooperative.

Strictly speaking, there is a fourth group of “other institutions”, including mortgage banks, building societies and loan associations, and so-called “special purpose banks” or “banks with special tasks”. Ideally, this diverse fourth group is included in the three pillars. Public special purpose banks or “Förderbanken” (development banks) on a national and federal state level, for instance, are sometimes subsumed under the public banking pillar and included as a third type of public banks.

Four aspects related to the German financing system are of importance for the issue at hand: First, this bank-based system means that banks dominate other financial institutions and that they have a large share in energy financing as well. Debt ratios of 80% up to 100% are known for wind energy or solar PV project financing. If sponsors do not have enough equity capital at their disposal, they will collect private equity or mezzanine capital from private or institutional investors, e.g. through participation certificates or subordinated loans. In addition, capital from local citizens may be collected through bearer bonds or savings certificates [11]. To some degree this accounts for the fact that the German crowdfunding market is still in its infancy. Energy crowdfunding is dominated by projects abroad, especially in developing countries. However, overall financing volumes are small.

Second, the state provides low interest refinancing through the national development bank KfW and through Rentenbank, which is the development bank for the agricultural and food sector. The European Investment Bank (EIB) only plays a minor role [12]. Some local banks partly use internal funds for refinancing. Green bonds seem to be a new instrument to source funds from international investors, and have provided a new tool for differentiating investments by sustainability metrics:

“In this way, you can, of course, transfer the issue of sustainability to investors, who haven’t identified with this topic so much up to now.”

Source #62: German Banking institution Landesbank (subsidiary) DE, 2017

Third, many local banks, i.e. Sparkassen and credit unions, are highly involved in the renewable energy sector due to these favourable refinancing conditions and easily calculable cash flows. The same can be said about some private regional banks. A relatively dense branch network and close ties to the local economy, especially small and medium-sized enterprises

[108] Each Sparkassen must restrict its activity to a specific area. See: https://www.centreforpublicimpact.org/case-study/sparkassen-savings-banks-germany/

(SMEs) or the "Mittelstand", enabled local banks to build a strong renewable energy credit portfolio. The regionally restricted and real economy-oriented business models of local banks, i.e. Sparkassen and credit unions, have proven to be more resilient than most parts of large bank and Landesbanken business [13]. In this context, an interview partner highlights that among credit cooperatives and Sparkassen there was something like a *"recollection of the regional as an answer to the financial crises of this world"* [interview #62].
Fourth, local banks are not only able to finance small and medium-sized projects, but also engage in larger-scale renewable energy transactions. In this case, they usually form alliances with their central banks, i.e. the Landesbank responsible for that area or DZ Bank AG, respectively, and/or build consortia or bank clubs together with other local banks, partly across pillars. This is the broad institutional context of energy finance in Germany.

Policy context

The German energy transition started with what Mautz et al. have called the "constructive-pragmatic turn" of the ecological movement. Renewable energy pioneers were deeply rooted in the anti-nuclear movement [1,2]. Community and citizen energy, including plants installed by farmers played a significant role. In 1991, the German government introduced the feed-in law, to ease the relationship between project developers and grid operators, and make projects economically feasible by offering priority grid access and fixed payments per kWh[109]. The introduction of the Renewable Energy Sources Act in 2000 strengthened these principles and helped to broaden the investor base, to professionalise the sector, and to mainstream renewable energy financing. These processes were accompanied by a shift in the relative composition of the forms of finance involved, from predominantly community equity/share based to closed-ended fund schemes [1,3]. Hence, the investor base broadened to include both local residents and supra-regional high net worth individuals (HNWI) and institutional investors, with large regional differences. After changes in tax laws and financial market regulations, the market volume of closed-ended funds has generally decreased. Within the renewable energy segments, the focus has shifted away from HNWI to institutional investors [4].
In 2014, the German government gradually changed the support scheme from a feed-in premium to an auction-based system in order to comply with the EU Environment and Energy State Aid Guidelines (EEAG) and to limit the costs of the support scheme. Some market players feared that this move could endanger a main characteristic of the German renewable energy system: its high "diversity of actors", as it is called in the Renewable Energy Sources Act of 2014, sec. 2 para. 5, and the Renewable Energy Sources Act of 2017, sec. 2 para. 3. Proponents link this diversity in ownership to good social acceptance and legitimacy, especially of wind energy projects. Community ownership in this case implies the construction of usually an

[109] See: https://www.iea.org/policiesandmeasures/pams/germany/name-21002-en.php

equity vehicle to organise the money capital of a geographic community around an energy project. The move from guaranteed feed in tariffs to speculative auctions for projects led to fears that community ownership and diversity of actors would diminish as only those with multiple project portfolios could afford to develop projects for a speculative and finite auction. In response some measures were taken in the Renewable Energy Sources Act 2017 to ensure diversity of actors. Currently, there is a debate about the measures taken by the legislator to ensure the “diversity of actors” and the question if easements for community wind as legally defined in sec. 3 no. 15 of the Renewable Energy Sources Act of 2017 facilitate “real community wind” or rather developer-led projects. We observe this distinction in several interviews, e.g. in relation to expectations that the share of “real community energy” will decrease:

“We presume that we will have around 70% of the accepted bids for community energy legally defined according to EEG 2017 and 30% real community energy. To an increasing degree, real community energy cannot fulfil the requirements [of the subsidy auction mechanism] *anymore and, in turn, does not make a bid anymore.”*

Source #58: German financial institution Development bank Federal DE, 2017

Also, it appears in contexts where interviewees discuss potential changes in the legal definition of “community energy companies” (Renewable Energy Sources Act, sec. 3 no. 15), e.g. with regard to the number of individuals who have to be present in a community energy group and have voting rights – the number currently stands at ten:

“Furthermore, the definition of community energy should be adapted and become more real – here, the number of natural persons could be increased significantly, for instance.”

Source #56: RE Developer DE, 2017

Changes in project structures triggered by the new regulations and auction mechanism pose challenges for the standard project finance approach. In an interview, a public pillar banker points out that the bank had to “work more concept-based” as in the case of start-ups. Credit rating posed problems – not only in the case of the special purpose vehicle in an early phase of project development with a “growing/accumulating creditworthiness”, but also for manufacturers, that partly took over risks in this early stage [interview #62].

These data show that changes to subsidy schemes lead to an adaptive period in which the financial vehicles and stakeholder composition can change. This adaptation enrols new institutions in energy finance and excludes others. It is beyond the scope of this research to trace the quantitative effect this has had in Germany, however it is clear that the potential trend is a reduction in community or citizen stakes in energy projects, due in part to the equity structure of community projects being incompatible with the auction mechanism and more compatible with the previous feed-in-tariff law.

Though there have been criticisms of social disparities within the energiwende [14; 15], the community equity model, paired with debt finance from the public bank structure, operated with a social and environmental narrative as well as an economic rationale [16]. The move to an auction structure that favours larger financial actors may threaten this ‘civic’ approach.

Alternative energy finance

As has been argued elsewhere [16], this bank based system was a conducive institutional environment for a co-evolution of the civic renewables sector and the public/co-operative bank financing sector. It reduced the financing problem to the question of how much equity the projects needed, and where to source that equity from. Renewable energy project developers built up relationships with public, private and institutional investors, and raised the necessary equity through closed-ended funds [17] or mezzanine capital like participation certificates [18]. Overall, German renewable energy finance is characterized by a variety of sources with a lion’s share of debt made up of highly standardised small to large-scale project finance by banks drawn from across the three pillars [interview #24].

Under this perspective, even community energy belongs to “mainstream energy finance”:

“You might have citizens or cooperatives as owners but the financing system is more or less the same because they use project finance as other project developers or maybe also utilities use project finance and it’s the same product, so the product what we offer in that case.”

Source #22: Banking Institution Landesbank DE, 2014

It is mainstream because community/citizen equity is a standard feature in renewable energy deals. The above quote is from a Landesbank employee. While it shows that community/citizen equity is just one of many ownership forms, it also shows that the public Landesbank, and community equity together may develop an energy project with no recourse needed to the commercial banking or wider financial sector.

The motivations of the community/citizen equity providers differ from a purely commercial focus on return on investment. While commercial returns do play a dominant role in some of these organisations motivations, in near shore regions in the north for example, other geographies display more justice oriented motives like contributions to climate policy and the energy transition [19]. An interviewee from a North German community wind project explains:

“Well, the idea was, in fact, that we have a very good location for wind power. We are directly at the North Sea coast, just four kilometres from the dike. And we knew, of course, before we started, that wind farms that already run had an excellent return on investment. That is, once, of course, the idea of profitability, which was behind it.”

Source #60: Co-operative confederation DE, 2017

In the sentences directly following this statement, he explains that the second motivation was to strengthen the local economy. Regarding the energy cooperative, one interview partner stresses the political thinking of co-operative members providing equity to projects:

"I would say that I have to add […]and I believe, this is now inherent to the market actor energy cooperative, that so among the members, but also among the acting persons, there are also often people with a political attitude, and that is, that they, have an opinion about and a vision of what, now, not only concerns the energy cooperative as a company, in the sense of the company, but also in the sense of a person acting in society, I'd say. And that often also many, or the majority of the people also, really, stand by the climate protection targets and, by the implementation of climate protection through renewable energies, […] that they, are very affine to environmental protection and climate protection and have the opinion that these are important issues, which are brought forward by Germany, and absolutely, I'd say, leading the way."

Source #60: Co-operative confederation DE, 2017

Another interview partner points out that there is a "portion of idealism" present besides financial interests [interview #61].
However, some people fear that this part of "alternative energy finance" may lose ground, i.e. that "risk-oriented market actors may withdraw from the market" [interview #60]. In addition to changes in energy laws, financial regulation could constrict the banks' currently existing leeway to adapt products and conditions to less professional and small partners:

"To be honest, in this context I fear the ECB European Central Bank] *and especially what regarding the bank processes – since, at the moment, we also make a living being able to tailor many things and adapt it to the often more unprofessional and smaller partners. And in this respect, I don't hope that we will lose this flexibility sometime, since then we would very much weaken the movement."*

Source #62: German Banking institution Landesbank (subsidiary) DE, 2017

Against this background, banks are thinking about new products that they can offer to community groups to enable early project development when no surety of subsidy is in place now the support mechanism is auction based. These include risk capital for the early development phase of wind energy projects, i.e. early-stage co-financing [interviews #61, #62].
In summary, citizen and co-operative shares in RE projects are commonplace in Germany and cannot be classified as 'alternative'. Changes to the subsidy regime, from guaranteed feed in tariff to competitive auction, alongside changes to bank regulation, have changed the financial vehicles used for renewable energy projects by introducing risk capital to cover the early stages of a project where no subsidy agreement is in place. This has changed the character of, but

not eliminated citizen participation; and increased the role of financial intermediaries, a key indicator of sector financialisation.

While still a niche market, interviewees from the banking sector mention crowdfunding as an innovative type of financing with a growing importance. They see a role for it in case of non-standard types of projects, giving *equity-like* capital to people without strong financial background, which in turn provides access to bank financing to them:

"This [financing of innovative projects] is where I definitely see a case for crowdfinancing, indeed. Well, I'd say, this issue of storage, in this context, I said that this is a mixed thing, we look at it not with the standard project finance, but we look at it a bit from the corporate finance perspective and from the project finance perspective lens, err, so in combination, and if you push this on the risk side or a bit further on the innovation track, err, then you reach, of course, an area where the standard bank credit and the standard project financing is not the method of choice anymore. Well. Sometimes, you have people who have a good idea. And this is even not that risky. But they don't have the equity necessary to implement it. Then you can, of course, help with this [crowdfinancing]. And, maybe, you can then put bank financing on-top of it, if that's possible."

Source #61: German Banking institution Value-based bank DE, 2017

<u>Matching outcomes to justice</u>

In the German interviews, we find little coverage of two of the original 8 principles of energy justice; availability, and affordability.

Interview partners do however stress the importance of transparency and accountability as a procedural dimension of community energy and the citizen finance stake, i.e. a transparent planning process and project development and an open and transparent communication with local inhabitants and the municipality:

"this guy stands in front of the camera and says well, you know, if I had come in here and my community had said I want to put up ten wind turbines, we wouldn't have been able to do it, so we had these town meetings and I got enough of my neighbours to say that they'll invest and the ones who didn't like it said okay, you can put up a couple. And they did that and then sat there for a couple of years and watched, you know, is it noisy, do people hate the sight, what are their returns and then they kept having these town meetings just to report the results and got it in the press and stuff, and a few years later, the people who hadn't got involved in the first round said I want in. Can you put up some more? And so you eventually reach your ten, if that's what you think you want to have, but you can't just go in and put these up right away. So that's what I document there and that is not, that is a very common occurrence over here."

Source #24: Energiewende NGO DE, 2017

*"[…] and the most important keyword with regard to the implementation of a community wind project is **transparency**. So, to always communicate openly and sincerely with the citizens and the municipality, not to do and manage anything and fiddle behind closed doors or behind closed curtains, but all must be open, open and also announced proactively. This also creates trust immediately and there is nothing worse than giving the impression in the village that you fiddle or that someone gets a special advantage perhaps, but everything must be openly and honestly announced."* [interview #63]

*"So, the very first thing which is totally important is **transparency** from the beginning, openness. Err, if citizens are taken along through meetings, err, from the first idea of 'We want to do this, what do you think about it?' until participation … in the … in the process, and in this context, I don't mean financial participation yet, but participation in designing the contracts, among others, 'Who is allowed to participate in which way?', this is, err, VERY important. … Err, and … then it is, of course, at the end, this peaks in the financial participation."* [interview #64]

"Well, we put the cards on the table at the very beginning, what we planned, and we brought the municipality in immediately." [interview #65]

The provision of community based equity is a vehicle to transparency. There can be no share offer without clear offer documents which render the financial predictions and development timelines visible to all community members. In this way a second of the original 8 principles of energy justice is realised: due process. In the structuring, communication and offering of equity vehicles community acceptance and participation are necessitated. Without acceptance the equity proportion of projects may not be fulfilled. It is not only through such equity offers transparency can be achieved, one of the few German crowdfunding platforms stated:

"'Okay, I have to find financial products where I can explain my customers who invest in these products who could give me the money for their pension or retirement, for example, and I have to be able to explain what the money is doing'. So, like to track the money"

Source #41: Alternative Finance Provider DE, 2017

Transparency is a strong and consistent theme throughout the German data. This is particularly do for citizen equity investments, i.e. the community finance vehicles, and also in the final quote from a crowdfunding platform. However the debt provided from the all pillars of the bank sector was criticised by the crowdfunding provider for being less transparent as savings consumers do not receive direct opportunities actively allocate their assets to specific schemes.
The next of the 8 principles of energy justice we identified strongly across the German sample was intra-gernerational equity. Interviewees link energy finance and intra-generational equity

in different ways, often focussing on the ways in which community level equity is structured and sourced:
One interviewee considers financial participation by local inhabitants who are affected by negative externalities of the power plants as a question of “civil rights, of autonomy and, at the end, of justice” [interview #61]. For him, participation does not only mean “the possibility to participate [financially in the project, but] in the best case, to form it themselves” [interview #61]. With regard to community energy, interview partners stress the necessity to make the same offer to all local citizens who want to participate in the project, i.e. they all invest pari passu:

“Well, here in North Frisia there is the cradle of community wind, where, all citizens are granted the same possibilities to underwrite shares, without any special advantages, for people who particularly took care for the project, and that’s precisely how we did it as well. We again implemented the classical community wind farm here, where all citizens are allowed to underwrite shares equally. And are able to participate in the advantages.” [interview #63]

“And in this context, it is important that everyone is treated equally. And this is also … I assume you also looked into this, these processes in rounds, in which the shares are awarded. And it is not the case that someone with a lot of money gets very many shares then. If there are many investors, he gets the same amount as someone who wants to invest much less.” [interview #64]

In these extracts we see how issues of transparency, due process, and intra-generational equity are bound together. The provision of equity vehicles at the community level clearly does not eliminate all issues of intra-generational justice, there are interviewees who criticize community energy for being exclusive, since only financially strong people have the ability to invest and unequal distribution of economic benefits may lead to social strife locally. The above-cited quote, for instance, continues in the following way:

“On the one hand, economic participation creates local acceptance, but it may also create social strife. Rents for wind are higher than earnings from pure agriculture.” [interview #56]

“In order to preserve acceptance in the long run and increase it, there is a need for new models: Besides property owners, more people have to profit, for example adjacent owners. The factor ‘property ownership’ has positive effects on acceptance only if property owners are local residents.” [interview #57]

Besides, intra-generational justice concerns – who is allowed to invest and who not – have become challenging for the structure of financial participation in larger energy projects in Germany, specifically around transmission grid projects:

"…of course, always the question will be posed who has access to such forms of participation, since you will always feel like saying that, in principle, you participate somehow in the earnings. I get an interest or a dividend or whatever. And the question to be posed here is: who is allowed to? The one over whose property there is the grid, is the one allowed to who lives directly next to the grid, the one who is two kilometres away from the grid, so to say, is the one allowed to who lives behind the mountain and is affected by the grid on the other side of the mountain. (…) Totally unsolved questions are to be solved by choice. I don't want to say arbitrarily, but to be solved by choice, but there is no natural, err, no natural approach. You have to define this approach somehow and this is to some degree discriminating. And in this way you discriminate, so to say."

Source #45: Transmission System Operator DE, 2017

"And the last problem, we haven't yet answered this for us, but just as an additional theoretical 'special treat', this is certainly not uninteresting for research, we asked ourselves at a certain point, how do I set limits for this whole thing, i.e. Whom? Who has the right to purchase such a bond or whatever, let me say, a savings certificate, to profit from the project that has all these many negative effects exactly in this location. And then, there was even something from the German constitution, concerning discrimination. So, I am not allowed to prevent a physician from Baden-Württemberg or a lawyer from Hamburg from purchasing a product of the grid in Uckermark."

Source #46: Transmission System Operator DE, 2017

These considerations of intra-generational equity about who can be included and excluded from various financial vehicles underpinning an energy project demonstrate a wider finding of the German case whereby justice implications of energy finance vehicles are important considerations not just for finance providers but also for project developers and infrastructure operators.

Of the 8 principles of energy justice we identify transparency, due process and intra-generational equity as the key themes arising from the data. At the beginning of this section we identified little coverage of two of the original 8, availability and affordability. We identified transparency, due process, and intra-generational equity as key themes. Of the remaining three: Sustainability, inter-generational equity, and responsibility we find interviewees do reference these as concerns and issues. For example on intragenerational equity a member of the public banking pillar saw clear advantages:

"For the history I think what is generic to savings banks is that they have always tried to follow the big trends in the economic and social development. For example during industrialisation in Germany where you could see a lot of crafts becoming industrialised from small companies,

then it was basically the savings banks that were there to lend. The same is true today where we have a great shift between generations so founders of smaller companies are looking for solutions to hand over that company to the younger generation so that's something where the savings banks are heavily involved."

Source #19: Banking institution [Savings bank] DE, 2017

However, issues of sustainability, inter-generational equity, and responsibility, were often assumed as 'given' since our interviews largely explored the mobilisation of finance around low-carbon energy transitions.

The following task was to identify where other themes emerged, which are related to procedural, distributional, or representative justice, but were not captured by the '8 principles'. We find two specific themes in the data; spatial-equity/local economic development, and financial sector resilience.

Many interviewees emphasise spatial issues and impacts of energy finance. The data from the sample often returned to the spatial impacts of energy investments on local economies and the role of energy investing in local economic development.

Interviewer: "Why does having a local sector matter? As opposed to why couldn't they [renewable energy developers] have just gone to one of the large Deutsche Bank or whatever.

Interviewee: Because that's more of the same. I mean, the Energiewende is such an important project also for German society, and it really changes the rules of the game. And it does this, I mean, if you look at the sort of the large bank, it's going to be more of, you know, the same and profit is the only thing that matters, rather than economic rural development in those communities and getting people together around a common cause."

Source #23: Energiewende NGO DE, 2017

"there is a close relation between the co-operative banks and energy co-operatives on the regional or local level. So, a lot of new renewable energy co-operatives were founded or were supported by co-operative banks. […] ***So, you can see this is more a regional development approach than an energy approach****. So, this story fits together with the local approach of the German co-operative banks because they finance the small and medium size companies in the regions. We asked the board members of the co-operatives what's the main motivation to run the co-operatives because co-operatives are companies but the boards members are volunteers. They said we want to promote renewable energy, we want to be a part of the energy transition was one reason and the other reason was the promotion of regional development."*

Source #16: German [mutual] bank DE [emphasis added], 2014

"It's a different way of thinking about energy production. Auctions are about price and cost of energy production and if you have a community or co-operative approach people think about production and consumption. If you have these close together then they don't only think about dividends they think about the reductions of the costs, it makes more sense to get more money from the PV plants if they pay tax to the community to finance this so there is a circle. And this circle will be completed if we have self-consumption within the co-operative and that is why this is a different way of thinking about energiewende, it's different to farmers who want to sell electricity like milk."

Source #16: German [mutual] bank DE

In the above data interviewees are connecting spatially specific investment with the flows of value from the projects in terms of energy cost saving, tax advantages etc. This also has the potential to support the local state:

"Well, first, there is an enormous amount of money flowing into the municipality. […] This is a very structurally weak area here. So, this is very important, this has been a 'Zuweisungsgemeinde' [i.e. a municipality that gets funds allocated from other municipalities in that federal state], that means, err, how shall I say? There have been reallocations of funds officially; expenditures in our municipality were supported financially from external funds. We couldn't meet the demand by internal financing. ***And this will change in the near future due to these community wind farms here in this municipality."***

Source #65: Developer/Community wind manager DE, 2017 [emphasis added].

One interview partner stresses strict rules to keep shares in the hands of local inhabitants rather than secondary residents or to prevent locals from selling their shares to outsiders [interview #63]. Interview partners from the banking sector emphasize positive effects of local roots and their banks' regionally grounded business models:

"So, they started with solar energy plants, so typical first projects and now they invested in a building, it was a brewery now it is the house of energy where energy service providers, any kind of company and service provider you need for energy efficiency things and so on. They are working in the building, they have their office in the building and that's important for the energy co-operatives in Germany, for new co-operatives in Germany. They integrated a kindergarten in this house of energy and they have a room for public events and for things like the district authorities in the region. They have their office in this building. So, you can see this is more a regional development approach than an energy approach. So, this story fits together with the local approach of the German co-operative banks because they finance the small and medium size companies in the regions." [interview #16]

and on resilience of the economy:

"So a savings bank all by itself can probably not prevent a given area in Germany from experiencing some sort of economic decline, we have seen that of course in the 90s in Eastern Germany in large parts of the county. What it can do is that it can prevent the economic decline from going below a certain level. It can stabilise. The difference between a savings bank and other lenders is that the savings bank will not withdraw. And the savings bank, because it is anchored within that local area and also bound to only operate in that local area, will have to live off the profits that it can make in that local area. This means that it has a very close look at risks because there is no way of going elsewhere, 'cherrypicking' balancing out whatever. ***Usually they do not go to the capital markets so they have to live off the profits they make by taking in deposits and lending."***

Source #19: Banking institution [Savings] bank DE, 2014 [emphasis added]

"…in Germany we weathered the whole financial crisis fairly well because we were largely off the stock market and people were putting tens of thousands of euros of their own money into these local projects that they could see, even if it's a wind turbine and they can see it, and they are a part of it…"

Source #24: Energiewende NGO DE, 2014

The link between the relative resilience of the German economy and the three pillar banking system has been made strongly in secondary works [21].

The justice themes that came through styrongly from the german interviews were transparency, intragenerational equity and spatial equity/regional economic development. While some interview partners do relate the three pillar German banking institions to whole financial sector resillience, we only identify this theme because it is so strongly noted by secondary data as well as corroborated to some degree by the interview data. We reflect this is largely due to the fact that initial interviews were indertaken to understand the forms of finance at work in the German energy transition and thier social issues and foundations and were not intended to explore macroeconomic issues, though in the UK case the resillience issue is much more pronounced.

The justice pincipals of intra and inter-generational equity, and spatial-equity are all *distributional* justice categories. The discussions of interviewees often came back to whether the benefits of energy investment were available to all citizens, could be equitably distributed, and whether any purposive exclusions were fair. The quote regarding who can be excluded from investing in transmission projects: „*I am not allowed to prevent a physician from Baden-Württemberg or a lawyer from Hamburg from purchasing a product of the grid in Uckermark." [interview #46]"* illustrates the structuring role of financial regulation. The implicit assumption is that those closest to the disbenefits of energy projects should be offered the first ability to share rewards. This is a simple distributional justice dilemma, but note how financial regulations that do not allow for spatial discrimination, in this case work against stated justice outcomes. The wider spatial impacts of the public and mutual banks alongside citizen equity in energy projects of the regions is a spatial development concern that transcends energy investing. The locally rooted nature of the Sparkassen public and Volksbanks means there is a minimum level of savings investment and credit available regardless of the regional economic situation. We find support for including this as a justice category from the UN's Sustainable Development Goal 8[110] in which the creation and maintenance of Indigenous/domestic banking and finance institutions is a key target. Access to finance from these domestic institutions is not guaranteed in the UK case, but is secured through the three pillar banking sector in Germany.

A further, point is the much less active alternative finance sector in Germany. The maturity of the public and co-operative banking system in financing small renewable energy schemes means that a socially motivated, small-scale bank based financing system already exists. Where our sample does speak of crowdfunding it is in ways to enrol this in the existing public or co-operative banking pillars.

Finally it is clear that there is a strong spatial justice element which runs through the public and co-operative banking sector. Two of the three pillars of the German model voice explicit spatial development and economic resilience goals. Both the Sparkassen/Landesbanken and the Volksbank networks are operationalising these goals through renewable energy investments. The local circulation of capital and the diverse effects this can have on local economic resilience is bound up with questions about the effectiveness of import substitution Vs more open trade policies [20] that are beyond the scope of this paper to address. However it is clear that there is a strong narrative of local provisioning of both energy and energy finance as a route toward more systemic resilience of regions.

To summaries the principles of justice that relate to energy finance in Germany are:

From within the 8 principles:

- Due process
- Transparency [good governance]
- Intra-generational Equity

From outside the 8 principles:

- Spatial equity/local economic development
- Financial sector resilience [to a lesser extent in the empirical data but to a greater extent from secondary sources]

110 http://www.un.org/sustainabledevelopment/economic-growth/

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Anlagen zu den Artikeln 5 und 6

Erläuterung zu den Tabellen in Artikel 5: Spezifikation der Variablen für die Auswertungen der Leuphana-Datensätze

Variable	Erläuterung
Gender	Geschlecht: männlich, weiblich
Age	Altersklassen im Original: <20, 20-34, 35-49, 50-64, >64 dichotome Variable mit Modell 1: 0 für Alter < 50, 1 für Alter > 49 Modell 2: 1 für 49 < Alter <65, 0 sonst (inhaltliche Begründung: Lebenszyklustheorien)
Occupation	Beschäftigungsverhältnis im Original: Schüler/Student, Angestellter, Selbständiger, Beamter, Rentner/Pensionär, Sonstiges dichotome Variable mit 1 für „Schüler/Student“ und „Rentner/Pensionär“, 0 sonst (inhaltliche Begründung: zeitliche Ressourcen)
Education	Ausbildung (höchster schulischer Abschluss) im Original: Hauptschulabschluss, Realschulabschluss/ mittlere Reife, Hochschulreife, Hochschulabschluss, Sonstiges dichotome Variable mit Modell 1: 1 für Hochschulreife und Hochschulabschluss, 0 sonst Modell 2: 1 für Hochschulabschluss, 0 sonst
Legal Structure	Rechtsform: eG, GmbH & Co. KG
Asset Class	Projekttyp: Photovoltaik, Windenergie an Land, Anteile an Stadtwerk
Founding Year	Gründungsjahr: • Modell 1: Gründungsjahr • Modell 2: 3 Phasen <2010, 2010-2013, >2013 • Modell 2: 2 unterschiedliche Phasen <2010 oder >2013, 2010-2013
Single Company	einzelne Unternehmen, n = 7

Fragebögen zu den eigenen Umfragen

Befragung von Holstenkamp & Kahla (2016)

Willkommensnachricht:

Herzlich willkommen zur Umfrage und vielen Dank für Ihr Interesse!

Die Dauer der Umfrage beträgt in etwa 5 bis 10 Minuten.

Die Bürgerbeteiligung im Rahmen der Energiewende wird durch die Bundespolitik immer wieder als bedeutender Faktor hervorgehoben. Im Zuge der Neugestaltung des EEG wird von der großen Koalition die „mit dem EEG bestehende Vielfalt der Akteure“ betont. Auf der anderen Seite werden Änderungen vorgenommen, die sich möglicherweise negativ auf die Umsetzungschancen von Bürgerprojekten auswirken. Dies ist Gegenstand der Untersuchungen im Forschungsprojekt, das die Leuphana Universität Lüneburg für die 100 prozent erneuerbar Stiftung durchführt.

Die Studie umfasst zwei Teile: In einem ersten Teil geht es darum, die derzeitige Marktsituation von Bürgerenergieanlagen quantitativ und qualitativ anhand ihrer Größe von Energieanlagen, von Investitionsmotive der beteiligten Bürgerinnen und Bürger und weiterer Faktoren zu beschreiben. Im zweiten Teil soll untersucht werden, wie die Vorgaben des Koalitionsvertrages zwischen CDU, CSU und SPD vom November 2013 und des Eckpunktepapiers von Minister Gabriel im Bereich des Ausbaus der Erneuerbaren Energien zur Stromerzeugung umgesetzt werden könnten und welche Auswirkungen dies auf die Bürgerenergie hätte.
Diese Umfrage bildet den Auftakt zum ersten Teil der Studie. Sie richtet sich an Mitglieder von Bürgerbeteiligungsgesellschaften im Bereich der Erneuerbaren Energien und dient dazu, die Motivation und Hintergründe zu erfragen. Damit wollen wir Ihre Bedürfnisse und Ziele ermitteln. Schließlich lassen sich die Auswirkungen von Änderungen im rechtlichen Rahmen nur dann verlässlich abschätzen, wenn mehr darüber bekannt ist, wer denn eigentlich hinter den Bürgerenergieanlagen steht. Schließlich hat die 100 prozent erneuerbar Stiftung vor, gemeinsam mit ihren Partnern im Bündnis Bürgerenergie Ihre Interessen in die Verhandlungen zum neuen EEG einzubringen. Durch Ihre Teilnahme leisten Sie damit einen wissenschaftlich und politisch wertvollen Beitrag zur Gestaltung der Energiewende!
Für Rückfragen und Anregungen sind wir stets dankbar. Bitte richten Sie diese an Frau Franziska Kahla (kahla@uni.leuphana.de, Tel.: 04131/677-1936).

Prof. Dr. Heinrich Degenhart (Professur für Finanzierung und Finanzwirtschaft)
Dipl. Volkswirt Lars Holstenkamp (Professur für Finanzierung und Finanzwirtschaft)
Franziska Kahla, M.Sc. (Professur für Finanzierung und Finanzwirtschaft)

Vertraulichkeitserkärung:
Sämtliche Angaben werden individuell anonymisiert und können nicht zu Ihnen persönlich zurückverfolgt werden. Im Rahmen der Auswertung erfolgt eine Zuordnung der Antworten zu den jeweiligen Beteiligungsgesellschaften. Diese Auswertung wird an die Gesellschaften für eine interne Verwendung weitergegeben. Es werden zu keinem Zeitpunkt individuelle Antworten veröffentlicht. Die erhobenen Daten werden auf zugangsbeschränkten Rechnern des Instituts für Bank-, Finanz- und Rechnungswesen der Leuphana Universität Lüneburg verwaltet.
Beteiligung:

a. Wie lautet der vollständig ausgeschriebene Name der Gesellschaft bei der eine Beteiligung vorliegt?
b. Wie sind Sie auf die Beteiligungsmöglichkeit aufmerksam geworden? (Auswahlfrage)
   - Bank
   - Privatpersonen

- ■ Presse
- ■ Gemeinde
- ■ Verbände/Vereine
- ■ Versorger
- ■ Unternehmen
- ■ Sonstiges _________________

c. Waren Sie bei der Gründung der Gesellschaft beteiligt? (ja/nein)

d. Sind Sie bei weiteren Gesellschaften im Bereich Erneuerbare Energien beteiligt? (ja/nein)

Motivation:

a. Welche Motivation hat Sie damals zu Ihrem Engagement bewegt? (Mehrfachnennungen möglich)
- ■ Renditeerwartung
- ■ kostengünstiger Strom- oder Wärmebezug
- ■ Erhöhung der regionalen Wertschöpfung
- ■ Umweltschutz/ CO2 Reduktion
- ■ Vorantreiben der Energiewende
- ■ Möglichkeit eines direkten Engagements
- ■ Mitgliedschaft in der Gemeinschaft
- ■ Sonstiges_________________

b. Haben sich Ihre Erwartungen erfüllt hinsichtlich…(Tabelle mit Auswahl 1-5) (1= nicht erfüllt; 5= vollständig erfüllt)

…einer hohen Rendite für Ihre Beteiligung?
…des kostengünstigen Strom- und Wärmebezugs?
…der Wertschöpfung für die Region?
…des Umweltschutzes/ der CO_2 Reduktion?
…des Vorantreibens der Energiewende?
…der Möglichkeit eines direkten Engagements?
…der Mitgliedschaft in der Gemeinschaft?

c. Wie wichtig schätzen Sie die finanzielle Beteiligung von Bürgern bei Erneuerbare Energien Projekten allgemein ein? (Tabelle mit Auswahl 1-5) (1= unwichtig; 5= sehr wichtig)

Akzeptanz:

a. Wie hoch schätzen Sie die Professionalität der Gesellschaft, an der Sie beteiligt sind, ein? (Tabelle mit Auswahl 1-5) (1= sehr gering; 5= sehr hoch)

b. Wie hoch schätzen Sie die Akzeptanz der Gesellschaft, an der Sie beteiligt sind, vor Ort ein? (Tabelle mit Auswahl 1-5) (1= sehr gering; 5= sehr hoch)
c. Wie hat sich Ihre Einstellung gegenüber Erneuerbaren Energien durch die Beteiligung verändert? (Tabelle mit Auswahl 1-5) (1= sehr negativ; 5= sehr positiv)
d. Wie hat sich Ihre Einstellung gegenüber den Projekten der Gesellschaft durch die Beteiligung verändert? (Tabelle mit Auswahl 1-5) (1= sehr negativ; 5= sehr positiv)

Aktivität innerhalb der Geschäftsführung:

a. Engagieren Sie sich aktiv in der Geschäftsführung der Gesellschaft? (ja/nein)
   ➔ b. und c. erscheinen nur bei der Auswahl „Ja“
b. Beruht Ihr Engagement auf unentgeltlicher Basis? (ja/nein)
c. Wie wichtig sind der **Gesellschaft**, an der Sie beteiligt sind, die folgenden Ziele? (Tabelle mit Auswahl 1-5) (1= unwichtig; 5= sehr wichtig)
   ■ professionelles Handeln
   ■ Erwirtschaftung eines hohen Gewinnes
   ■ Ausschüttung eines hohen Gewinnes
   ■ Schaffung langfristige Stabilität der Gesellschaft
   ■ kostengünstige Strom- oder Wärmeversorgung der Region
   ■ Erhöhung der regionalen Wertschöpfung
   ■ Schaffung von Arbeitsplätzen
   ■ Erweiterung des Geschäftsbetriebes
   ■ Umweltschutz/ CO2 Reduktion
   ■ Vorantreiben der Energiewende
   ■ Steigerung der Akzeptanz der Anlagen vor Ort
   ■ Sonstiges

Persönliche Fragen:

a. Geschlecht (Auswahlfrage)
   ■ männlich
   ■ weiblich
b. Alter (Auswahlfrage)
   ■ unter 20
   ■ zwischen 20 und 34
   ■ zwischen 35 und 49
   ■ Zwischen 50 und 64
   ■ über 64
c. Wie hoch ist Ihre Beteiligung in €? (freies Feld)
d. Was ist Ihr derzeitiges Arbeitsverhältnis? (Auswahlfrage)

- ■ Angestellter
- ■ Selbstständig
- ■ Schüler/ Student/ Auszubildender
- ■ Rentner/ Pensionär
- ■ Arbeitssuchend
- ■ Sonstiges_______________

e. Was ist Ihr höchster Bildungsabschluss? (Auswahlfrage)

- ■ Hauptschulabschluss
- ■ Realschulabschluss/ Mittlere Reife
- ■ Fachhochschulreife
- ■ Abitur, allgemeine oder fachgebundene Hochschulreife
- ■ Hochschulabschluss (Universität, Fachhochschule)
- ■ Schule beendet ohne Abschluss
- ■ Sonstiges _____________

Kommentarfenster:

Endnachricht:
Vielen Dank für Ihre Teilnahme.

Leuphana Universität Lüneburg
Institut für Bank-, Finanz- und Rechnungswesen
Professur für Finanzierung und Finanzwirtschaft

<u>Befragung von Holstenkamp & Kowallik (forthc.)</u>

Online Fragebogen - Startbildschirm

Herzlich willkommen zur Umfrage und vielen Dank für Ihre Teilnahme!
Die Leuphana Universität Lüneburg untersucht im Rahmen eines Forschungsprojektes, welche Motive, Wünsche und Wertvorstellungen Bürgerinnen und Bürger haben, sich im Rahmen einer Bürgerenergiegenossenschaft an einem Stadtwerk zu beteiligen. Ihre Angaben werden selbstverständlich anonymisiert; die Antworten können nicht zu Ihnen persönlich zurückverfolgt werden. Bei der Auswertung wird lediglich nach Ort – „A“ und „B“ – unterschieden: Wir untersuchen zwei Fälle im Detail und befragen daher Mitglieder der „Bürgerenergiegenossenschaft A“ eG und der „Bürgerenergiegenossenschaft B“ eG.

Das Projekt wird von einem mittelgroßen Stadtwerk unterstützt, das über eine Bürgerbeteiligung nachdenkt. Aus den Ergebnissen werden daher konkrete Handlungsempfehlungen für eine solche Bürgerbeteiligung abgeleitet.
Die Dauer der Umfrage beträgt lediglich 5 Minuten.
Anregungen und Kritik nehmen wir gerne auf und leiten diese ggf. weiter. Rückfragen richten Sie bitte an Frau Jennifer Kowallik (jennifer.kowallik@leuphana.de, Tel.: 04131/677-2151).
Die Ergebnisse der Befragung werden wir Ihnen über Ihre Genossenschaft zukommen lassen. Gerne können Sie uns auch kontaktieren, wenn wir Ihnen die Auswertung direkt zukommen lassen sollen.
Vielen Dank für Ihre Unterstützung!
Prof. Dr. Heinrich Degenhart
Dipl.-Volkswirt Lars Holstenkamp
Dipl.-Kffr. Jennifer Kowallik, M.Sc.

Fragen:
[Die Fragereihenfolge wird zufällig variiert.]

Wie sind Sie auf die Beteiligungsmöglichkeit aufmerksam geworden? (Bitte wählen Sie einen oder mehrere Punkte aus der Liste aus.)

☐ Energieversorger

☐ Gemeinde

☐ Presse

☐ Bürgerversammlung

☐ Privatperson

☐ Verbände / Vereine

☐ Bank

☐ Unternehmen

☐ Sonstiges: ____

Waren Sie bei der Gründung der Gesellschaft beteiligt?

- ○ Ja
- ○ Nein
- ◉ keine Antwort

Sind Sie bei weiteren Gesellschaften im Bereich Erneuerbare Energien beteiligt?

- ☐ Ja
- ☐ Nein
- ☒ keine Antwort

Was hat Sie damals zu Ihrem Engagement bewogen?

	1 (nicht wichtig)	2	3	4	5 (sehr wichtig)	keine Antwort
Rendite	☐	☐	☐	☐	☐	☒
kostengünstiger Strom- oder Wärmebezug	☐	☐	☐	☐	☐	☒
Erhöhung der regionalen Wertschöpfung	☐	☐	☐	☐	☐	☒
Umweltschutz/ CO_2-Reduktion	☐	☐	☐	☐	☐	☒
Vorantreiben der Energiewende	☐	☐	☐	☐	☐	☒
Möglichkeit eines direkten Engagements	☐	☐	☐	☐	☐	☒
Mitgliedschaft in der Gemeinschaft	☐	☐	☐	☐	☐	☒

Welche weiteren Gründe gibt es für Ihr Engagement?

(Tragen Sie die Antworten bitte nacheinander, durch Kommata getrennt, ein!)

Wie hoch sollte die Rendite mindestens sein?

(Tragen Sie bitte einen Wert ein! Sie können Erläuterungen hierzu im folgenden Feld eintragen.)

Erläuternde Kommentare:

Würden Sie auf einen Teil der Rendite verzichten, wenn diese für einen sozialen Zweck eingesetzt würde?

- ☐ In jedem Fall.
- ☐ Ja, wenn die Rendite größer als die von mir angegebene Mindestrendite ist.
- ☐ Nein.

- keine Antwort

Würden Sie auf einen Teil der Rendite verzichten, wenn diese für die Entwicklung Ihrer Stadt bzw. Region eingesetzt würde?

- In jedem Fall.
- Ja, wenn die Rendite größer als die von mir angegebene Mindestrendite ist.
- Nein.
- keine Antwort

Würden Sie eine Mitgliedschaft in der Bürgerenergiegenossenschaft weiterempfehlen?

- Ja
- Nein
- keine Antwort

Fühlen Sie sich ausreichend über das Engagement des lokalen Energieversorgers informiert?

- Ja
- Nein
- keine Antwort

Fühlen Sie sich ausreichend über die Bürgerenergiegenossenschaft involviert?

- Ja
- Nein
- keine Antwort

Abschließend bitten wir Sie, für die Auswertung der Umfrage noch einige Angaben zu Ihrer Person zu machen. Damit würden wir gerne einige (Vor-)Urteile überprüfen, die zu engagierten Personen in Bürgerenergiegenossenschaften bestehen.

- weiblich
- männlich
- keine Antwort
-

Zu welcher Altersgruppe gehören Sie?
Bitte wählen Sie eine der folgenden Antworten:

- unter 20
- zwischen 20 und 34

- zwischen 35 und 49
- Zwischen 50 und 64
- über 64
- keine Antwort

Was ist Ihr **höchster** Bildungsabschluss?
Bitte wählen Sie eine der folgenden Antworten:

- Hauptschulabschluss
- Realschulabschluss/Mittlere Reife
- Fachhochschulreife
- Abitur, allgemeine oder fachgebundene Hochschulreife
- Hochschulabschluss (Universität, Fachhochschule)
- Schule beendet ohne Abschluss
- Sonstiges:
- keine Antwort

Wie hoch ist Ihre Beteiligung **in Euro**?

(Im Rahmen der Auswertung stellt diese Angabe einen interessanten Wert dar. Es wäre daher sehr hilfreich, wenn Sie hier eine Angabe machen würden.)

Antwort

Abschließend haben Sie die Möglichkeit, Anregungen, Kommentare, Kritik und andere Hinweise für uns zu hinterlassen. Vielen Dank dafür!

Abschlusstext:

Vielen Dank für Ihre Teilnahme!

Leuphana Universität Lüneburg, Institut für Bank-, Finanz- und Rechnungswesen, Professur für Finanzierung und Finanzwirtschaft

Für Rückfragen und Anregungen sind wir stets dankbar. Bitte richten Sie Ihre Fragen und Kommentare an Frau Jennifer Kowallik (jennifer.kowallik@leuphana.de, Tel.: 04131/677-2151)

Vertraulichkeitserklärung: Sämtliche Angaben werden individuell anonymisiert und können nicht zu Ihnen persönlich zurückverfolgt werden. Im Rahmen der Auswertung erfolgt eine Zuordnung der Antworten zu den jeweiligen Orten („A“ bzw. „B“). Es werden zu keinem Zeitpunkt individuelle Antworten veröffentlicht. Die erhobenen Daten werden auf zugangsbeschränkten Rechnern des Instituts für Bank-, Finanz- und Rechnungswesen der Leuphana Universität Lüneburg verwaltet.

STATA-Code für die Analysen in Artikel 5

Bearbeitung und Analyse der Daten von Radtke (2016)

Bearbeitung des Originaldatensatzes für die Analyse

```
* Reworking of final dataset from Radtke (2016)
* Umfrage Bürgerbeteiligung EE
* Code: Lars Holstenkamp, 23/11/2018

set more off
clear
capture log close
log using dj18, replace

* ursprünglichen Datensatz laden
cd C:\Users\FUFW\Documents\Buergerbeteiligungsmodelle\Joerg_Datensatz
use daten_final_korr

* -------------------------------------------------
* -------------------------------------------------
* Datensatz für Analyse aufbereiten
* -------------------------------------------------
* -------------------------------------------------

* Löschen aller nicht benötigten Variablen
keep id a2 a3 a4* a7 a8 a11 b1 b2 b3 b4 b9 d10* d11* d12 d14 e3* e4 dataID ///
        z_akustW z_akustW_and Energie Rechtsform Groesse einkommen wind akademiker

* -------------------------------------------------
* (Re-)Kodierung & Labeling
* -------------------------------------------------

* Variable "Geschlecht" (a2)
replace a2="0" if a2=="weiblich"
replace a2="1" if a2=="männlich"
destring a2, replace
label define Geschlecht 0 "weiblich" 1 "männlich"
label val a2 Geschlecht
label var a2 "Geschlecht"

* Variable "Altersklasse" (a3)
replace a3="1" if a3=="bis 1"
replace a3="2" if a3=="18-25"
replace a3="3" if a3=="25-35"
replace a3="4" if a3=="35-45"
replace a3="5" if a3=="45-55"
replace a3="6" if a3=="55-65"
```

```
replace a3="7" if a3=="65-75"
replace a3="8" if a3=="75-85"
replace a3="9" if a3=="über"
destring a3, replace
label var a3 "Altersklasse"
label define Altersklasse 1 "bis 18" 2 "18-25" 3 "25-35" 4 "35-45" 5 "45-55" 6 "55-65" 7 "65-75" 8 "75-85" 9 "über 85"
label val a3 Altersklasse

* Variable "Bildung" (a4) = höchster Bildungsabschluss
forv i=1/8 {
	replace a4_`i'="1" if a4_`i'=="Ja"
	replace a4_`i'="0" if a4_`i'=="Nicht GewÃ¤hlt"
	destring a4_`i', replace
}
drop a4_and
* Zusammenfassen in einer neuen Variable a4
gen a4=.
forv i=1/8 {
	replace a4=`i' if a4_`i'==1

* Löschen der alten Variablen
drop a4_*
* Labeling
label var a4 "Höchster Bildungsabschluss"
label define Bildung 1 "Hauptschule" 2 "Realschule" 3 "Abitur" 4 ///
	"Ohne Abschluss/unbekannt" 5 "Lehre/FacharbeiterIn" 6 ///
	"Meister/Fachschule" 7 "(Fach-)Hochschule/Universität" 8 "Promotion"
label val a4 Bildung

* Variable "Einkommen" (a7)
replace a7="1" if a7=="kein eigenes Einkommen"
replace a7="2" if a7=="0 - 500 Euro"
replace a7="3" if a7=="501 bis 1.500 Euro"
replace a7="4" if a7=="1.501 bis 2.500 Euro"
replace a7="5" if a7=="2.501 bis 3.500 Euro"
replace a7="6" if a7=="3.501 bis 5.000 Euro"
replace a7="7" if a7=="5.001 bis 7.000 Euro"
replace a7="8" if a7=="7.001 bis 10.000 Euro"
replace a7="9" if a7=="grÃ¶ÃŸer als 10.000 Euro"
destring a7, replace
label var a7 "Einkommensklasse"
label define Einkommen 1 "kein eigenes Einkommen" 2 "0 - 500" ///
	3 "501 – 1.500" 4 "1.501 – 2.500" 5 "2.501 – 3.500" 6 ///
	"3.501 – 5.000" 7 "5.001 – 7.000" 8 "7.001 – 10.000" 9 ">10.000"
label val a7 Einkommen

* Variable "Wohnort" (a8)
replace a8="1" if a8=="Innenstadt"
replace a8="2" if a8=="Stadtviertel nahe der Innenstadt"
replace a8="3" if a8=="Stadtviertel nahe dem Stadtrand"
replace a8="4" if a8=="Stadtrand"
replace a8="5" if a8=="Mittelstadt (20.000 bis 100.000 Einwohner)"
replace a8="6" if a8=="Kleinstadt (5.000 bis 20.000 Einwohner)"
replace a8="7" if a8=="Dorf (unter 5.000 Einwohner)"
destring a8, replace
label var a8 "Wohnort"
label define Wohnort 1 "Innenstadt" 2 "Stadtviertel nahe der Innenstadt" ///
	3 "Stadtviertel nahe dem Stadtrand" 4 "Stadtrand" 5 ///
	"Mittelstadt (20.000 – 100.000 Einwohner)" 6 ///
	"Kleinstadt (5.000 – 20.000 Einwohner)" 7 "Dorf (unter 5.000 Einwohner)"
label val a8 Wohnort
```

```
* Zusammenfassung in verschiedenen Aggregationsstufen
forv i=1/4 {
	gen x`i'=a8
	replace x`i'=1 if x`i'==2 | x`i'==3 | x`i'==4
	replace x`i'=x`i'-3 if x`i'>3
}
* x1: Stadttyp
label var x1 "Stadttyp"
label define Stadttyp 1 "Großstadt" 2 ///
	"Mittelstadt (20.000 – 100.000 Einwohner)" 3 ///
	"Kleinstadt (5.000 – 20.000 Einwohner)" 4 "Dorf (unter 5.000 Einwohner)"
label val x1 Stadttyp
* x2: Groß-, Mittel-, Kleinstadt
replace x2=3 if x2==4
label var x2 "Stadtgröße"
label define Stadt 1 "Großstadt" 2 "Mittelstadt" 3 "Kleinstadt und Dorf"
label val x2 Stadt
* x3: Stadt/Land
replace x3=0 if x3==1 | x3==2
replace x3=1 if x3==3 | x3==4
label var x3 "Ländliche Region"
label define Laendlich 0 "Städtisch" 1 "Ländlich"
label val x3 Laendlich
* x4: Stadt/Dorf
replace x4=0 if x4==1 | x4==2 | x4==3
replace x4=1 if x4==4
label var x4 "Dorf"
label define Land 0 "Stadt" 1 "Dorf"
label val x4 Land

* Variable "Entfernung Anlage" (a11)
replace a11="1" if a11=="...in unmittelbarer NÃ¤he (maximal 500 Meter)."
replace a11="2" if a11=="...im gleichen Stadtteil (bis ca. 5 km Entfernung)."
replace a11="3" ///
	if a11=="...in einem benachbarten Stadtviertel/Gemeinde (bis ca. 10 km Entfernung)."
replace a11="4" if a11=="...in der Umgebung (bis ca. 20 km Entfernung)."
replace a11="5" if a11=="...in 20 bis 50 km Entfernung."
replace a11="6" if a11=="...in mehr als 50 km Entfernung."
replace a11=".k" if a11=="keine Angabe"
destring a11, replace
label var a11 "Entfernung von Anlagen"
label define Entfernung 1 "in unmittelbarer Nähe (maximal 500 Meter)" ///
	2 "...im gleichen Stadtteil (bis ca. 5 km Entfernung)." ///
	3 "...in einem benachbarten Stadtviertel/Gemeinde (bis ca. 10 km Entfernung)." ///
	4 "...in der Umgebung (bis ca. 20 km Entfernung)." ///
	5 "...in 20 bis 50 km Entfernung." 6 "...in mehr als 50 km Entfernung"
label val a11 Entfernung

* Variable "Beteiligungssumme" (b1)
replace b1="1" if b1=="weniger als 500 Euro"
replace b1="2" if b1=="501 bis 1.000 Euro"
replace b1="3" if b1=="1.001 bis 2.000 Euro"
replace b1="4" if b1=="2.001 bis 3.000 Euro"
replace b1="5" if b1=="3.001 bis 5.000 Euro"
replace b1="6" if b1=="5.001 bis 10.000 Euro"
replace b1="7" if b1=="mehr als 10.000 Euro"
replace b1=".k" if b1=="keine Angabe"
destring b1, replace
label var b1 "Beteiligungssumme (Klassen)"
label define Beteiligungssumme 1 "< 500" 2 "501 – 1.000" 3 "1.001 – 2.000" ///
	4 "2.001 – 3.000" 5 "3.001 – 5.000" 6 "5.001 – 10.000" 7 "> 10.000"
label val b1 Beteiligungssumme
```

```
* Variable "finanzielle Motivation" (b2)
replace b2="5" if b2=="trifft voll zu"
replace b2="4" if b2=="trifft teilweise zu"
replace b2="3" if b2=="bin unentschieden"
replace b2="2" if b2=="trifft eher nicht zu"
replace b2="1" if b2=="trifft Ã¼berhaupt nicht zu"
destring b2, replace
label var b2 "finanzielle Motivation"
label define Bewertung 1 "trifft überhaupt nicht zu" 2 "trifft eher nicht zu" ///
        3 "bin unentschieden" 4 "trifft teilweise zu" 5 "trifft voll zu"
label val b2 Bewertung

* Variable "ökologische Motivation" (b3)
replace b3="5" if b3=="trifft voll zu"
replace b3="4" if b3=="trifft teilweise zu"
replace b3="3" if b3=="bin unentschieden"
replace b3="2" if b3=="trifft eher nicht zu"
replace b3="1" if b3=="trifft Ã¼berhaupt nicht zu"
destring b3, replace
label var b3 "ökologische Motivation"
label val b3 Bewertung

* Variable "Bürgerhand-Motivation" (b4)
replace b4="5" if b4=="trifft voll zu"
replace b4="4" if b4=="trifft teilweise zu"
replace b4="3" if b4=="bin unentschieden"
replace b4="2" if b4=="trifft eher nicht zu"
replace b4="1" if b4=="trifft Ã¼berhaupt nicht zu"
destring b4, replace
label var b4 "Energie in Bürgerhand-Motivation"
label val b4 Bewertung

* Variable "Erfahrung mit EE-Beteiligungsprojekten" (b9)
replace b9="0" if b9=="Nein."
replace b9="1" if b9=="Ja, und zwar:"
destring b9, replace
label var b9 "Erfahrung mit EE-Beteiligungsprojekten"
label define dummy 0 "Nein" 1 "Ja"
label val b9 dummy

* Variable "Zustimmung Ausbau EE" (d10)
forv i=1/9 {
        replace d10_`i'="1" if d10_`i'=="Ja"
        replace d10_`i'="0" if d10_`i'=="Nicht GewÃ¤hlt"
        destring d10_`i', replace
}
drop d10_and
forv i=1/8 {
        replace d10_`i'=.k if d10_9==1
}
drop d10_9
* Zusammenfassung für Wind und PV
gen d10wind=d10_1
replace d10wind=1 if d10_1==0 & d10_2==1
replace d10wind=2 if d10_1==1 & d10_2==0
replace d10wind=.i if d10_1==1 & d10_2==1      //-> Beides zus. nicht konsistent!
                                                          //        (n = 5)
drop d10_1 d10_2
gen d10pv=d10_3
replace d10pv=1 if d10_3==0 & d10_4==1
replace d10pv=2 if d10_3==1 & d10_4==0
```

```
replace d10pv=.i if d10_3==1 & d10_4==1         //-> Beides zus. nicht konsistent!
                                                                                 //         (n = 8)
drop d10_3 d10_4
rename d10_5 d10bio
rename d10_6 d10wasser
rename d10_7 d10geothermie
rename d10_8 d10unentschl
* Labeling
label var d10wind "Zustimmung zum Wind-Ausbau"
label var d10pv "Zustimmung zum PV-Ausbau"
label var d10bio "Zustimmung zum Biomasseausbau"
label var d10wasser "Zustimmung zum Wasserkraftausbau"
label var d10geothermie "Zustimmung zum Geothermieausbau"
label var d10unentschl "Unentschlossene"
label define Zustimmung 0 "beides nicht ausgewählt" 1 "wenige weitere Anlagen" ///
        2 "einige weitere Anlagen"
label val d10wind Zustimmung
label val d10pv Zustimmung
label define Zustimmung2 0 "nicht gewählt" 1 "ja"
label val d10bio Zustimmung2
label val d10wasser Zustimmung2
label val d10geothermie Zustimmung2
label val d10unentschl Zustimmmung2

* Variable "Einstellung EE" (d11)
drop d11_and
forv i=1/11 {
        replace d11_`i'="1" if d11_`i'=="Ja"
        replace d11_`i'="0" if d11_`i'=="Nicht GewÃ¤hlt"
        destring d11_`i', replace
}
forv i=1/10 {
        replace d11_`i'=.k if d11_11==1
}
drop d11_11
label var d11_1 "positivere Einstellung"
label var d11_2 "Akzeptanz von Beeinträchtigungen"
label var d11_3 "Glaube an dezentrale Energieversorgung"
label var d11_4 "Befürwortung gemeinschaftlicher Projekte"
label var d11_5 "Gegner von großen Kraftwerken"
label var d11_6 "Aussprache für mehr Bürgerbeteiligung"
label var d11_7 "Achtsamkeit eigener Energieverbrauch"
label var d11_8 "ökologischere Haltung"
label var d11_9 "keine Einstellungsänderung"
label var d11_10 "kritischere Haltung"
forv i=1/10 {
        label val d11_`i' Zustimmung2
}

* Variable "Akzeptanz" (d12)
replace d12="9" if d12=="extrem positiv"
replace d12="8" if d12=="sehr positiv"
replace d12="7" if d12=="positiv"
replace d12="6" if d12=="eher positiv"
replace d12="5" if d12=="neutral"
replace d12="4" if d12=="eher negativ"
replace d12="3" if d12=="negativ"
replace d12="2" if d12=="sehr negativ"
replace d12="1" if d12=="extrem negativ"
destring d12, replace
label var d12 "Akzeptanz der Anlagen"
label define Akzeptanz 1 "extrem negativ" 2 "sehr negativ" 3 "negativ" ///
```

```
	4 "eher negativ" 5 "neutral" 6 "eher positiv" 7 "positiv" 8 "sehr positiv" ///
	9 "extrem positiv"
label val d12 Akzeptanz

* Variable "Veränderung Akzeptanz" (d14)
replace d14="0" if d14=="Ist unverÃ¤ndert geblieben."
replace d14="2" if d14=="Ja, ist deutlich angestiegen." | ///
	d14=="Ja, ist deutlich gestiegen."
replace d14="1" if d14=="Ja, ist ein wenig angestiegen." | ///
	d14=="Ja, ist ein wenig gestiegen."
replace d14="-1" if d14=="Nein, ist ein wenig gesunken."
replace d14="-2" if d14=="Nein, ist deutlich gesunken."
replace d14=".s" if d14=="Planung in Abstimmung mit der"
destring d14, replace
label var d14 "Veränderung der Akzeptanz der Anlagen"
label define Veraenderung -2 "Nein, ist deutlich gesunken" ///
	-1 "Nein, ist ein wenig gesunken" 0 "Ist unverändert geblieben" ///
	1 "Ja, ist ein wenig angestriegen" 2 "Ja, ist deutlich angestiegen"
label val d14 Veraenderung

* Variable "Engagement" (e3)
forv i=1/9 {
	replace e3_`i'="1" if e3_`i'=="Ja"
	replace e3_`i'="0" if e3_`i'=="Nicht GewÃ¤hlt"
	destring e3_`i', replace
}
* Analyse hinsichtlich Konsistenz
* e3_9: "keine Angabe" => nicht gleichzeitig mit "ja" bei anderer Option
* "tab" für e3_9 kombiniert mit den anderen Dummy-Variablen e3_1 bis e3_8
* Test, ob irgendwo beides mit "ja" beantwortet, was inkonsistent wäre
forv i=1/8 {
	tab e3_9 e3_`i'
}
* Ergebnis:
* Inkonsistente Antworten für:
* e3_2 & e3_9, n=1
* e3_4 & e3_9, n=2
* e3_7 & e3_9, n=2
gen e3akt=e3_1+e3_2+e3_3+e3_4+e3_5+e3_6+e3_7
tab e3_8 e3_9 if e3akt==0
* Ergebnis: (483/96, 463/0)
* => 483 Personen haben nichts angekreuzt
* e3_9=1 für n=100 => 4 Personen haben inkonsistent geantwortet
* 463 engagieren sich nicht gesellschaftlich
* Inkonsistenzen auflösen
replace e3_9=0 if e3_9==1 & e3akt>0		//->Annahme: Angabe zu Engagement stimmt
label var e3_1 "Engagement: politische Partei"
label var e3_2 "Engagement: Verein"
label var e3_3 "Engagement: Stadtteil, Agenda, Nachbarschaftsgruppe"
label var e3_4 "Engagement: Verband"
label var e3_5 "Engagement: Gewerkschaft"
label var e3_6 "Engagement: Glaubensgemeinschaft"
label var e3_7 "Engagement: Genossenschaft"
label var e3_8 "Engagement: Keine"
label var e3_9 "Engagement: keine Angabe"
forv i=1/9 {
	label val e3_`i' Zustimmung2
}

* Variable "aktives Mitglied" (e4)
replace e4=".a" if e4=="ar aber scho"
replace e4="0" if e4=="Nein."
```

```
replace e4="1" if e4=="Ja."
replace e4=".k" if e4=="keine Angabe"
destring e4, replace
label var e4 "aktives Mitglied"
label define JaNein 0 "Nein" 1 "Ja"
label val e4 JaNein

* Variable "Umfrage-ID" (dataID)
label var dataID "Umfrage-ID"

* Variable "Energie"
replace Energie="1" if Energie=="Solar"
replace Energie="2" if Energie=="Wind"
replace Energie="3" if Energie=="Waermev"
replace Energie="4" if Energie=="mehrere"
destring Energie, replace
rename Energie tech
label var tech "Technologie/Energieform"
label define techL 1 "PV" 2 "Wind" 3 "Wärme" 4 "mehrere"
label val tech techL

* Variable "Rechtsform"
rename Rechtsform rf
replace rf="1" if rf=="GbR"
replace rf="2" if rf=="Genossenschaft"
replace rf="3" if rf=="GmbH"
replace rf="4" if rf=="GmbH-Co"
replace rf="5" if rf=="Verband"
replace rf="6" if rf=="Verein"
destring rf, replace
label var rf "Rechtsform"
label define rfL 1 "GbR" 2 "eG" 3 "Genussrecht" 4 "GmbH & Co. KG" 5 "Verband" 6 "Verein"
label val rf rfL

* Generate variables for types of participation
generate rf_ind=0                    // variable that denotes if indirect participation (Ge-
nussrecht)
replace rf_ind=1 if rf==3
label var rf_ind "indirekte Beteiligung"
label val rf_ind JaNein
generate rf_diff=rf                  // further differentiation of associations/clubs
replace rf_diff=1 if rf==2 | rf==4
replace rf_diff=2 if rf==3
replace rf_diff=3 if rf==5 | rf==6
label var rf_diff "Beteiligungstypen"
label define diffL 1 "direkte Beteiligung" 2 "Genussrecht" 3 "Verein"
label val rf_diff diffL

* Variables "Groesse", "einkommen", "wind" and "akademiker"
rename Groesse gr
replace gr="1" if gr=="klein"
replace gr="2" if gr=="mittel"
replace gr="3" if gr=="gross"
destring gr, replace
label var gr "Größe (ad hoc, JR)"
label define grL 1 "klein" 2 "mittel" 3 "gross"
label val gr grL
rename einkommen eink
replace eink="1" if eink=="niedriges Einkommen"
replace eink="2" if eink=="mittleres Einkommen"
replace eink="3" if eink=="hohes Einkommen"
destring eink, replace
```

```
label var eink "Einkommensklasse (zus.)"
label define einkL 1 "niedriges Einkommen" 2 "mittleres Einkommen" 3 "hohes Einkommen"
label val eink einkL
replace wind="0" if wind=="andere"
replace wind="1" if wind=="Wind"
destring wind, replace
label var wind "Windenergie (Dummy)"
label val wind JaNein
label var akademiker "Akademiker (Dummy)"
label val akademiker JaNein

save dj18_1.dta, replace
clear

log close
exit
```

Analyse – erste Schritte

```
* Analysis of final dataset from Radtke (2016)
* Umfrage Bürgerbeteiligung EE
* Code: Lars Holstenkamp, 25/11/2018

set more off
clear
capture log close
log using dj18_an, replace

* Laden des Datensatzes
use dj18_1

* Chi^2-Test für soziodemografische Variablen und Einflussfaktoren
* Faktoren: Rechtsformen, indirekte Beteiligung, Beteiligungstypen, Technologie, Größe
local types "rf rf_ind rf_diff tech gr"
foreach x of local types {
	foreach num in 2 3 4 7 {
		tab a`num' `x', chi2 V
	}
}
foreach x of local types {
	tab akademiker `x', chi2 V
}
clear
log close

exit
```

Analyse2 (Konstruktion von Dummy-Variablen und Variationen von rf)

```
* Analysis of final dataset from Radtke (2016)
* Umfrage Bürgerbeteiligung EE
* Code: Lars Holstenkamp, 27/11/2018

set more off
clear
capture log close
log using dj18_an2, replace

* Laden des Datensatzes
use dj18_1
```

```
* Konstruktion von Dummy-Variablen aus soziodemografischen Variablen und Variationen von rf
* anschließend Wiederholung der Tests aus dj18_an
tab akademiker rf_diff if rf_diff>3, chi2 V
tab a7, nol
generate a7_dummy=0
replace a7_dummy=1 if a7>5 & a7!=.
local types "rf rf_ind rf_diff tech gr"
foreach x of local types {
	tab a7_dummy `x', chi2 V
}
generate a7_dummy2=0
replace a7_dummy=1 if a7>4 & a7!=.
foreach x of local types {
	tab a7_dummy2 `x', chi2 V
}
tab rf
gen rf2=rf
replace rf2=. if rf==1 | rf==5 | rf==6
gen a3_dummy=0
replace a3_dummy=1 if a3>5 & a3!=.
gen a3_dummy2=a3_dummy
replace a3_dummy2=0 if a3==6
foreach num in 2 3 4 7 {
	tab a `num' rf2, chi2 V
}
local socdem "a2 a3_dummy a3_dummy2 akademiker a7_dummy a7_dummy2"
foreach x of local socdem {
	tab `x' rf2, chi2 V
}
gen rf3=rf2
replace rf3=3 if rf2==4
gen rf4=rf2
replace rf4=2 if rf2==4
forv i=3/4 {
	foreach x of local socdem {
		tab `x' rf`i', chi2 V
	}
}

clear
log close
exit
```

Analyse3 – Bereinigung des Datensatzes für <= 30 Rückläufer

```
* Analysis of final dataset from Radtke (2016)
* Umfrage Bürgerbeteiligung EE
* Code: Lars Holstenkamp, 27/11/2018

set more off
clear
capture log close
log using dj18_an3, replace

* Laden des Datensatzes
use dj18_1

* Ausschluss von Daten für Gesellschaften mit n<31 Rückläufen
* anschließend Wiederholung der Tests aus dj18_an
```

```
* Erstellen eines Datensatzes mit Anzahl der Rückläufe
sort dataID id
contract dataID
save surveycount, replace
clear

* Laden des Datensatzes
use dj18_1

* Merge mit Anzahl Rückläufe
merge m:1 dataID using surveycount
drop _merge
tab _freq
hist _freq

* Löschen, wenn _freq<=30
drop if _freq<=30

* Analyse
local types "rf rf_ind rf_diff tech gr"
foreach x of local types {
	foreach num in 2 3 4 7 {
		tab a`num' `x', chi2 V
	}
}
foreach x of local types {
	tab akademiker `x', chi2 V
}
tab akademiker rf_diff if rf_diff>3, chi2 V
generate a7_dummy=0
replace a7_dummy=1 if a7>5 & a7!=.
foreach x of local types {
	tab a7_dummy `x', chi2 V
}
generate a7_dummy2=0
replace a7_dummy=1 if a7>4 & a7!=.
foreach x of local types {
	tab a7_dummy2 `x', chi2 V
}
gen rf2=rf
replace rf2=. if rf==1 | rf==5 | rf==6
gen a3_dummy=0
replace a3_dummy=1 if a3>5 & a3!=.
gen a3_dummy2=a3_dummy
replace a3_dummy2=0 if a3==6
foreach num in 2 3 4 7 {
	tab a `num' rf2, chi2 V
}
local socdem "a2 a3_dummy a3_dummy2 akademiker a7_dummy a7_dummy2"
foreach x of local socdem {
	tab `x' rf2, chi2 V
}
gen rf3=rf2
replace rf3=3 if rf2==4
gen rf4=rf2
replace rf4=2 if rf2==4
forv i=3/4 {
	foreach x of local socdem {
		tab `x' rf`i', chi2 V
	}
}
```

```
clear
log close
exit
```

Bearbeitung und Analyse der Leuphana-Daten (Holstenkamp & Kahla, 2016; Holstenkamp & Kowallik, forthc.)

Zusammenfügen der beiden Datensätze

```
* Lars Holstenkamp
* 15 November 2018
* Reworking and combination of Leuphana datasets

version 12
set more off
capture log close

log using xxx_si-ep_leu-ds, replace
* -----
* Original dataset from Holstenkamp/Kowallik, copied to file
* -----
use hk17

* Drop variables not observed in Holstenkamp/Kahla (2016)
drop renditeverzicht_sozial renditeverzicht_stadt
* Rename and label certain variables
rename urban id_comp
label var id_comp "ID des Unternehmens"
replace id_comp=10001 if id_comp==0
replace id_comp=10002 if id_comp==1
* Save under new name
save hk2016, replace
clear

* -----
* Original dataset from Holstenkamp/Kahla (2016), copied to file
* -----
use lf2014

* Drop variables not observed in Holstenkamp/Kowallik
drop random1 insample1 random2 insample2 random3 insample3 random4 ///
	insample4 random5 insample5 random6 insample6 random7 insample7 ///
	random8 insample8 random9 insample9 random10 insample10
drop aufm_bank aufm_privat aufm_presse aufm_gem auf_ev aufm_energie ///
	aufm_unternehmen
drop bet_anz erw_* betform_* profess akzept einst_ee einst_proj ///
	fuehrung ehrenamt wichtig_* region* ca ef_kombi* gf_kombi bet_kombi ///
	betform_wichtig_fin motivn*

* Save dataset (new=reworked dataset)
save lf2016, replace

* Generate variable with number of responses
* Contract to dataset of frequencies (responses per company)
contract name, freq(freq)
label var freq "Frequency of responses"
save lf2016_freq, replace
clear
* Merge both datasets   // -> freq=number of responses per company
use lf2016
```

```
merge n:1 name using lf2016_freq
drop _merge

* Check content of variable "bet_av"
gen bet_diff=beteiligung-bet_av
tab bet_diff
tab bet_diff bet_av if bet_diff==.
tab bet_diff bet_av if bet_diff==., missing
drop bet_diff
drop bet_av                                   // -> not necessary

* Drop all observations for companies with less than 15 responses
drop if freq<15                      // here: response rate>10% (as far as known)
drop freq

* Recode variable "beteiligung"
replace beteiligung=1 if beteiligung<2500
replace beteiligung=2 if beteiligung>1 & beteiligung<5000
replace beteiligung=3 if beteiligung>2 & beteiligung<10000
replace beteiligung=4 if beteiligung>3 & beteiligung<25000
replace beteiligung=5 if beteiligung>4 & beteiligung<50000
replace beteiligung=6 if beteiligung>=50000 & beteiligung!=.
label define betL 1 "500 bis < 2.500 Euro" 2 "2.500 bis < 5.000 Euro" ///
        3 "5.000 bis < 10.000 Euro" 4 "10.000 bis < 25.000 Euro" ///
        5 "25.000 bis < 50.000 Euro" 6 "> 50.000 Euro"
label val beteiligung betL
* Recode variable "bildung"
replace bildung=5 if bildung==7
replace bildung=3 if bildung==6
replace bildung=bildung+10 if bildung==4 | bildung==5
replace bildung=4 if bildung==15
replace bildung=5 if bildung==14

save, replace
clear

* -----
* Combine both datasets
* -----
* Rework Holstenkamp/Kowallik dataset
use hk2016
* Drop variable "renditeerwartung"
drop renditeerwartung
* Rename variables so that identical with lf21016
rename id_comp id_umfrage
rename id id_inumfrage
rename gruendungsmitglied gruendung_bet
rename beteiligungen_weitere bet_weitere
rename arbeitsverhaeltnis arbv
rename motiv_wertschoepfung motiv_regwert
rename motiv_engagement motiv_partizipation
* Generate new variables contained in lf2016
generate str100 name="Bürger-Energie-Genossenschaft Steinfurt eG"
replace name="BürgerEnergie Jena eG" if id_umfrage==10002
generate gf=2
generate str50 land="Nordrhein_Westfalen"
replace land="Thueringen" if id_umfrage==10002
generate jahr=2014
replace jahr=2011 if id_umfrage==10002
generate ef=10
generate id=1356
replace id=371 if id_umfrage==10002
```

```
* Change values where not identically coded with Holstenkamp/Kahla (2016)
replace geschlecht=geschlecht+1
replace arbv=arbv+10
replace arbv=1 if arbv==15
replace arbv=2 if arbv==11
replace arbv=3 if arbv==14
replace arbv=4 if arbv==13
replace arbv=5 if arbv==12
replace arbv=6 if arbv>15

* Save reworked dataset
save, replace
clear

* Combine both datasets
use lf2016
append using hk2016

* Relabel variable "bildung"
label define eduL 1 "Hauptschulabschluss" 2 "Realschulabschluss/mittlere Reife" ///
	3 "Hochschulreife" 4 "Hochschulabschluss" 5 "Sonstiges"
label val bildung eduL

* Relabel variable "ef"
label define efL 4 "photovoltaic" 8 "wind energy" 10 "shares in utility"
label val ef efL

* Save as combined dataset
save leuphana, replace

clear
log close
exit
```

Analyse des kombinierten Datensatzes

```
* Lars Holstenkamp
* 15 November 2018
* Analysis of Leuphana dataset(s)

version 12
set more off
capture log close

log using xxx-si-ep_leu-an, replace

clear
use leuphana

* ---
* Test difference between groups:
* A) According to legal structure

* Test differences in gender along legal structures
tab geschlecht gf, chi2 V

* Add two age variables according to predictions
generate alter1=0
replace alter1=1 if alter>3
generate alter2=0
```

```
replace alter2=1 if alter==4
* Test differences in age groups along legal structures
tab alter gf, chi2 V
tab alter1 gf, chi2 V
tab alter2 gf, chi2 V

* Add an occupation variable according to predictions
generate arbv1=0
replace arbv1=1 if arbv==1 | arbv==5
replace arbv1=. if arbv==6
* Test differences in occupation groups along legal structures
tab arbv gf, chi2 V
tab arbv1 gf, chi2 V

* Add two education variables according to predictions
generate bildung1=0
replace bildung1=1 if bildung>3
replace bildung1=. if bildung==5
generate bildung2=0
replace bildung2=1 if bildung==4
replace bildung2=. if bildung==5
* Test differences in education groups along legal structures
tab bildung gf, chi2 V
tab bildung1 gf, chi2 V
tab bildung2 gf, chi2 V

* B) According to asset class

* Test differences in gender along asset classes
tab geschlecht ef, chi2 V

* Test differences in age groups along asset classes
tab alter ef, chi2 V
tab alter1 ef, chi2 V
tab alter2 ef, chi2 V

* Test differences in occupation groups along asset classes
tab arbv ef, chi2 V
tab arbv1 ef, chi2 V

* Test differences in education groups along asset classes
tab bildung ef, chi2 V
tab bildung1 ef, chi2 V
tab bildung2 ef, chi2 V

* C) According to founding year

* Generate two further "year" variables
* jahr1: differentiation into three phases
generate jahr1=1
replace jahr1=2 if jahr>2009
replace jahr1=3 if jahr>2013
* jahr2: "golden ages" 2010-2013
generate jahr2=0
replace jahr2=1 if jahr>2009 & jahr<2014

* Test differences in gender along years/phases
tab geschlecht jahr, chi2 V
tab geschlecht jahr1, chi2 V
tab geschlecht jahr2, chi2 V

* Test differences in age groups along years/phases
```

```
tab alter jahr, chi2 V
tab alter jahr1, chi2 V
tab alter jahr2, chi2 V
tab alter1 jahr, chi2 V
tab alter1 jahr1, chi2 V
tab alter1 jahr2, chi2 V
tab alter2 jahr, chi2 V
tab alter2 jahr1, chi2 V
tab alter2 jahr2, chi2 V

* Test differences in occupation groups along years/phases
tab arbv jahr, chi2 V
tab arbv jahr1, chi2 V
tab arbv jahr2, chi2 V
tab arbv1 jahr, chi2 V
tab arbv1 jahr1, chi2 V
tab arbv1 jahr2, chi2 V

* Test differences in education groups along years/phases
tab bildung jahr, chi2 V
tab bildung jahr1, chi2 V
tab bildung jahr2, chi2 V
tab bildung1 jahr, chi2 V
tab bildung1 jahr1, chi2 V
tab bildung1 jahr2, chi2 V
tab bildung2 jahr, chi2 V
tab bildung2 jahr1, chi2 V
tab bildung2 jahr2, chi2 V

* D) According to single company

* Test differences in gender along single companies
tab geschlecht name, chi2 V

* Test differences in age groups along single companies
tab alter name, chi2 V
tab alter1 name, chi2 V
tab alter2 name, chi2 V

* Test differences in occupation groups along single companies
tab arbv name, chi2 V
tab arbv1 name, chi2 V

* Test differences in education groups along single companies
tab bildung name, chi2 V
tab bildung1 name, chi2 V
tab bildung2 name, chi2 V

* E) According to strength of profit motive

* Test differences in strength of profit motive
tab motiv_rendite name, chi2 V
bysort name: tabstat motiv_rendite, stats(n mean med sd min max)
tab motiv_rendite gf, chi2 V
bysort gf: tabstat motiv_rendite, stats(n mean med sd min max)
tab motiv_rendite ef, chi2 V
bysort ef: tabstat motiv_rendite, stats(n mean med sd min max)
tab motiv_rendite jahr, chi2 V
bysort jahr: tabstat motiv_rendite, stats(n mean med sd min max)
tab motiv_rendite jahr1, chi2 V
bysort jahr1: tabstat motiv_rendite, stats(n mean med sd min max)
tab motiv_rendite jahr2, chi2 V
```

```
bysort jahr2: tabstat motiv_rendite, stats(n mean med sd min max)

* Construct variable according to strength of profit motive
* "rendite1": wind in the north vs rest
generate rendite1=0
replace rendite1=1 if id==1031
* "rendite2": wind in north, utility shares, rest
generate rendite2=0
replace rendite2=1 if gf==10
replace rendite2=2 if id==1031

* Test differences in gender along investor types
tab geschlecht rendite1, chi2 V
tab geschlecht rendite2, chi2 V
* Test differences in age groups along investor types
tab alter rendite1, chi2 V
tab alter rendite2, chi2 V
tab alter1 rendite1, chi2 V
tab alter1 rendite2, chi2 V
tab alter2 rendite1, chi2 V
tab alter2 rendite2, chi2 V
* Test differences in occupation groups along investor types
tab arbv rendite1, chi2 V
tab arbv rendite2, chi2 V
tab arbv1 rendite1, chi2 V
tab arbv1 rendite2, chi2 V
* Test differences in education groups along investor types
tab bildung rendite1, chi2 V
tab bildung rendite2, chi2 V
tab bildung1 rendite1, chi2 V
tab bildung1 rendite2, chi2 V
tab bildung2 rendite1, chi2 V
tab bildung2 rendite2, chi2 V

clear
log close
exit
```

STATA-Code für die Analysen in Artikel 6

```
*Paper
*Auswertung der Umfrage
*Franziska Kahla
*29.05.15
*__________________________________________

set more off
capture log close
log using paper, replace

*Arbeitsverzeichnis wechseln
cd [directory]
pwd

* Öffnen und Bearbeiten der Datei
use paper_final.dta, clear
browse

*__________________________________________
* new variables
*__________________________________________
```

```
* region classification
generate region=.
replace region=1 if land=="Niedersachsen" | land=="Schleswig_Holstein" | ///
        land=="Bremen" | land=="Nordrhein_Westfalen" | land=="Hamburg"
replace region=2 if land=="Thueringen" | land=="Berlin" | land=="Mecklenburg_Vorpommern" | ///
        land=="Sachsen_Anhalt" | land=="Sachsen" | land=="Brandenburg"
replace region=3 if land=="Hessen" | land=="Rheinland_Pfalz" | land=="Baden_Wuerttemberg" | ///
        land=="Bayern" | land=="Saarland"
label define label_region 1 "North" 2 "East" 3 "South"
label values region label_region
drop land

* company age classification with 4 categories
*Company age: ca2
generate ca2=.
replace ca2=1 if jahr<=2000
replace ca2=2 if jahr>2000 & jahr<=2006
replace ca2=3 if jahr>2006 & jahr<=2011
replace ca2=4 if jahr>2011
label define label_ca2 1 "till 2000" 2 "2001-2005" 3 "2006-2011" 4 "since 2012"
label values ca2 label_ca2
drop jahr

* number of investments
replace bet_anz=1 if bet_anz==.

* average investment sum
gen bet_av=beteiligung/bet_anz

* coding und transformation from string to numeric
* energy type
replace ef="1" if ef=="Bio"
replace ef="2" if ef=="Bio, PV"
replace ef="3" if ef=="PV, Bio"
replace ef="4" if ef=="PV"
replace ef="5" if ef=="PV, Wind"
replace ef="6" if ef=="Netz"
replace ef="7" if ef=="Wind, PV"
replace ef="8" if ef=="Wind"
destring ef, replace

* aggregation of energy type
gen ef_kombi=.
replace ef_kombi=1 if ef==1 | ef==2
replace ef_kombi=2 if ef==3 | ef==4 | ef==5
replace ef_kombi=3 if ef==6
replace ef_kombi=4 if ef==7 | ef==8

* legal form
replace gf="1" if gf=="GbR"
replace gf="2" if gf=="eG"
replace gf="3" if gf=="GmbH" | gf=="UG"
replace gf="4" if gf=="UG & Co. KG" | gf=="GmbH & Co. KG"
replace gf="5" if gf=="AG"
destring gf, replace

* aggregation investment sum
gen bet_kombi=.
replace bet_kombi=10000 if bet_av<10000
replace bet_kombi=25000 if bet_av>=10000 & bet_av<25000
replace bet_kombi=50000 if bet_av>=25000 & bet_av<50000
```

```
replace bet_kombi=100000 if bet_av>=50000 & bet_av<=100.000
replace bet_kombi=100001 if bet_av>100000 & bet_av!=.
label define label_bet_kombi 10000 "<10.000" 25000 "10.000-24.999" 50000 "25.000-49.999" 100000
"50.000-100.000" 100001 ">100.000"
label values bet_kombi label_bet_kombi
label var bet_kombi "Investment"

* importance of participation opportunity
replace betform_wichtig1="1" if betform_wichtig1=="Finanzielle Beteiligung (dauerhafte Beteiligung)"
replace betform_wichtig2="1" if betform_wichtig2=="Finanzielle Beteiligung (dauerhafte Beteiligung)"
replace betform_wichtig3="1" if betform_wichtig3=="Finanzielle Beteiligung (dauerhafte Beteiligung)"
replace betform_wichtig4="1" if betform_wichtig4=="Finanzielle Beteiligung (dauerhafte Beteiligung)"
replace betform_wichtig5="1" if betform_wichtig5=="Finanzielle Beteiligung (dauerhafte Beteiligung)"
replace betform_wichtig6="1" if betform_wichtig6=="Finanzielle Beteiligung (dauerhafte Beteiligung)"

replace betform_wichtig1="2" if betform_wichtig1=="Beteiligung im Planungsprozess"
replace betform_wichtig2="2" if betform_wichtig2=="Beteiligung im Planungsprozess"
replace betform_wichtig3="2" if betform_wichtig3=="Beteiligung im Planungsprozess"
replace betform_wichtig4="2" if betform_wichtig4=="Beteiligung im Planungsprozess"
replace betform_wichtig5="2" if betform_wichtig5=="Beteiligung im Planungsprozess"
replace betform_wichtig6="2" if betform_wichtig6=="Beteiligung im Planungsprozess"

replace betform_wichtig1="3" if betform_wichtig1=="Runder Tisch"
replace betform_wichtig2="3" if betform_wichtig2=="Runder Tisch"
replace betform_wichtig3="3" if betform_wichtig3=="Runder Tisch"
replace betform_wichtig4="3" if betform_wichtig4=="Runder Tisch"
replace betform_wichtig5="3" if betform_wichtig5=="Runder Tisch"
replace betform_wichtig6="3" if betform_wichtig6=="Runder Tisch"

replace betform_wichtig1="4" if betform_wichtig1=="Information (Zeitung, Internet, Informationsveran-
staltungen)"
replace betform_wichtig2="4" if betform_wichtig2=="Information (Zeitung, Internet, Informationsveran-
staltungen)"
replace betform_wichtig3="4" if betform_wichtig3=="Information (Zeitung, Internet, Informationsveran-
staltungen)"
replace betform_wichtig4="4" if betform_wichtig4=="Information (Zeitung, Internet, Informationsveran-
staltungen)"
replace betform_wichtig5="4" if betform_wichtig5=="Information (Zeitung, Internet, Informationsveran-
staltungen)"
replace betform_wichtig6="4" if betform_wichtig6=="Information (Zeitung, Internet, Informationsveran-
staltungen)"

replace betform_wichtig1="5" if betform_wichtig1=="Günstigerer Wärme- oder Strombezug"
replace betform_wichtig2="5" if betform_wichtig2=="Günstigerer Wärme- oder Strombezug"
replace betform_wichtig3="5" if betform_wichtig3=="Günstigerer Wärme- oder Strombezug"
replace betform_wichtig4="5" if betform_wichtig4=="Günstigerer Wärme- oder Strombezug"
replace betform_wichtig5="5" if betform_wichtig5=="Günstigerer Wärme- oder Strombezug"
replace betform_wichtig6="5" if betform_wichtig6=="Günstigerer Wärme- oder Strombezug"

replace betform_wichtig1="6" if betform_wichtig1=="Finanzieller Ausgleich (einmalige Zahlung)"
replace betform_wichtig2="6" if betform_wichtig2=="Finanzieller Ausgleich (einmalige Zahlung)"
replace betform_wichtig3="6" if betform_wichtig3=="Finanzieller Ausgleich (einmalige Zahlung)"
replace betform_wichtig4="6" if betform_wichtig4=="Finanzieller Ausgleich (einmalige Zahlung)"
replace betform_wichtig5="6" if betform_wichtig5=="Finanzieller Ausgleich (einmalige Zahlung)"
replace betform_wichtig6="6" if betform_wichtig6=="Finanzieller Ausgleich (einmalige Zahlung)"
destring betform_*, replace

* importance of financial participation
gen betform_wichtig_fin=.
replace betform_wichtig_fin=1 if betform_wichtig1==1
replace betform_wichtig_fin=2 if betform_wichtig2==1
replace betform_wichtig_fin=3 if betform_wichtig3==1
```

```
replace betform_wichtig_fin=4 if betform_wichtig4==1
replace betform_wichtig_fin=5 if betform_wichtig5==1
replace betform_wichtig_fin=6 if betform_wichtig6==1

* motive if management function
gen motivn_mgt_r=.
replace motivn_mgt_r=1 if motiv_rendite==1 & fuehrung==1
replace motivn_mgt_r=2 if motiv_rendite==2 & fuehrung==1
replace motivn_mgt_r=3 if motiv_rendite==3 & fuehrung==1
replace motivn_mgt_r=4 if motiv_rendite==4 & fuehrung==1
replace motivn_mgt_r=5 if motiv_rendite==5 & fuehrung==1
label values motivn_mgt_r label_motivn_mgt_r
label var motivn_mgt_r "return motive for Mgt"

gen motivn_mgt_b=.
replace motivn_mgt_b=1 if motiv_bezug==1 & fuehrung==1
replace motivn_mgt_b=2 if motiv_bezug==2 & fuehrung==1
replace motivn_mgt_b=3 if motiv_bezug==3 & fuehrung==1
replace motivn_mgt_b=4 if motiv_bezug==4 & fuehrung==1
replace motivn_mgt_b=5 if motiv_bezug==5 & fuehrung==1
label values motivn_mgt_b label_motivn_mgt_b
label var motivn_mgt_b "supply motive for Mgt"

gen motivn_mgt_w=.
replace motivn_mgt_w=1 if motiv_regwert==1 & fuehrung==1
replace motivn_mgt_w=2 if motiv_regwert==2 & fuehrung==1
replace motivn_mgt_w=3 if motiv_regwert==3 & fuehrung==1
replace motivn_mgt_w=4 if motiv_regwert==4 & fuehrung==1
replace motivn_mgt_w=5 if motiv_regwert==5 & fuehrung==1
label values motivn_mgt_w label_motivn_mgt_w
label var motivn_mgt_w "added value motive for Mgt"

gen motivn_mgt_u=.
replace motivn_mgt_u=1 if motiv_umwelt==1 & fuehrung==1
replace motivn_mgt_u=2 if motiv_umwelt==2 & fuehrung==1
replace motivn_mgt_u=3 if motiv_umwelt==3 & fuehrung==1
replace motivn_mgt_u=4 if motiv_umwelt==4 & fuehrung==1
replace motivn_mgt_u=5 if motiv_umwelt==5 & fuehrung==1
label values motivn_mgt_u label_motivn_mgt_u
label var motivn_mgt_u "conservation motive for Mgt"

gen motivn_mgt_t=.
replace motivn_mgt_t=1 if motiv_energiewende==1 & fuehrung==1
replace motivn_mgt_t=2 if motiv_energiewende==2 & fuehrung==1
replace motivn_mgt_t=3 if motiv_energiewende==3 & fuehrung==1
replace motivn_mgt_t=4 if motiv_energiewende==4 & fuehrung==1
replace motivn_mgt_t=5 if motiv_energiewende==5 & fuehrung==1
label values motivn_mgt_t label_motivn_mgt_t
label var motivn_mgt_t "energy transition motive for Mgt"

*____________________________________________

* generation of labels
*____________________________________________

* gender
label define label_gender 1 "male" 2 "female"
label values geschlecht label_gender

* age
label define label_alter 1 "< 20" 2 "20-34" 3 "35-49" 4 "50-64" 5 "> 64"
label values alter label_alter
```

```
* employment
label define label_arbv 2 "employee" 7 "seeking work" 4 "official" 5 "pensioner" ///
        1 "student" 3 "self-employed" 6 "others"
label values arbv label_arbv

* graduation
label define label_bildung 4 "master craftsman's diploma" 1 "Hauptschule" 2 "Realschule" ///
        3 "technical university qualification" 6 "general university qualification" 5 "university degree" 7 "others"
label values bildung label_bildung

* energy type
label define label_ef 1 "bio-energy" 2 "bio-energy & photovoltaic" 3 "photovoltaic & bio-energy" ///
        4 "photovoltaic" 5 "photovoltaic & wind-energy" 6 "grid" 7 "wind-energy & photovoltaic" 8 "wind-energy"
label values ef label_ef

label define label_ef_kombi 1 "bio-energy" 2 "photovoltaic" 3 "grid" 4 "wind-energy"
label values ef_kombi label_ef_kombi

label define label_ef_kombi2 1 "bio-energy" 2 "photovoltaic" 3 "wind-energy"
label values ef_kombi2 label_ef_kombi2

label define label_ef_kombi3 1 "bio-energy" 2 "bio-energy & photovoltaic" 4 "photovoltaic" ///
        3 "grit" 5"wind-energy" 6 "wind-energy & photovoltaic"
label values ef_kombi3 label_ef_kombi3

* legal form
label define label_gf 1 "BGB company" 2 "Cooperative" 3 "GmbH/ UG" 4 "GmbH & Co. KG" 5 "AG"
label values gf label_gf
label values gf_kombi label_gf_kombi

* management
label define label_fuehrung 1 "member with management function" 0 "ordinary member"
label values fuehrung label_fuehrung

* voluntary work
label define label_ehrenamt 1 "voluntary management function" 0 "salaried management function"
label values ehrenamt label_ehrenamt

* founder member
label define label_gruendung_bet 1 "founder member" 0 "ordinary member"
label values gruendung_bet label_gruendung_bet

* general variables
label var region "region"
label var ca "age of company"
label var geschlecht "gender"
label var alter "age of persons"
label var bildung "education"
label var arbv "work"
label var id "ID in database"
label var ef "energy type"
label var gf "legal form"
label var name "name of company"
label var bet_anz "number of shares"
label var id_umfrage "ID of survey"
label var id_inumfrage "ID with survey ID"
label var gruendung_bet "involved in foundation (yes/no)"
label var ef_kombi "technology"
```

```
* attention
label var aufm_bank "aware trough bank"
label var aufm_privat "aware trough privatperson"
label var aufm_presse "aware trough press"
label var aufm_gem "aware trough municipality"
label var auf_ev "aware trough incorporated society"
label var aufm_energie "aware troughutility company"
label var aufm_unternehmen "aware trough other company"

* motives
label var motiv_rendite "return"
label var motiv_bezug "regional energy"
label var motiv_regwert "regional added value"
label var motiv_umwelt "motive of conservation"
label var motiv_energiewende "advance the energy transition"
label var motiv_partizipation "participation"
label var motiv_gemeinschaft "member within the community"

* expactations
label var erw_rendite "expectations realized concerning return"
label var erw_bezug "expectations realized concerning regional energy"
label var erw_regwert "expectations realized concerning regional added value"
label var erw_umwelt "expectations realized concerning conservation"
label var erw_energiewende "expectations realized concerning advancing the energy transition"
label var erw_partizipation "expectations realized concerning participation"
label var erw_gemeinschaft "expectations realized concerning implemantation within the community"

* importance of participation opportunity
label var betform_bezug "participation by energy supply"
label var betform_einmalzahlung "participation by single payment"
label var betform_rundertisch "participation by round table"
label var betform_infos "participation by information access"
label var betform_finbeteiligung "participation by financial involvement"
label var betform_beteiligungprozess "participation in the process"

* ranking of importance of participation opportunity
label var betform_wichtig1 "priority 1"
label var betform_wichtig2 "priority 2"
label var betform_wichtig3 "priority 3"
label var betform_wichtig4 "priority 4"
label var betform_wichtig5 "priority 5"
label var betform_wichtig6 "priority 6"
label var betform_wichtig_fin "priority of financial investemt [1=highest priority]"

* chance in attitude
label var profess "evaluation of professionalism"
label var akzept "evaluation of acceptance"
label var einst_ee "change in attitude towards renewable energies"
label var einst_proj "change in attitude towards projects"

* company goals
label var fuehrung "members with management function"
label var ehrenamt "volentary work"

label var wichtig_gewinnerwirt "gain of return"
label var wichtig_versorg "supply of electricity and heat"
label var wichtig_reg "regional added value"
label var wichtig_umwelt "conservation"
label var wichtig_energiewende "advancing the energy transition"

label var wichtig_profess "increase in professionalism"
label var wichtig_gewinnaussch "payout return"
```

```
label var wichtig_stab "increase in stability"
label var wichtig_arb "creation of jobs"
label var wichtig_erw "expansion of business operations"
label var wichtig_akzeptanz "creation of acceptance"

label var beteiligung "investment sum"

*____________________________________________

* histogram
*____________________________________________

* investment sum
hist bet_av, bin(30) freq xtitle("investment sum in 1.000 Euro") ytitle("absolute frequency") col(blue) gap(20)

* importance financial participation
hist betform_wichtig_fin, percent col(blue)

*____________________________________________

* tables
*____________________________________________

tab gf
tab ef
tab ca
tab ca2
tab bildung
tab region
tab arbv
tab region ef
tab gf ef
tab gf ca
tab gf ca2
tab fuehrung geschlecht
tab gf bet_kombi
tab fuehrung motiv_rendite
tab ca ehrenamt
tab ca2 ehrenamt
tab betform_wichtig_fin
tab betform_wichtig_fin aufm_gem
tab betform_wichtig_fin aufm_privat

tabstat bet_av, stats(n mean var sd min max med)
tabstat gf, stats(n mean var sd min max med)
tabstat ef, stats(n mean var sd min max med)
tabstat motiv_rendite, stats(n mean var sd min max med)
tabstat motiv_rendite if gf==2, stats(n mean var sd min max med)
tabstat wichtig_*, stats (mean)
tabstat wichtig_gewinnerwirt, stats (mean)
tabstat wichtig_versorg, stats (mean)
tabstat wichtig_reg, stats (mean)
tabstat wichtig_umwelt, stats (mean)
tabstat wichtig_energiewende, stats (mean)
*____________________________________________

* motives boxplot
*____________________________________________

graph hbox motiv_* if fuehrung==1, intensity(100) bargap(20)legend(label(1 "return") label(2 "supply with energy") ///
```

```
        label(3 "regional added value")label(4 "conservation") label(5 "energy transition") ///
                label(6 "participation") label(7 "member in community"))

graph hbox motiv_* if fuehrung==0, intensity(100) bargap(20)legend(label(1 "return") label(2 "supply
with energy") ///
        label(3 "regional added value")label(4 "conservation") label(5 "energy transition") ///
                label(6 "participation") label(7 "member in community"))


graph hbox motiv_* if gf==2,  intensity(100) bargap(20) ///
        legend(label(1 "return") label(2 "supply with energy") label(3 "regional added value")label(4
"conservation") ///
                label(5 "energy transition") label(6 "participation") label(7 "member in community"))

graph hbox motiv_* if gf==4,  intensity(100) bargap(20) ///
        legend(label(1 "return") label(2 "supply with energy") label(3 "regional added value")label(4
"conservation") ///
                label(5 "energy transition") label(6 "participation") label(7 "member in community"))


graph hbox motiv_* if ef_kombi==1, intensity(100) bargap(20) ///
        legend(label(1 "return") label(2 "supply with energy") label(3 "regional added value")label(4
"conservation") ///
                label(5 "energy transition") label(6 "participation") label(7 "member in community"))

graph hbox motiv_* if  ef_kombi==2, intensity(100) bargap(20) ///
        legend(label(1 "return") label(2 "supply with energy") label(3 "regional added value")label(4
"conservation") ///
                label(5 "energy transition") label(6 "participation") label(7 "member in community"))

graph hbox motiv_* if ef_kombi==4, intensity(100) bargap(20) ///
        legend(label(1 "return") label(2 "supply with energy") label(3 "regional added value")label(4
"conservation") ///
                label(5 "energy transition") label(6 "participation") label(7 "member in community"))

graph hbox motiv_* if region==1, intensity(100) bargap(20) ///
        legend(label(1 "return") label(2 "supply with energy") label(3 "regional added value")label(4
"conservation") ///
                label(5 "energy transition") label(6 "participation") label(7 "member in community"))

graph hbox motiv_* if region==2, intensity(100) bargap(20) ///
        legend(label(1 "return") label(2 "supply with energy") label(3 "regional added value")label(4
"conservation") ///
                label(5 "energy transition") label(6 "participation") label(7 "member in community"))

graph hbox motiv_* if region==3, intensity(100) bargap(20) ///
        legend(label(1 "return") label(2 "supply with energy") label(3 "regional added value")label(4
"conservation") ///
                label(5 "energy transition") label(6 "participation") label(7 "member in community"))

*________________________________________________

* Variance between same technology but diffrent regions
*________________________________________________

gen test=0
replace test=1 if id==431 | id==530 | id==639 | id==680 | id==699 | id==825 | id==950 | id==1031 |
id==1139 | id==1327
label var test "Companies with response n>=5"

graph box motiv_rendite if test==1, over(id, sort(ef)) asyvars box(1, col(yellow)) ///
        box(2, col(green)) box(3, col(green)) box(4, col(yellow)) box(5, col(yellow)) ///
```

```
          box(6, col(orange)) box(7, col(blue)) box(8, col(blue)) box(9, col(blue)) box(10, col(blue)) ///
          legend(off) showyvar

graph box motiv_umwelt if test==1, over(id, sort(ef)) asyvars box(1, col(yellow)) ///
          box(2, col(green)) box(3, col(green)) box(4, col(yellow)) box(5, col(yellow)) ///
          box(6, col(orange)) box(7, col(blue)) box(8, col(blue)) box(9, col(blue)) box(10, col(blue)) ///
          legend(off) showyvar

graph box motiv_bezug if test==1, over(id, sort(ef)) asyvars box(1, col(yellow)) ///
          box(2, col(green)) box(3, col(green)) box(4, col(yellow)) box(5, col(yellow)) ///
          box(6, col(orange)) box(7, col(blue)) box(8, col(blue)) box(9, col(blue)) box(10, col(blue)) ///
          legend(off) showyvar

*―――――――――――――――――――――――――――――――――――――――――――――――――――――

* chi squared test
*―――――――――――――――――――――――――――――――――――――――――――――――――――――

* company age and motives
tab motiv_bezug ca2, chi2
tab motiv_rendite ca2, chi2
tab motiv_regwert ca2, chi2
tab motiv_partizipation ca2, chi2
tab motiv_umwelt ca2, chi2
tab motiv_energiewende ca2, chi2
tab motiv_gemeinschaft ca2, chi2

*legal form and motives
tab motiv_rendite gf, chi2
tab motiv_bezug gf, chi2
tab motiv_regwert gf, chi2
tab motiv_partizipation gf, chi2
tab motiv_umwelt gf, chi2
tab motiv_energiewende gf, chi2
tab motiv_gemeinschaft gf, chi2

*energy type and motives
tab motiv_rendite ef_kombi, chi2
tab motiv_bezug ef_kombi, chi2
tab motiv_regwert ef_kombi, chi2
tab motiv_partizipation ef_kombi, chi2
tab motiv_umwelt ef_kombi, chi2
tab motiv_energiewende ef_kombi, chi2
tab motiv_gemeinschaft ef_kombi, chi2

*region and motives
tab motiv_rendite region, chi2
tab motiv_bezug region, chi2
tab motiv_regwert region, chi2
tab motiv_partizipation region, chi2
tab motiv_umwelt region, chi2
tab motiv_energiewende region, chi2
tab motiv_gemeinschaft region, chi2

* investment sum and motives
tab motiv_rendite bet_kombi2, chi2
tab otiv_bezug bet_kombi2, chi2
tab motiv_regwert bet_kombi2, chi2
tab motiv_partizipation bet_kombi2, chi2
tab motiv_umwelt bet_kombi2, chi2
tab motiv_energiewende bet_kombi2, chi2
tab motiv_gemeinschaft bet_kombi2, chi2
```

```
* diffrent members and motives
tab motiv_rendite fuehrung, chi2
tab motiv_bezug fuehrung, chi2
tab motiv_regwert fuehrung, chi2
tab motiv_partizipation fuehrung, chi2
tab motiv_umwelt fuehrung, chi2
tab motiv_energiewende fuehrung, chi2
tab motiv_gemeinschaft fuehrung, chi2

* voluntary work and motives
tab motiv_rendite ehrenamt, chi2
tab motiv_bezug ehrenamt, chi2
tab motiv_regwert ehrenamt, chi2
tab motiv_partizipation ehrenamt, chi2
tab motiv_umwelt ehrenamt, chi2
tab motiv_energiewende ehrenamt, chi2
tab motiv_gemeinschaft ehrenamt, chi2

*legal from and priority of financial investment
tab gf betform_wichtig_fin, chi2

*

*Cramers V
*

* intensity of dependencies

*legal form and motives
tab motiv_rendite gf, V
tab motiv_bezug gf, V
tab motiv_regwert gf, V
tab motiv_partizipation gf, V
tab motiv_umwelt gf, V
tab motiv_energiewende gf, V
tab motiv_gemeinschaft gf, V

*energy type and motives
tab motiv_rendite ef_kombi, V
tab motiv_bezug ef_kombi, V
tab motiv_regwert ef_kombi, V
tab motiv_partizipation ef_kombi, V
tab motiv_umwelt ef_kombi, V
tab motiv_energiewende ef_kombi, V
tab motiv_gemeinschaft ef_kombi, V

* company age and motives
tab motiv_rendite ca2, V
tab motiv_bezug ca2, V
tab motiv_regwert ca2, V
tab motiv_partizipation ca2, V
tab motiv_umwelt ca2, V
tab motiv_energiewende ca2, V
tab motiv_gemeinschaft ca2, V

*region and motives
tab motiv_rendite region, V
tab motiv_bezug region, V
tab motiv_regwert region, V
tab motiv_partizipation region, V
tab motiv_umwelt region, V
```

```
tab motiv_energiewende region, V
tab motiv_gemeinschaft region, V

* diffrent members and motives
tab motiv_rendite fuehrung, V
tab motiv_bezug fuehrung, V
tab motiv_regwert fuehrung, V
tab motiv_partizipation fuehrung, V
tab motiv_umwelt fuehrung, V
tab motiv_energiewende fuehrung, V
tab motiv_gemeinschaft fuehrung, V

* investment sum and motives
tab motiv_rendite bet_kombi2, V
tab motiv_bezug bet_kombi2, V
tab motiv_regwert bet_kombi2, V
tab motiv_partizipation bet_kombi2, V
tab motiv_umwelt bet_kombi2, V
tab motiv_energiewende bet_kombi2, V
tab motiv_gemeinschaft bet_kombi2, V

*________________________________________
* Robustness Test
*________________________________________

forvalues i=1/10 {
        gen random`i'= runiform()
        sort random`i'
        gen insample`i' = (_N - _n) < 200
}

forvalues i=1/10{
*legal form and motives
tab motiv_rendite gf if insample`i', chi2
tab motiv_bezug gf if insample`i', chi2
tab motiv_partizipation gf if insample`i', chi2
}
forvalues i=1/10{
*energy type and motives
tab motiv_rendite ef_kombi if insample`i', chi2
tab motiv_bezug ef_kombi if insample`i', chi2
tab motiv_energiewende ef_kombi if insample`i', chi2
}
forvalues i=1/10{
* company age and motives
tab motiv_rendite ca2 if insample`i', chi2
tab motiv_gemeinschaft ca2 if insample`i', chi2
}
forvalues i=1/10{
*region and motives
tab motiv_rendite region if insample`i', chi2
tab motiv_regwert region if insample`i', chi2
tab motiv_partizipation region if insample`i', chi2
}
forvalues i=1/10{
* diffrent members and motives
tab motiv_rendite fuehrung if insample`i', chi2
tab motiv_bezug fuehrung if insample`i', chi2
tab motiv_regwert fuehrung if insample`i', chi2
tab motiv_partizipation fuehrung if insample`i', chi2
tab motiv_gemeinschaft fuehrung if insample`i', chi2
}
```

```
forvalues i=1/10{
* investment sum and motives
tab motiv_rendite bet_kombi2 if insample`i', chi2
tab motiv_partizipation bet_kombi2 if insample`i', chi2
}

save paper_final.dta, replace

*________________________________________________

* end
*________________________________________________

log close
exit
```