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Dedication

This thesis is dedicated to:

*The women of Afghanistan who are fighting an unequal war**

&

My mother, Mehr Afza, who passed away when I was four. I love you and miss you very much.

* Parts of this thesis were written after the fall of the country in the hands of the Taliban in August 2021 who have since largely banned women from workplaces, schools and universities, travelling without a male companion, and even visiting parks.

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I wish you all the best!

Abstract

Over the past two decades, transitions research has witnessed rapid development. However, there is still a notable gap in our understanding of sustainability transitions in conflict settings and the role of international organizations in these transitions. Little is known about the dynamics of power, limiting and facilitating factors, and the role of (international) actors in sustainability transitions in conflict settings. This dissertation seeks to make contributions to these discussions by examining energy transitions in Afghanistan, a conflict-affected country, between 2001 and 2021. It specifically focuses on the involvement of international development organizations, shedding light on their role in energy access, institutional change, and imagining Afghanistan's future energy system development.

After security, access to affordable energy is frequently reported to be Afghanistan's most pressing need. Following the fall of the first Taliban regime in 2001, billions of dollars and dozens of international development organizations poured into Afghanistan to support the reconstruction of the country including its energy sector. In the twenty years between 2001 and 2021, the government of Afghanistan and the international development organizations worked on various aspects of energy system development despite on-going insurgency and threats against infrastructural projects. After two decades of armed opposition, the Taliban regained power on August 15, 2021, resulting in the suspension of operations for most development organizations, with only a few humanitarian agencies remaining active. Within this context, this thesis explores topics such as the country's energy potential and policy, the role of international development organizations in the energy sector, and visions for a future energy system in Afghanistan.

The research conducted for this thesis employed a qualitative case study approach, utilizing semi-structured interviews and document analysis. The key findings of this research can be summarized as follows: Afghanistan possesses a renewable energy potential exceeding 300 GW, encompassing 23 GW of hydro power (across all scales), 220 GW of solar power, 67 GW of wind power, and 4 GW of biomass. However, the domestic installed capacity remains limited, ranging between 600 and 700 MW, mainly sourced from large hydro facilities and thermal plants, with renewable energy playing a minor role. Throughout the period of 2001-2021, Afghanistan heavily relied on electricity imports from Central Asian countries, fulfilling around 80% of its electricity needs. International development organizations played a crucial role in assisting the governments of Afghanistan in establishing a regulatory framework for the energy sector. Notably, they contributed to the development of key laws and policy documents, such as the Renewable Energy Policy, which outlines Afghanistan's objective of sourcing 95% of its electricity from renewable sources by 2032.

Further findings of this research concern firstly the role of international organizations in institutional change and secondly the energy imaginaries in the conflict-affected setting of Afghanistan. Throughout their 20-year involvement, international organizations sought

wide-ranging institutional changes in relation to the energy sector of Afghanistan. These included (a) the development of a regulatory framework for the sector involving several organizational and regulative changes, (b) extensive privatization efforts including corporatization of the state-owned energy utility DABS, and (c) empowerment of women in both general and energy-specific contexts.

In terms of energy imaginaries, a dominant imaginary is that of 'Afghanistan as an energy corridor' between Central Asia and South Asia, which is supported by the government and several powerful actors. When considering energy sources, experts advocate for a least-cost supply approach, regardless of the specific energy sources. Additionally, experts recommend implementing small-scale off-grid projects in remote and sparsely populated rural areas, while advocating for grid-connected large-scale projects in urban areas. The suggestion for off-grid projects stems from their resilience in the face of armed conflicts, such as the numerous attacks documented on energy projects in Afghanistan. This research contributes to literature on the role of international organizations in sustainability transitions, transitions in conflict settings, and the energy sector of Afghanistan.

Keywords: Afghanistan; International development organizations; Energy Transitions; Sustainability transitions; Fragile and conflict settings

Zusammenfassung

In den letzten zwei Jahrzehnten hat sich die Transformationsforschung rasant entwickelt. Dennoch gibt es immer noch eine bemerkenswerte Lücke in unserem Verständnis davon, wie Transformationen in Richtung einer nachhaltigen Energieerzeugung in Konfliktsituationen möglich sind und welche Rolle internationale Organisationen bei diesen Prozessen spielen. Es ist nur wenig über die Machtdynamiken, die einschränkenden und fördernden Faktoren und die Rolle der (internationalen) Akteure bei Nachhaltigkeitstransformationen in Konfliktsituationen bekannt. Diese Dissertation möchte einen Beitrag zu diesen Diskussionen leisten, indem sie die Energiewende in Afghanistan, einem von zahlreichen Konflikten betroffenen Land, zwischen 2001 und 2021 untersucht. Sie konzentriert sich insbesondere auf die Beteiligung internationaler Entwicklungsorganisationen und beleuchtet deren Rolle beim Energiezugang, beim institutionellen Wandel und bei der Vorstellung von der zukünftigen Entwicklung des afghanischen Energiesystems.

Der Zugang zu erschwinglicher Energie wird nach der politischen Sicherheit häufig als das dringendste Bedürfnis Afghanistans bezeichnet. Infolge des Sturzes des ersten Taliban-Regimes im Jahr 2001 strömten viele Milliarden Dollar und Dutzende von internationalen Entwicklungsorganisationen nach Afghanistan, um den Wiederaufbau des Landes einschließlich seines Energiesektors zu unterstützen. In den zwanzig Jahren zwischen 2001 und 2021 arbeiteten die afghanische Regierung und die internationalen Entwicklungsorganisationen trotz anhaltender Aufstände und Drohungen gegen Infrastrukturprojekte an verschiedenen Aspekten der Entwicklung des Energiesystems. Nach zwei Jahrzehnten des bewaffneten Widerstands erlangten die Taliban am 15. August 2021 die Macht zurück, was zur Folge hatte, dass die meisten Entwicklungsorganisationen ihre Arbeit einstellten und nur einige wenige humanitäre Organisationen aktiv blieben. Vor diesem Hintergrund werden in dieser Arbeit Themen wie das Energiepotenzial und die Energiepolitik des Landes, die Rolle der internationalen Entwicklungsorganisationen im Energiesektor und die Visionen für ein zukünftiges Energiesystem in Afghanistan untersucht.

Die für diese Arbeit durchgeführten Untersuchungen basieren auf einem qualitativen Fallstudienansatz, bei dem halbstrukturierte Interviews und Dokumentenanalysen eingesetzt wurden. Die wichtigsten Ergebnisse dieser Untersuchung lassen sich wie folgt zusammenfassen: Afghanistan verfügt über ein Potenzial an erneuerbaren Energien von mehr als 300 GW, darunter 23 GW Wasserkraft (in allen Größenordnungen), 220 GW Solarenergie, 67 GW Windkraft und 4 GW Biomasse. Die im Inland installierte Kapazität ist jedoch nach wie vor begrenzt und liegt zwischen 600 und 700 MW, die hauptsächlich aus großen Wasserkraftwerken und Wärmekraftwerken stammen, wobei erneuerbare Energien eine untergeordnete Rolle spielen. Im Zeitraum von 2001 bis 2021 war Afghanistan in

hohem Maße von Stromimporten aus zentralasiatischen Ländern abhängig, die rund 80 % des afghanischen Strombedarfs deckten. Internationale Entwicklungsorganisationen spielten eine entscheidende Rolle bei der Unterstützung der afghanischen Regierung bei der Schaffung eines Regulierungsrahmens für den Energiesektor. Sie trugen insbesondere zur Ausarbeitung wichtiger Gesetze und Richtlinien bei, wie z. B. der Renewable Energy Policy, in der das Ziel Afghanistans festgelegt ist, bis 2032 95 % seines Stroms aus erneuerbaren Quellen zu beziehen.

Weitere Ergebnisse dieser Untersuchung betreffen erstens die Rolle internationaler Organisationen beim institutionellen Wandel und zweitens die Energievorstellungen im konfliktbetroffenen Afghanistan. Während ihres 20-jährigen Engagements bemühten sich die internationalen Organisationen um weitreichende institutionelle Veränderungen im Energiesektor Afghanistans. Dazu gehörten (a) die Entwicklung eines Regulierungsrahmens für den Energiesektor, der mehrere organisatorische und regulative Änderungen beinhaltete, (b) umfangreiche Privatisierungsbemühungen einschließlich der Korporatisierung des staatlichen Energieversorgungsunternehmens DABS und (c) die Stärkung der Rolle der Frauen sowohl im Allgemeinen als auch im energiespezifischen Kontext.

Was die Energievorstellungen betrifft, so dominiert die Vorstellung von ‘Afghanistan als Energiekorridor‘ zwischen Zentralasien und Südasien, welcher von der Regierung und mehreren mächtigen Akteur:innen unterstützt wird. Bei der Betrachtung der Energiequellen plädieren die Expert:innen für einen Least-Cost-Versorgungsansatz, unabhängig von den spezifischen Energiequellen. Darüber hinaus empfehlen die Expert:innen die Durchführung kleiner netzunabhängiger Projekte in abgelegenen und dünn besiedelten ländlichen Gebieten, während sie für netzgebundene Großprojekte in städtischen Gebieten plädieren. Die Empfehlung für netzunabhängige Projekte ergibt sich aus ihrer Widerstandsfähigkeit gegenüber bewaffneten Konflikten, wie den zahlreichen dokumentierten Angriffen auf Energieprojekte in Afghanistan.

Diese Studie leistet einen Beitrag zum bislang lückenhaften akademischen Wissensstand über die Rolle internationaler Organisationen bei Nachhaltigkeitstransformationen, Nachhaltigkeitstransformationen in Konfliktsituationen, und dem Energiesektor in Afghanistan.

Stichworte: Afghanistan; Internationale Entwicklungsorganisationen; Energiewende; Nachhaltigkeitstransformationen; Fragile Situationen und Konfliktsituationen

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List of Abbreviations

ACEP	Afghan Clean Energy Project
ADB	Asian Development Bank
AEIC	Afghanistan Energy Information Center
ANDS	Afghanistan National Development Strategy
AREU	Afghanistan Renewable Energy Union
AREP	Afghanistan Renewable Energy Policy
ASERD	Afghanistan Sustainable Energy for Rural Development
ASEW	Afghanistan Sustainable Energy Week
CASA-1000	Central Asia South Asia Electricity Transmission and Trade Project
CDC	Community Development Council
CIDA	Canadian International Development Agency
DABS	Da Afghanistan Breshna Sherkat
DFID	Department for International Development
ERDA	Energy for Rural Development in Afghanistan
ESIP	Afghanistan Energy Sector Improvement Program
ESRA	Afghanistan Renewable Energy Supply for Rural Areas
ESRA	Energy Services Regulation Authority
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HPP	Hydropower Plant
ICE	Inter-Ministerial Commission for Energy
IDEA	Institutional Development for Energy in Afghanistan
JICA	Japan International Cooperation Agency
KfW	Kreditanstalt für Wiederaufbau
kW	kilo-watt
MEW	Ministry of Energy and Water
MLP	Multi-level Perspective on Socio-technical Transitions
MoEc	Ministry of Economy
MoF	Ministry of Finance
MoMP	Ministry of Mines and Petroleum
MRRD	Ministry of Rural Rehabilitation and Development
MW	Mega-watt
NEPA	Afghanistan's National Environmental Protection Agency
NESP	Afghanistan National Energy Supply Program
NGO	Non-governmental Organizations
NSP	National Solidarity Programme
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development

PSMP	Afghanistan's Power Sector Master Plan
PV	Photovoltaic
RE	Renewable Energy
REED	Rural Energy and Enterprise Development
RER2032	Renewable Energy Roadmap for Afghanistan
RTPS	Regional Transition Paths to Sustainability
SIGAR	Special Inspector General for Afghanistan Reconstruction
TAPI	Turkmenistan-Afghanistan-Pakistan-India Natural Gas Pipeline
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
USD	US Dollar

Chapter 1

Introduction

Author: Abdullah Fahimi

1. Introduction: Framework Paper

This dissertation investigates energy transitions in conflict-affected Afghanistan and the role of international development organizations from 2001 to 2021. Alongside security, access to affordable energy is consistently identified as the country's most urgent priority. In the immediate aftermath of the ousting of the first Taliban regime in 2001, Afghanistan experienced an influx of billions of dollars and dozens of international development organizations dedicated to its reconstruction, including the energy sector. Despite the ongoing insurgency and threats to infrastructural projects, the governments of Afghanistan and international development organizations collaborated on various aspects of energy system development over the twenty-year period. However, two decades later, on August 15, 2021, the Taliban regained power after a prolonged armed opposition, resulting in the suspension of operations for all but a few humanitarian agencies. Within this context, this thesis examines energy potential and policy, the role of international development organizations in Afghanistan's energy sector, and experts' visions for a future energy system in the country.

On 30th March 2022, United Nations' (UN) Secretary-General António Guterres in a meeting of the Peacebuilding Commission of the UN stated: "As we meet today, one quarter of humanity lives in conflict-affected areas. Two billion people." This statistic aligns with the findings of the OECD's States of Fragility 2022 report, which identifies a record number of 60 fragile settings out of the 176 analyzed, housing 24% of the world's population or 1.9 billion individuals (OECD, 2022a). The World Bank has listed 37 countries including Afghanistan[1] in its 2023 fiscal year list of Fragile and Conflict-affected Situations (FCS) with a total population of more than one billion (World Bank, n.d.). These figures, even if inconsistent and considering the latter, highlight the substantial portion of the world population living in regions with limited or no access to affordable and clean energy, clean drinking water, education and health services, and sufficient food. In many cases, particularly where populations generally depend on agriculture, climate change has worsened the situation. Moreover, evidence suggests climate change in some cases climate enhances the risk of conflict onset (Ide et al., 2020). Considering the sizeable population living in conflict areas and the worsening climate emergency, the following question arises: How can societal functions in conflict-affected areas be fulfilled in sustainable ways?

One such sustainability transition is the low-carbon energy transition. Whether it is responding to the urgent matter of meeting the needs of the 775 million people mainly in low-income countries in Global South lacking access to energy services or for purposes of

[1] Afghanistan has consistently appeared on the FCS list since it was first compiled in 2006.

fighting environmental emergencies, there is a strong case for low-carbon energy transitions. Grubler (2012, p. 8) asserts that "the need for the 'next' energy transition is widely apparent as current energy systems are simply unsustainable on all accounts of social, economic, and environmental criteria". Literature on energy transitions has covered a wide variety of topics such as the sources of energy, scales of energy technologies, end-use applications, energy policy and governance, role of actors, and other socio-technical themes around such transitions. Because today's many sociotechnical systems in sectors such as agriculture, transport, communication, and many others are interlinked with or in most cases dependent on energy, decarbonization of energy systems or in other words low-carbon energy transitions are of utmost significance in the fight against climate change and societal well-being.

Currently, there are several important developments and debates with regard to global energy transitions around electrification, (green) hydrogen, and nuclear power. The role of the electricity subsector and renewables-based *electrification* will continue to be critical in economy-wide decarbonization efforts and the collective struggle to keep global warming well below 2°C. Renewables-based electrification of services and sectors such as transport, agriculture, heating, and industry will greatly contribute to emission reductions (Bogdanov et al., 2021). Other benefits of electrification include better air quality, higher energy security, and employment opportunities. The push for electrification will allow electricity to become the main energy carrier by 2050 with a total share of nearly 50% in final energy consumption (IRENA, 2020). Similarly, IRENA (2019) predicts that by 2050 the share of renewables will increase to two-thirds of energy consumption and 86% in electricity generation.

Hydrogen, looking at the current debates, might play a significant role in the ongoing energy transition, while there is uncertainty when it comes to the role of nuclear. Sectors and services which cannot be electrified directly can rely for instance on green hydrogen (i.e., hydrogen produced by renewable electricity). The discourse and technological progress around hydrogen and power-to-x applications and benefits (e.g., storage, uses in hard-to-electrify sectors) have intensified over the past couple of years (Nami et al., 2022). Similar to the growing literature on justice in energy transitions, there have been attempts to explore the justice challenges of hydrogen transition (Müller et al., 2022). With regard to continuation or discontinuation of nuclear energy production, there are conflicting viewpoints in the literature. Some view nuclear as a key element of efforts to combat climate change while others advocate the phase out of this technology for reasons of safety due to radioactive waste and potential for accidents (e.g., the Fukushima incident in 2011), economic unviability compared to the falling costs of renewables, and association with nuclear weapons (IEA, 2020; Johnstone et al., 2016).

Overall, much of these debates happen in the context of high-income European and North American contexts. Similarly, the bulk of literature on energy transitions both conceptually and empirically has drawn on and looked at high income European and North American contexts. This trend can be observed with respect to historical energy transitions from human and animal labour and traditional biomass to coal, from coal to oil and gas, and comparatively recently to electricity. Conceptually, majority of the approaches and frameworks designed to study energy transitions have been developed based on European experiences which might not be able to fully explain complexities in low- and middle-income countries in Africa and Asia or Global South in general. Similarly, up until recently, the bulk of empirical studies on energy transitions investigated contexts in Europe and North America. Even empirical studies investigating energy transitions mechanisms in Global South settings have drawn on concepts developed in Global North.

There are, however, growing calls urging researchers to pay closer attention to contextual conditions and ask 'different' questions (Marotti de Mello et al., 2021). In response, more recently particularly since the last decade, place-based perspectives have gained traction. Such perspectives are better suited to explain the usually multifaceted nature and context-specific conditions of sustainability and energy transitions (Binz et al., 2020; Coenen et al., 2021). Energy transitions in low-and middle-income countries may entail different dynamics, processes, challenges, prospects, and factors including actors, institutions, technologies, resource endowments, etc.

Not only are there fundamental differences between high-income Global North countries and low- and middle-income Global South countries, there are differences among and within Global South settings. These differences can be observed along the lines of ontological assumptions in these cultures regarding sustainability and development, the role of (informal) institutions, the extent of economic and political stability, infrastructures, constellation of actors and what role each play, degree of inequality, and the level of existing capacities including technical and financial.

Low- and middle-income countries encounter unique challenges on their path to achieving low-carbon energy systems. However, these countries also have the potential to leverage the benefits of 'leapfrogging' and make significant progress towards achieving Sustainable Development Goals as a result of energy transitions. The challenges can be generalized as low access rate, weak energy networks, prevalence of traditional biomass, limited finance, low capacity, high inequality, etc. According to the latest report by International Energy Agency (IEA), nearly 775 million people around the world do not have access to electricity (IEA, 2022). Much of the population without access to electricity reside in Africa and low-income countries in Asia. In Afghanistan, only around 30% of the population have access to the electricity grid.

Yet, low- and middle-income countries as late-adopters of new energy systems have the advantage to learn from the experiences of early-adopters, profit from cheaper technologies, and implement faster transitions (Arndt et al., 2019; Grubler, 2012). Furthermore, the potential benefits of renewable energy transitions are many which may spill into sectors beyond that of energy. Not only are low-carbon energy transitions fundamental in the fight against climate change, they also contribute to expansion of energy access, energy security, and system resilience in the face of armed conflicts in less stable areas such as Afghanistan or Gaza (Fischhendler et al., 2022; Foster, 2022). Renewable energy transitions which contribute directly to the Sustainable Development Goal 7 (SDG 7) (i.e., ensuring access to affordable, reliable, sustainable and modern energy for all) have interlinkages as well as trade-offs with several other SDGs including eradicating poverty (SDG 1), education (SDG 4), gender equality (SDG 5), access to clean water (SDG 6), and health (SDG 3) (Fuso Nerini et al., 2017).

In Afghanistan, post-2001 efforts with technical and financial assistance by international aid organizations have resulted in the development of both infrastructure and regulatory framework in the energy sector. Decades of war pre-2001 had left infrastructure and institutions in the energy sector dysfunctional, but a relatively calmer reconstruction period unfolded between 2001 and 2021. During this time, numerous projects were implemented to improve electricity access, (re)build the sector's infrastructure, establish a regulatory framework, and enhance energy security. It is important to note that Afghanistan's energy development occurs within a highly dynamic geopolitical context. The country's geographical location between rival blocks and aggressive neighbouring nations, along with the presence of numerous countries involved from 2001 to 2021, including world powers with conflicting interests, added further complexity to energy planning and overall the situation.

Against this background, this thesis looks at the energy sector of Afghanistan and the role of international development organizations over 20 years between 2001 and 2021. There have been few attempts to investigate the energy sector of Afghanistan from an 'energy transitions' perspective and particularly the role of international development organizations in these processes. Therefore, it is hoped that this dissertation will contribute to a deeper understanding of energy transitions in conflict settings such as Afghanistan and the role international development organizations might play. It is necessary here to clarify exactly what is meant by energy transitions in the context of Afghanistan in contrast to the global energy transitions. In European countries where current discussions on energy transitions refer to mainly the transition from fossil fuels to renewables, in Afghanistan and throughout this thesis, the term energy transitions also refers to transitions from conventional fuels (e.g., traditional biomass) to modern forms of energy rather than exclusively discussing transitions away from fossil fuels.

Th rest of this introductory chapter has been organized in the following way: Section 1.1 defines research aims and sketches the overall structure of the dissertation. Section 1.2 discusses the conceptual background of the research in four subsections. First, it introduces the prominent conceptual frameworks in sustainability transitions. Second, it reviews sustainability transitions in Global South and the differences with the same processes in Global North. Third, the subsection presents a brief history of energy transitions. It also examines literature on what the processes of energy transitions might entail in conflict settings. Following that, section 1.3 summarizes two prominent global initiatives towards sustainability, namely the Agenda 2030 and the Paris Agreement. Section 1.4 presents the research methodology employed in this dissertation describing the research approach and sources of data.

1.1. Research Aims and Structure of the Thesis

This dissertation follows calls to investigate (a) the role of actors in sustainability and energy transitions, particularly international development organizations, (b) energy transitions in contexts outside Europe especially in low- and middle-income countries of Global South, and (c) the politics of energy system development in conflict settings. I aim to study these topics in the context of Afghanistan in the period between 2001 and 2021. 2001 is the year the first Taliban government was ousted and dozens of international organizations arrived in Afghanistan to contribute to the (re)construction of the country. 2021 is the year most international actors including those active in the energy sector left Afghanistan after the Taliban returned to power in August of that year. Specific aims of the dissertation are outlined in the following paragraphs.

Research Aims:

The **first** aim of this dissertation is to produce empirical insight on an under-researched context such as Afghanistan. Aspects such as the potential of different (renewable) energy sources, the role of different actors, and the development of a regulatory framework for the energy sector of Afghanistan have received scant attention. Here I ask the research question: *What is the potential of different renewable energy sources and who were the main actors in Afghanistan's energy sector between 2001 and 2021?* By reviewing documents and conducting interviews, the thesis sets out to identify the main actors including development organizations and governmental agencies in Afghanistan's energy sector, determine the potential of renewable energy sources, and discuss the policy landscape in the energy sector. In this sense, this article which makes up chapter three of the thesis is exploratory in nature.

The **second** aim of this dissertation is to contribute to the literature on institutional dynamics and agency in sustainability transitions by its attempt to understand the role of

transnational actors in inducing institutional change. The main research question here is: *what role did the international development organizations play in Afghanistan's energy sector in terms of institutional change and regulatory landscape development?* Here, we (I in collaboration with two co-authors) draw on (a) Regional Transition Paths to Sustainability (RTPS) by Strambach and Pflitsch (2020) and the related methodological approach of transition topology; and (b) emerging work on transnational actors within the geography of transitions (Hansen and Nygaard, 2013; Raven et al., 2012; Wieczorek et al., 2015). It is now established that the pace, scope and content of sustainability transitions processes can vary from context to context and even within a national boundary (Hansen and Coenen, 2015; Köhler et al., 2019). In this regard, the institutional environment in which transitions occur may be a determining factor. Who can change these institutions and how they are changed, especially in a low-income and aid-dependent country like Afghanistan, is what this part of the dissertation aims to shed more light on. In doing so, the dissertation aims to contribute to conceptualization of the role of international organizations, an underexplored topic researchers have so far paid little attention to (Kranke and Quitsch, 2021).

In light of the insights into the potential of (renewable) energy, role of different actors, and the development of regulatory landscape in the country's energy sector, this dissertation sets as its **third** aim understanding energy experts' visions of future energy systems for Afghanistan. In accordance with this aim, here I ask the following research question: *What are alternative energy imaginaries in Afghanistan?* To answer this question, I in collaboration with two co-authors draw on concepts of sociotechnical imaginaries (Jasanoff, 2015; Jasanoff and Kim, 2009) and discursive power (Reed, 2013) as used in Interpretive Policy Analysis. While future energy systems or the energy system of the country itself haven't often been subjects of public debates in Afghanistan, they drew attention mainly from policy circles and aid donors. This article, making up chapter five of the dissertation, intends to assess the views of energy experts who worked in or on Afghanistan's energy sector with regard to the country's energy system development given its geographical location, the persistent armed conflicts, and the socio-economic conditions.

Structure of the Dissertation:

This dissertation is organized in six chapters. Here I outline the structure of the thesis and present a brief summary of each chapter. In addition to chapters one, two, and six, I co-authored three research articles (see Table 1) that make up chapters three, four, and five of this dissertation. The order of the three articles include in this dissertation does not correspond to the actual course of research undertaken, but seeks to provide a structure that the reader can best follow the arguments. The structure of the dissertation is elaborated below:

Chapters 1, 2, and 6 in this dissertation complement the three articles included. *Chapter one* serves as the framework paper. It introduces the research topic and defines the aims of this dissertation. In the remaining subsections, the chapter reviews conceptual frameworks and perspectives regarding sustainability transitions, energy transitions in Global South, and the role of actors in sustainability transitions. The chapter then summarizes two international sustainability-relevant initiatives before addressing methodological questions in the concluding part.

Chapter two provides an overview of the empirical context — Afghanistan and its energy sector. It begins by reviewing Afghanistan's recent history in terms of conflicts, foreign aid, and energy developments. It will then go on and provide an account of contextual conditions of Afghanistan and its energy sector before summarizing its energy potential. The core part of this chapter is an evaluation of the developments in Afghanistan's energy sector between 2001 and 2021 and the role of development aid and international development organizations in these. The chapter concludes with a brief outlook of Afghanistan's energy sector post-2021 following the return of the Taliban to power and the interruption and in some cases halting of most development aid activities.

Chapter three: Fahimi, A., & Upham, P. (2018). The renewable energy sector in Afghanistan: Policy and potential. Published in: Wiley Interdisciplinary Reviews: Energy and Environment. This chapter contributes to filling research gap regarding the developments in the energy sector of Afghanistan after 2001. It provides an account of the main policymaking organizations and actors including the different governmental ministries, international development organizations, and multilateral banks. It then evaluates the potential of different renewable energy sources in the country including hydro, solar, wind, geothermal and biomass. Table 1 provides an overview of the research articles included in this dissertation.

Chapter four: Fahimi, A., Upham, P., & Pflitsch, G. (2023). Building energy institutions in a conflict zone: the case of Afghanistan Submitted to: Energy Research and Social Science. The purpose of this article is to map the role of international development organizations in changing institutions and organizations in the energy sector of Afghanistan. The findings of this study show development organizations (a) changed organizations and institutions and helped shape a regulatory framework for the energy sector; (b) encouraged privatization of energy systems and implemented projects to achieve this; and (c) promoted women's empowerment.

Chapter five: Fahimi, A., Upham, P., & Münch, S. (2022). Afghanistan's energy sociotechnical imaginaries: Alternative visions in a conflict zone. Published in: Political geography. The aim of this paper is to discuss energy imaginaries and their geopolitical dimensions in Afghanistan. Drawing on the concepts of sociotechnical imaginaries and discursive power, it

presents energy imaginaries on three dimensions of an energy system and investigates the interplay of power with these imaginaries. It presents imaginaries on (a) energy importation, (b) energy sources, and (c) scale of energy technologies. Interviews with experts who worked on or in the energy sector of Afghanistan between 2001 and 2021 with either aid agencies, the governments of Afghanistan, and academic institutions as well as policy documents made it possible to present visions of a future energy system or dimensions of it.

Table 1. Overview of research articles included in the dissertation[2].

Chapter	Author(s), Year, Title	Publication status
3	Fahimi, A., & Upham, P. (2018). The renewable energy sector in Afghanistan: Policy and potential.	Published in: Wiley Interdisciplinary Reviews: Energy and Environment, 7(2), e280.
4	Fahimi, A., Upham, P., & Pflitsch, G. (2023). Building energy institutions in a conflict zone: the case of Afghanistan.	Submitted to: Energy Research and Social Science
5	Fahimi, A., Upham, P., & Münch, S. (2022). Afghanistan's energy sociotechnical imaginaries: Alternative visions in a conflict zone.	Published in: Political geography, 98, 102657.

Chapter six concludes the dissertation by restating its main findings and contributions. Since each article included in this dissertation discusses their respective key findings in detail, this chapter presents a brief analysis of the entire research project through the lens of MLP of the transitions literature. In addition, I also comment on the consequences of the return of the Taliban to power for the energy sector of Afghanistan since it can be considered a turning point which transformed many aspects with regard to the energy sector of the country. Lastly, I reflect on the policy implications of this research and possible future research in this regard. I have also gone over the limitations faced during completion of this dissertation on a context in constant flux and the constraining data accessibility challenge.

1.2. Conceptual Background

This thesis has drawn on concepts and frameworks within the sustainability transitions literature. In the following subsections I expand on the sustainability transitions research field (subsection 1.2.1), sustainability transitions in Global South (subsection 1.2.2), energy transitions in conflict settings in Global South (1.2.3), and the (under)conceptualization of actors particularly international development organizations within sustainability transitions research (subsection 1.2.4).

[2] Additional details regarding the individual contributions of each author can be found in Appendix 1.

1.2.1. Sustainability Transitions

Sustainability transitions refer to "radical transformation towards a sustainable society as a response to a number of persistent problems confronting contemporary modern societies" (Grin et al., 2010, p. 1). As a research field, sustainability transitions has expanded and diversified both in terms of topics studied and geographical applications over the course of almost two decades (Köhler et al., 2019; Markard et al., 2012). With this rapid growth and expansion, different approaches have been established which reflect the diversity in disciplines and background of scholars studying such transitions. Within the field, one can observe a pluralization and cross-fertilization of conceptual frameworks from a variety of fields such as business administration, political sciences, cultural studies, psychology, geography, and critical perspectives (Sovacool and Hess, 2017; Truffer et al., 2022). The updated research agenda of 2019 (Köhler et al., 2019) defines a number of characteristics of sustainability transitions.

Here I summarize the characteristics of sustainability transitions as per Köhler et al. (2019, pp. 2–3). Sustainability transitions: (a) are multidimensional and coevolutionary consisting of elements such as technologies, markets, user practices, cultural meanings, policies, etc. They are not linear processes but occur in co-evolutionary manner and involve a number of elements and dimensions; (b) are performed by a range of actors from civil society, academia, policy circles, markets, etc.; (c) are, from an epistemological perspective, mainly about stability and change; (d) are long-term processes that can take decades and may undergo different phases such as predevelopment, take-off, acceleration, and stabilization; (e) can be open-ended and uncertain due to the presence of multiple transition pathways in all domains and uncertainty in terms of innovation, political, and socio-cultural processes; (f) may be contested as actors often act based on their values and interests; and (g) may need support from public policy in terms of directing normative directionality to avoid free-rider problems and prisoners' dilemmas.

There are three dominant approaches to studying sustainability transitions: socio-institutional, socio-ecological, and socio-technical (Loorbach et al., 2017). Owing to the diversity in disciplines and approaches studying sustainability transitions, a number of frameworks and theories have been developed, mostly in Europe. These include the multi-level perspective on socio-technical transitions (MLP), the strategic niche management framework (SNM), the transition management framework (TM) and the technological innovation systems framework (TIS). These frameworks stem mainly from socio-technical and socio-institutional approaches (Loorbach et al., 2017). Moreover, scholars have employed a variety of perspectives and angles in their research on sustainability transitions and borrowed concepts from fields far and wide further enlivening the enlivening transitions research.

The multi-level perspective on socio-technical transitions (MLP), so far, has been one of the most prominent frameworks in studying transitions (Geels, 2002; Smith et al., 2010). The Multi-level Perspective (MLP) is "a middle-range theory that conceptualizes overall dynamic patterns in socio-technical transitions" (Geels, 2011, p. 26). This framework borrows concepts from different disciplines such as science and technology studies, structuration theory and neo-institutional theory, modelling, economic geography, management studies, political science, evolutionary economics, and sociology (Geels, 2011, 2004; Geels and Schot, 2010; Markard et al., 2012). This framework argues that socio-technical transitions occur as a result of dynamic processes within and interactions of these dynamics between three analytical levels: niche, regime, and landscape. MLP maintains that developments in the landscape level put pressure on the existing regime and in so doing create opportunities for niche innovations to break through (Geels, 2002). Or at a time when niches are not sufficiently developed, the landscape pressure may force the regime to reorient itself and gradually transition to a new system.

Regime is perhaps the most important level because transitions are defined as shift from one socio-technical regime to another; the other two levels are defined in relation to the regime level (Geels, 2011). Rip and Kemp (1998, p. 338), in their seminal work, define regime as "the rule-set or grammar embedded in a complex of engineering practices, production process technologies, product characteristics, skills and procedures, ways of handling relevant artifacts and persons, ways of defining problems—all of them embedded in institutions and infrastructures." Some examples of regime rules are cognitive routines and shared beliefs, capabilities and competences, lifestyles and user practices, institutional arrangements and regulations, and legally binding contracts. Socio-technical regimes are usually resistant to change owing to high degree of structuration, close relationship between incumbent actors and vested interests (Geels, 2011; Smith et al., 2010). Regime provides stability for incumbent socio-technical systems through various lock-in mechanisms, such as scale economics, sunk investments in infrastructure and machinery, power relations, institutional commitments, shared beliefs and discourses, and consumer lifestyles and preferences being adjusted around the existing system. Because these lock-in mechanisms create path dependence, it is difficult for a new innovation or system to dislodge the existing one. Incremental innovations do occur in the regime level (Geels, 2011).

While incremental innovation or change may take place in the regime level (meso-level), radical innovations (e.g., new technology, new rules, new concepts/ideas, etc.) usually emerge in the micro level, ***niche***, which is a protected space (Geels, 2011, 2002). This protection can take the form of economic protection (e.g., subsidies and price measures), institutional protection (e.g., favourable regulations), political (e.g., embodying political program), spatial protection (e.g., resource attributes), socio-cognitive protection (e.g., training programs), or cultural protection (e.g., community energy ambitions) (Smith and

Raven, 2012). Protection is needed because the ratio of price and performance of new technologies are usually low (Verbong and Geels, 2007). Examples of niches are R&D laboratories, subsidized demonstration projects, or small market niches (Geels, 2011). Articulation of expectations or visions, network-building, and learning and articulation processes are key to niche development. Niches are thought to be crucial for transitions as they offer radical alternatives to existing regimes.

A broader context beyond the direct influence of niche and regime actors is the *socio-technical* ***landscape***. This (macro) level in which regimes are situated encompasses slow-changing external factors such as globalization, changes in international political situation, deep cultural patterns, macro economy, values, climate change, demographical trends, wars, natural catastrophes, etc. (Geels, 2011). The context of landscape is even harder to change than that of regimes. It is an "exogenous environment that as such is beyond the direct influence of regime and niche actors." (Geels and Schot, 2010, p. 23) Figure 1 illustrates the three analytical levels and contains details added later on to the original MLP.

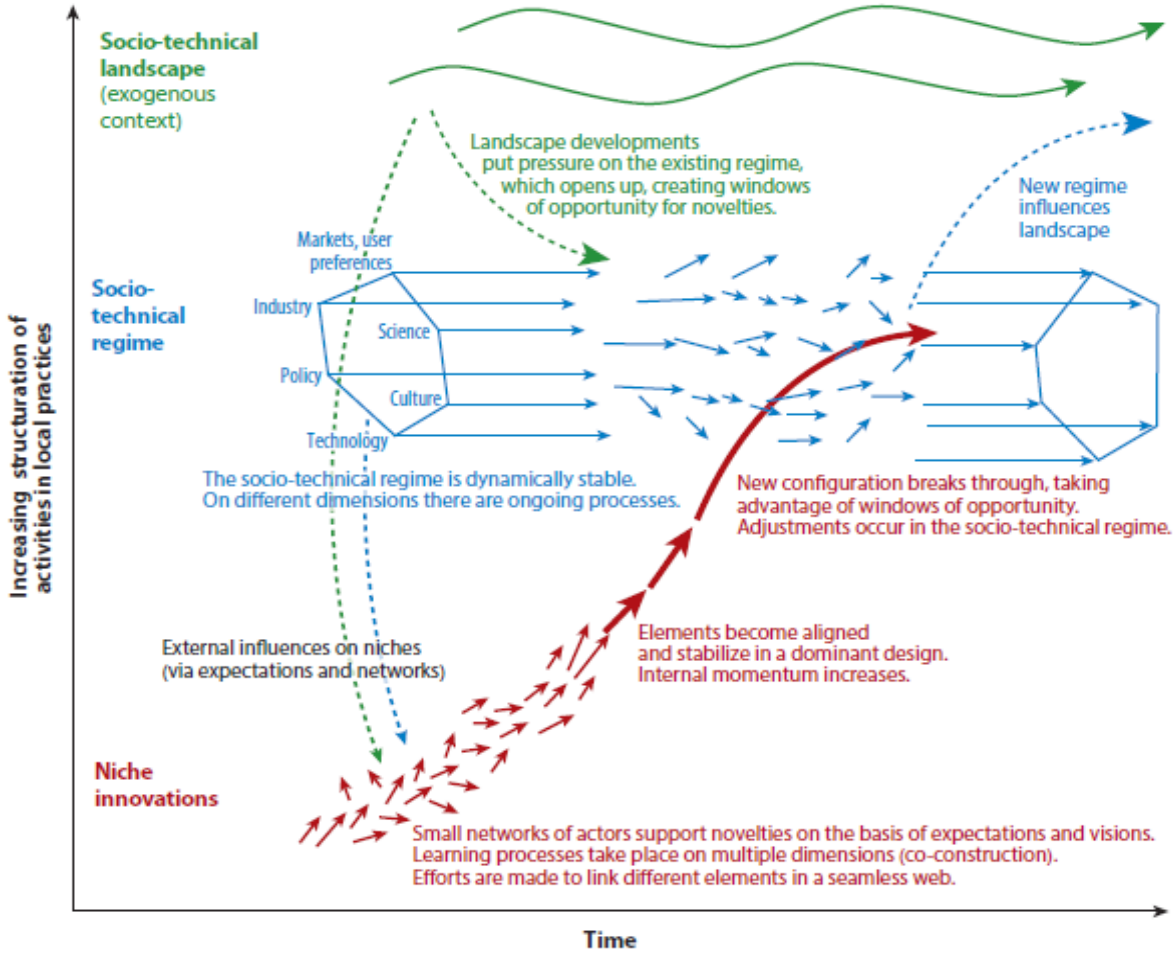

Figure 1. The original Multi-level Perspective (MLP) with added details. **Source**: (Loorbach et al., 2017)

Strategic Niche Management (SNM) framework was developed to analyze mainly the emergence of new innovations. Niche-innovations can be created or supported by market actors or governments in protected spaces where they are not subject to mainstream market selection (Geels and Raven, 2006). Examples of such protection include Research & Development (R&D) support, subsidies, tax cuts, relaxation of regulations, quotas, public awareness campaigns, and other incentives. Niches or protected spaces that perform three functions (Smith and Raven, 2012): (1) they shield the novel innovations from the mainstream selection environment; (2) they nurture the development of innovations by assisting in learning processes, articulating expectations, and helping with networking; and (3) they empower niche innovations to enter the market selection environment. Empowerment of niche innovations can be done in either the 'fit and conform' way or 'stretch and transform' way. In the former, innovations are aligned with existing industrial norms and structures, thus making them in a way an incremental change to the incumbent regime. In the latter however, it is sought that niche practices are institutionalized in the wider regime or in other words the regime is made more favourable to the niche innovations with adjustments and rearrangements. Overall, with such protection in niches, innovations are expected to develop and enter broader and more diverse markets. The need for protection gradually drops as the innovations become competitive and start to contribute to regime shifts towards a new state (Smith and Raven, 2012).

Transition Management (TM) framework is a governance approach intended to assist policymakers manage transitions and implement governance strategies and instruments (Loorbach, 2010). This framework borrows a great deal from policy science and management theory, precisely the concepts of comprehensive planning, adaptive, interactive, and multi-level governance, and management theory (Kemp and Loorbach, 2003). The governance instruments presented by this framework include transition arenas (strategic), transition scenarios (tactical), transition experiments (operational), and transition monitoring (reflexive) (Loorbach, 2010; Loorbach et al., 2017). For managing transitions and changing the order and direction of societal systems, the transition management framework identifies four types of governance activities: strategic, tactical, operation, and reflexive. Strategic activities include processes of vision development, strategic discussions, long-term goal formulation, norm setting, etc. Tactical activities refer to steering activities that relate to the dominant structures (regime) of a system (Loorbach, 2010). Examples could be processes of agenda building, negotiating, networking, coalition building, etc (Kemp et al., 2007). Operational activities encompass processes of experimenting, project building, implementation, etc. And finally reflexive activities relate to monitoring and evaluation works in terms of process as well as content. Here, actors can also draw lessons from experiments implemented in earlier activities and make adjustments in their future agenda.

Transitions are thought to undergo multiple phases and progress in an S-shaped curve involving four stages that differ in speed and nature (Rotmans et al., 2001):

> In the predevelopment phase, there is very little visible change but there is a lot of experimentation. In the take-off phase, the process of change gets under way and the state of the system begins to shift. In the acceleration (breakthrough) phase structural changes take place in a visible way through an accumulation of socio-cultural, economic, ecological and institutional changes that react to each other; during the acceleration phase, there are collective learning processes, diffusion and embedding processes. In the stabilisation phase, the speed of social change decreases and a new dynamic equilibrium is reached (Kemp and Rotmans, 2005, p. 37).

Technological Innovation Systems (TIS) framework has a more explicit focus on innovation and draws on ideas from innovation systems theory (Malerba, 2002) and industrial economics (Weber and Truffer, 2017). This framework deals with the emergence of novel technologies and the institutional and organizational structures that go parallel with technological development (Bergek et al., 2008). A system is "a group of related parts that move or work together" (*Merriam-Webster.com*). The parts of innovation systems are actors, institutions, and networks (structural components) which contribute to the overall function of developing, diffusing, and utilizing (functional components) new products and processes (Bergek et al., 2008). It is argued that the fulfilment of the following seven functions may result in the development of a new technology: 1) knowledge development and diffusion, 2) influence on the direction of search, 3) entrepreneurial experimentation, 4) market formation, 5) legitimation, 6) resource mobilization and 7) development of positive externalities (Bergek et al., 2008).

1.2.2. Sustainability Transitions in Global South

Similar to the general trend in the field, research on sustainability transitions in Global South countries has grown rapidly over the past decade. Wieczorek's (2018) search for publications in these contexts between 2005 and 2016 yielded 115 results with a growing trend. With regard to their scope, studies have ventured beyond energy and transport domains to examine transitions in agriculture, waste, land use, and sanitation systems. These studies have been conducted in an increasingly diverse group of countries and regions, from landlocked countries in Africa (Pedersen and Andersen, 2023) to small island states in Pacific (Keeley, 2017), and from mega cities in India (Dutt, 2022) to small communities in Thailand (Marquardt and Delina, 2019).

Before I dive into features of sustainability transition in Global South, it is worth pondering about the term Global South and the alternatives used. By Global South this thesis refers to

low- and middle-income countries commonly referred to as 'least developed' and 'developing' countries or emerging economies. Where possible, the usage of terms such as 'first world' and 'third world' or 'developed countries' and 'developing countries' has been avoided throughout this dissertation. In such terminology, I agree with scholars who think there are implicit assumptions of underdevelopment and development, inferiority and superiority and a definite meaning and a pre-determined trajectory of progress (Escobar, 1995; Hansen et al., 2018).

As far as sustainability transitions are concerned, several elements differ in Global South from those in Global North: ontological assumptions, institutions, cultures, economic systems, infrastructures, technological capacity, the role of State, political stability, priorities, needs, etc (Ramos-Mejía et al., 2018). In a similar way, there are large differences between Global South countries and within communities. These differences point to the need for relational concepts and place-based frameworks.

A geographical perspective implies that context-specific factors and related spatial variation are equally important for understanding transitions. In these respects, the particularities of sustainability transitions in Global South remain a rather small literature. This is despite, for example, the value of understanding how political economy and governance structures promote stability or change in socio-technical regimes (Angel and Rock, 2009); or how civil society attempts at transition management may be compromised by illiberal political regimes (Noboa and Upham, 2018); or the role of conflict of different types and security in transitions processes (Fischhendler et al., 2022; Kivimaa et al., 2022).

From studies by Wieczorek (2018) and Hansen et al. (2018), we know regime instability and diversity is higher in Global South compared to Global North. The above two studies also find that informal institutions such as norms, values and cultures play a more important role in Global South either shaping formal institutions or prevailing when formal institutions fail. Weaker state apparatus, higher social inequality, and higher economic and political instability are some other conditions often observed in Global South countries (Hansen et al., 2018; Ramos-Mejía et al., 2018). To what extent have the transitions literature developed in European cities taken into account issues of poverty, ill-functioning state apparatus, informal institutions, and other socio-economic characteristics? And to what extent then are these concepts helpful to analyse exactly the phenomena they have failed to consider?

Regarding the importance of historical contexts and political economies for transitions, Scoones (2016, p. 302) writes:

> Sustainability means different things to different people in different contexts. In extremely poor settings, for example, improving livelihoods and reducing poverty is a priority. In other settings, sustainability policy rhetoric is trumped by the power of

> incumbent or corrupt interests. And, in others, states have been "hollowed out," limiting their power and capacity. Some states are aid dependent and therefore unable to influence spending, with sustainability narrowly constructed by external aid donors, increasingly around the conditionalities of climate finance. In conflict settings, states may be highly fragmented, and with little authority, and sustainability concerns may not be on the agenda at all.

Sustainability transitions frameworks mostly fail to account for heterogeneities, complexities, and context-specific conditions of Global South. The vast majority of the articles reviewed by Weiczorek (2018) in search of empirical insights from Global south have employed transitions frameworks mainly developed in Europe. Since contexts in for instance Germany and the Netherlands and those in Afghanistan, Columbia or Kenya are not the same, theoretical frameworks developed in the former cannot be applied to ones in the latter group in a straightforward manner. Researchers are invited to be aware of the "Western bias" in theories of transitions and ask different research questions keeping in mind the different conditions in Global South (Marotti de Mello et al., 2021). Ghosh et al., (2021) stress the importance of accounting for "local sensitivities, socio-political and cultural conditions that confronts colonial thinking and practises."

Here I review the seminal works of Hansen et al. (2018) and Wieczorek (2018) who have taken stock of literature on sustainability transitions in Global South. To start with, Hansen et al. (2018) firstly point to the need for a fundamental reevaluation of the ontological assumptions inherent in the theoretical frameworks of sustainability transitions regarding their application in Global South. Secondly, they suggest more detailed analysis of the different nature and composition of regimes in Global South. This could cover themes such as the role of informal institutions, the level of regime stability, and processes of institutional change. Thirdly, the authors call for detailed analysis of the role of transnational actors including aid donors, multinational companies, consultancies, and foreign investors in sustainability transitions in Global South. Fourthly, they advocate for studying knowledge and capacity development because of technology transfers to Global South.

Likewise, Wiecorek's (2018) work takes stock of 115 articles studying transitions literature in Global South between 2005 and 2016. She summarizes her findings around:

- experimentation and upscaling - that in Global South transnational sustainability experiments are emerging;
- stability, change and power –there is a higher degree of instability of regimes;
- regime uniformity – regimes are less uniform compared to Global North;
- contextual forces – contrary to theory, landscape factors are not exogenous;

- path-dependence – path dependency such as colonial past can be observed but simultaneously the absence of fossil regimes present opportunities for sustainability transitions;
- transnational linkages – actors both in niches and regimes have transnational links and technology, capital, and knowledge flow to Global South; and
- normative orientation –there are differences in sustainability perceptions.

In these regards respectively, her policy recommendations are: (a) moving away from tech transfer type of aid to designing experiments that can be sustained by local communities, (b)filling 'unserved spaces' with sustainable alternatives, (c) making use of fragmentation of regimes as a basis for transformative policies, (d) paying closer attention to historical developments, (e) taking advantage of the lack of fossil fuels infrastructure to promote sustainable options, (f) making use of transnational links to secure finance, and (g) applying participatory models of decision-making.

1.2.3. Energy Transitions, Global South, and Conflict Settings

Energy provides heat, power, light, and transport. Humans' survival and growth have depended on energy (Fouquet, 2009). Throughout human history, we have consumed energy, either from renewable sources or later fossil fuels: from solar energy captured and converted by plants and consumed by animals and humans when humans led nomadic lives as hunter-gatherers to making use of wind for transport and crushing grains to the use of woodfuels for heating in sixteenth century when the human population grew, to the transition to fossil fuels such as coal and later oil (Fouquet, 2009). Here, I provide a brief history of energy transitions before diving deeper into the implications and aspects of the current low-carbon energy transitions in Global South. I then write briefly about the particularities of the current energy transition from fossil fuels to renewables in conflict settings.

The first, or one of the first ***energy transitions***, may have occurred as a result of change in the usage of fire (Rutter and Keirstead, 2012). Our ancestors transitioned from using fire for only keeping warm to cooking food about two million years ago (Wrangham et al., 1999). For both cooking and heating wood was the main source. Later, other renewable resources such as water and wind were utilized and waterwheels and windmills built for grinding grains and transportation (Rutter and Keirstead, 2012). Although differences of opinion still exist, according to Sovacool (2016, p. 203) "an energy transition most broadly involves a change in an energy system, usually to a particular fuel source, technology, or prime mover (a device that converts energy into useful services, such as an automobile or tele-vision)." Major energy transitions have occurred relatively recently. These were mainly transitions from renewables to fossil fuels and currently from fossil fuels to renewables. They include the

transition from biomass to coal for heating (1500-1800), residential coal to gas for heating (1880-1975), gas to electricity for lighting (1810-1935), and the gradual ongoing transition to low-carbon energy (Fouquet, 2010). Figure 2 prepared by Fouquet and Hippe (2022, p. 2) originally captioned "[g]lobal primary energy consumption, 1800–2019" illustrates global energy transitions between 1800 and 2019.

Energy transitions have occurred under circumstances in which social, political, economic, or environmental factors have put pressure on the dominant energy regime or when better and more efficient alternatives were available. For example, industrialization processes required far more energy and for a cheaper price than wood fuel could offer, thus opening the door for coal. In other cases, a new emerging energy source or technology was able to deliver the same services but with superior quality and additional advantages (e.g., easier, cleaner, cheaper, etc.). Availability of alternative energy sources or technologies threaten the existing regime from below (i.e., niche in MLP terms). Seen through the MLP lens, the combination of pressure from the landscape-level and innovations in the niche-level brings about transitions in the energy sector. Typically historical energy transitions have brought with them improved energy efficiency in service provision, higher per capita energy use, complexity in the energy system's structure, innovations within the system, and wider changes in technology and society (Rutter and Keirstead, 2012).

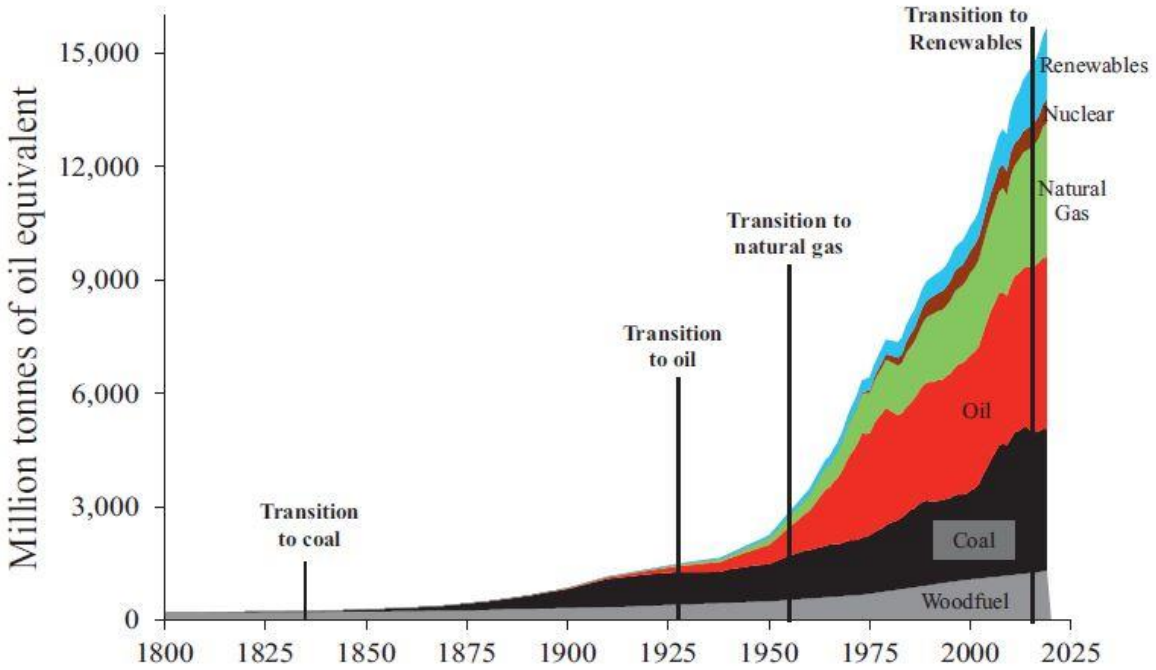

Figure 2. Global energy transitions between 1800 and 2019. **Source**: (Fouquet and Hippe, 2022)

In terms of pace, energy transitions have usually been slow processes taking decades in some cases and centuries in other (Fouquet, 2010). There are however debates about the pace of energy transitions, with some claiming there is a possibility of 'rapid transitions' which can happen much quicker than historical transitions (Sovacool, 2016) and others maintaining transitions are protracted processes which take multiple decades or even centuries arguing that some of the cotemporary energy transitions are not full system transitions but only partial changes in elements or they are anomalies difficult to replicate (Grubler et al., 2016). It must also be pointed out that during or after an energy transition more than one source or technology of energy may coexist. Present day energy systems in many countries are comprised of renewable energy (RE), fossil fuel and traditional biomass at large and small technological scales all coexisting.

Turning now to analysing ***energy transitions in Global South and conflict settings***, existing literature highlights some differences and advantages as wells obstacles for low- and middle-income countries compared to their high-income counterparts. Specific advantages of low-carbon energy transitions for Global South countries mainly in Africa and Asia may include increased access to energy, reduced climate change-related damages, improved public health due to less pollution, reduced inequalities for distributional reasons, job creation, and an overall improved welfare status (IRENA, 2022a). These advantages could potentially result in energy security, environmental sustainability, energy reliability, energy democracy, and justice in terms of participation and distribution of risks and benefits (Vanegas Cantarero, 2020). Importantly for Global south, with the ever-declining costs of renewables according to IRENA's latest report - Renewable Power Generation Costs in 2021(IRENA, 2022b), some have highlighted the benefits of 'leapfrogging' for low-and middle-income countries for example from traditional biomass directly to clean energy sources skipping the fossil fuel step (Arndt et al., 2019; Yu and Gibbs, 2018).

Nonetheless, Global South countries also find many obstacles on their way to low-carbon energy systems. Despite substantial variations in terms of geography, infrastructure, cultures, market size, institutions, and other socio-economic and physical conditions, low- and middle-income countries in Global South face in many cases similar challenges in their clean energy transitions. These, based on Vanegas Cantarero (2020) and Goldthau et al. (2020), are listed below:

- Wide-ranging use of traditional biomass mainly for cooking and heating particularly in rural areas,
- Low (or in some cases particularly in remote rural areas no) access to energy,
- Low innovative, institutional, and administrative capacities,
- Dependency on OECD countries for low-carbon technology not developed domestically and the accompanied constraining intellectual property rights issue,

- Small and weak electricity networks,
- Resource-dependent economic model in some Global South particularly Middle East countries,
- Financial instability and challenges in privatization and other administrative issues,
- Poor data availability,
- Inequity and other energy justice issues such as low citizen participation, and
- Possibility of (or concerns about) resource exploitation and neo-colonialism practices by foreign actors.

While energy transitions scholarship on Global South in general has advanced markedly over the past decade, few studies have looked at energy transitions in (post-) ***conflict settings*** or war zones, their processes and dynamics, enabling or limiting factors and the interactions of the various elements in such transitions. Fischhendler et al. (2022, p. 1) point to how literature has failed to pay attention to conflict settings highlighting "little is known about how conditions of acute interstate conflict shadowed by geopolitical forces shape this [RE] deployment." A thread of literature which touches on some issues with regard to energy transitions in conflict settings are geopolitics and politics of (renewable) energy (Blondeel et al., 2021; Scholten et al., 2020; Scholten and Bosman, 2016; Vakulchuk et al., 2020). Search for academic articles on renewable energy transition in conflict countries as of May 2023 yield a handful of results.

Research dealing with the geopolitics of renewable energy (transformation) sheds light on a number of issues ranging from electrification, trade patterns, to digitalization and cybersecurity (Blondeel et al., 2021). Similarly, relevant themes in the above literature on low-carbon energy transition in conflict settings can be summarized around three points: energy security, factors encouraging renewable energy deployment, and factors discouraging RE deployment. In the following, a synthesis of these discussions is presented.

First, energy security is one of the major concerns for conflict-affected areas. It is defined as "uninterrupted availability of energy sources at an affordable price." (IEA, 2023) Other definitions highlight low vulnerability of and the absence of threats to energy systems as energy security (Cherp and Jewell, 2014). Transition to low-carbon energy systems can improve energy security. Unlike fossil fuels, renewables are not vulnerable to risks of 'trade chokepoints' like the strait of Hormuz as they are dispersed in nature (Blondeel et al., 2021). The same dispersed and decentralized nature of renewables contributes to energy security especially if energy systems are off-grid and decentralized. Furthermore, because renewable sources of energy are more evenly distributed geographically, they have the potential to increase access rate especially in remote and hard-to-access areas (particularly in conflict settings) hence contributing to energy security.

Second, the current literature has identified various factors encouraging RE deployment. Countries who have been reliant on others for imports of mainly fossil fuel energy so far want to reduce this dependency and the risk of energy being used as an 'energy weapon' (Fischhendler et al., 2022; Vakulchuk et al., 2020). Similarly, renewables-based off-grid and decentralized systems are more resilient especially in conflict settings and reduce reliance on other states and thus geopolitical risks. This of significant importance in conflict areas as in the case of an integrated national grid, damage to one part of the grid, either from terrorist attacks, natural disasters, or malfunctions, can affect the whole system (Scholten and Bosman, 2016). Small-scale renewables based solutions can also help displaced populations and refugees on the move because of conflicts or natural disasters (Huber and Mach, 2019). Transitions to renewable energy in general have been studied for their potential in empowering communities, advancing relations and peace, and reducing conflicts (Kivimaa et al., 2022; Vakulchuk et al., 2020). Moreover, it is claimed that these transitions also bring about stronger climate institutions (Kivimaa et al., 2022).

Third, conflict settings present conditions which can be discouraging for RE transitions and vice versa RE deployment might add to conflicts in some settings. Weak regulatory environment, absence of political stability, inadequate financial mechanisms, and lack of guarantees common to violent conflicts discourage investors (Fischhendler et al., 2022). Similarly, attacks on energy projects or energy infrastructure which are particularly vulnerable in violent conflicts and may even be targets can increase costs and further deter investment. Violent attacks also disrupts and limits movements of goods, labour, and technology all vital for project development (Spyrou et al., 2019).

Conversely, renewable energy transition might also feed into conflicts. RE development might meet resistance and create tensions around land issues. These include disputes such as those encompassed in the phenomenon of Not in My Backyard (NIMBY), civic-military land competition, and land for energy projects vs agro-food purposes. In terms of trade, low-carbon energy transitions might lead to competitions and conflicts over rare earth elements such as lithium and cobalt which are essential for clean energy technologies (Scholten et al., 2020). In these contexts, energy transitions could strengthen undemocratic institutions and criminal and armed groups while also shifting location of conflicts to localities with rare earth elements (Kivimaa et al., 2022). Also relevant for trade is transition to renewables might increase trade of technologies for energy generation and services in contrast to the declining trade of energy carriers as has been the case with fossil fuels (Scholten et al., 2020). With regard to digitalization which has been hotly debated in tandem with energy transitions, there is the risk of power grid and other infrastructure falling victim to hacks and cyberattacks (Hielscher and Sovacool, 2018).

Additionally, since renewable energy transition means electricity will become the main energy carrier, there are geopolitical concerns with regard to how electric grids are arranged. If grids are interconnected between countries, disrupting or limiting electricity supply could become a foreign policy tool (Smith Stegen, 2018). Similarly, and also in the case of an integrated national grid, damage to one part of the grid can affect the whole system (Scholten and Bosman, 2016). On the other hand, off-grid and decentralized systems are more resilient especially in conflict settings and reduce reliance on other states and thus geopolitical risks. This is not to ignore the advantages of interconnected grids as they ease energy trade, improve regional cooperation and relations (Blondeel et al., 2021).

The role of actors in energy transitions as we know from literature or in Western Europe can be different in contexts of conflicts. One such actor is the state as Scoones (2016, p. 306) notes:

> Equally, in conflict-affected parts of the world, states have fragmented, often with limited authority in parts of their notional territory. Here, others may assert control, whether through private corporate interests, local elites and warlords, informal militia, drug gangs, or organized terrorist groups (70, 146, 208). Unlocking transformations to sustainability and development is, not surprisingly, especially challenging in such contexts, as conventional market, state, and citizen configurations have shifted. Where states have been weakened or undermined, the reassertion of regimes of rule, rooted in democratic state formations that frame, guide, and steer development-oriented transformations for sustainability, becomes essential (139).

Instead, a group of actors which are particularly effective are international development organizations who possess comparatively substantial resources and technical capacity (Bhamidipati et al., 2019).

In conclusion, transitions to renewable sources of energy present different risks and benefits to countries in Global South compared to those in Global North. The former which face particular challenges such as low access rate, difficulty in securing finance, and weak administrative and technical capacities might find transitions to clean energy difficult. These challenges are more pronounced in (post-) conflict settings which have received scant attention in the literature. Policy recommendations for energy transitions and energy system development in conflict-affected areas include designing conflict-sensitives strategies, diversifying mixes with a dominant role for PV, and building power systems with higher shares of local resources (Dabelko et al., 2013; Spyrou et al., 2019).

1.2.4. Actors in Sustainability Transitions: The Role of International Development Organizations

One topic that initially did not receive enough attention in sustainability transitions research is agency and the role of actors (Genus and Coles, 2008; Smith et al., 2005). While conceptualization of agency and the role of actors in transitions has advanced over the past years, there are still gaps in the literature particularly with regard to the role of international development organizations (Kranke and Quitsch, 2021). Here I give an outline of current research on agency and the role of actors in sustainability transitions, particularly civil society. I then discuss the under-conceptualization of the role of international development organization with examples highlighting their potential role in such processes particularly in aid-recipient countries of Global South.

Structuration theory by Giddens (1984) which can be considered as a disciplinary background of MLP is useful in studying agency and structure (Geels and Schot, 2010). According to this theory, the structure within which actors are embedded shape their actions and behaviour and at the same time actors can practice their agency to shape the surrounding structures. Foxon et al. (2010, p. 1205), writing about transition pathways for the UK electricity sector, maintains that "actors' behaviours may be characterized by the values they hold, the resources they command, and the strategies they choose to follow. These are in turn influenced by the institutional factors of national policies, market rules, and regulatory structures."

Transitions researchers have drawn on approaches from neo-institutional theory that look at how actors and their actions shape institutions (Battilana et al., 2009; Lawrence and Suddaby, 2006). There are different insights from these studies. First, studies have shown that actors in influential positions, so called "institutional entrepreneurs", are able to induce institutional change. Examples are policymakers or managers of public utilities, that induced institutional change by both building coalitions with other influential actors and referring to broader landscape pressures like climate change or water scarcities (e.g., Block and Paredis, 2013; Gibbs and O'neill, 2014; Hodson and Marvin, 2010; Quitzau et al., 2013; Rohracher and Späth, 2014). Second, also actors in less favourable positions are able to induce institutional change. Drawing on the institutional work approach (Lawrence et al., 2011; Lawrence and Suddaby, 2006), studies have shown how these actors are able to initiate institutional change via distributed agency.

Brown et al. (2013), for instance, show how a group of loosely coupled frontrunners engaged in creating new and disrupting old institutional routines using the example of Melbourne's stormwater management. Binz et al. (2016) e.g., analysed how early actors in the emerging innovation system of potable water reuse in California (US), who did not hold a strong

position within the established socio-technical system, engaged in multi-dimensional institutional work to legitimize new technological innovations. Third, how actors induce institutional change is context-specific and best practices from one place cannot easily be transferred to another place. On the one hand, this is due to differences in the actor constellations involved in institutional work. On the other hand, institutional work processes are shaped by the existing historically developed spatial institutional structures which they are attempting to change (Binz et al., 2016; Jolly et al., 2016).

In the rapidly growing transitions literature, there are references to multiple ways in which actors practice agency and the different types of actors. Fischer and Newig (2016) after reviewing 386 scholarly articles up to 2014 map the varieties of actors and their functions in terms of the three levels of MLP (i.e., niche, regime, and landscape), the classic State, Market, and Civil Society categorization, and with regard to the particular governance levels they are situated in (i.e., from local to international). There is also a further category of actors called intermediaries which has attracted attention particularly over the past couple of years (Kivimaa et al., 2019).

In the MLP, most actors operate at the regime and niche levels since the landscape level is thought to be beyond the reach of actors (excluding few exceptions). In the State, Market, and Civil Society categorization, State is argued to usually (not always) act as the provider of finance and protected spaces for niches. Market actors including firms are important players both in niches and regimes. Civil Society is a heterogenous group of actors including political, religious, charitable, environmental, and occupational groups (Köhler et al., 2019). With regard to sustainability transitions, civil society can for instance lobby, protest, and pressure the dominant regimes. In terms of where civil society groups are in the MLP framework, it is ambiguous at best. Some scholars, for instance Seyfang et al. (2010, p. 6) place them at the landscape level arguing civil society "represents and constitutes general landscape-level cultural trends and these can prompt relatively rapid and effective regime changes given the right conditions".

In terms of actors on different governance levels, Fischer and Newig (2016) find that actors are present on local (with limited agency), regional (weak agency), national (leading or structuring agency), and global levels (weak agency). Of relevance for this thesis, actors on the global level include NGOs, multinational corporations (MNCs), international organizations, global social movements. The role of international organizations such as donors are vital in renewable energy transitions in fragile and aid-dependent contexts (See e.g., Marquardt et al., 2016; Ockwell et al., 2018).

While the specifically sociotechnical transitions literature on aid donors is small, there is a larger literature on the role of aid donors in energy system change, which we briefly review below as empirical context. Of course aid donors are not the only important actor in such

contexts: States have key roles that are not only economic – establishing and enforcing property rights, for example – but also in terms of influencing technology choices at multiple levels (Johnstone and Newell, 2018; Osunmuyiwa and Kalfagianni, 2017). Yet aid donors can be highly influential actors in contexts where States are weak or have access to relatively limited resources. This is not to say that donor agency is not moderated by a range of factors, as noted below.

The larger literature on the role of aid donors in energy system change covers a range of themes. Bertheau and Lindner (2021) argue that while the three East Asian donor states Japan, South Korea and China are particularly important because they account for a large share of aid disbursement to the region and serve as development role models for many recipient countries, all three states have contradicted their own international pledges by financing fossil-fuel power generation projects in many countries in the region in the period examined, with China's energy-related aid flows being particularly opaque.

Atteridge and Savvidou (2019) point to the ways in which pre-existing structures constrain the effectiveness of development finance. In the context of the energy sectors of Small Island Developing States, they find little correlation between the size of the financial allocations made to individual countries and their energy access gaps. Yang and Park (2020) highlight the role of developing countries internal capabilities for effectively utilizing external resources. Analysing panel data for 98 developing countries between 2000 and 2014, they find that countries' financial incentive policies for renewable energy and their degree of political democracy are both key influences on the effectiveness of aid. Keeley (2017), again examining this for Small Island Developing States, argues that conditions for effective use of aid for renewable energy are: well-structured action plans; an effective regulatory body responsible for renewable energy; and attention to the financial aspects of utilities. In the same contexts, Dornan and Shah (2016) argue that energy efficiency and access to modern energy services have received insufficient attention, despite the strong economic case for such investments.

Marquardt (2015) points to the need for stronger forms of donor coordination, and Buntaine and Pizer (2015) argue that donor agencies should reallocate resources to improve policies that promote private investment in developing countries, rather than finance individual clean energy facilities. Hansen and Nygaard (2013) similarly observed resistance to change in the Malaysian context, with the effectiveness of twenty years of donor interventions being limited due to strong opposing interests in maintaining the status quo.

Analysing energy-related aid to the South Pacific from1990-2012, Betzold (2016) finds a shift in donor thinking: that donors have put greater emphasis on renewable energy, especially hydro and solar power, and also in off-grid systems, often solar. Donors have also given more attention to the 'soft' side of development: capacity-building, training and policy

development. All of this has been replicated to some extent in Afghanistan. Moreover, Kim (2018) finds that, examining a panel of 29 donors and 99 recipients, donors have tended to increase the amount of aid for renewable energy and have changed their energy aid-giving patterns accordingly since the start of the Kyoto Protocol. This stands somewhat in contrast with the earlier conclusion reached by Alesina and Dollar (2000), namely that the direction of foreign aid has been dictated as much by political and strategic considerations, as by the economic needs and policy performance of the recipients, and that colonial past and political alliances are major determinants of foreign aid.

In short, donor aid in the energy sector is complex in its motivation and effectiveness, and Afghanistan is no exception. In the next sections we turn to the theoretical approach that we use here for mapping some of the organisational and institutional change processes involved, as aid donors seek to change the energy regime of the country.

1.3. Global Initiatives with sustainability transitions components

2015 is a historic year in terms of climate action and efforts for a sustainable future. It witnessed the adoption of two historical agreements: the Paris Agreement under the auspices of the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nation's 2030 Agenda and the accompanying Sustainable Development Goals (SDGs). Even though Paris Agreement and the 2030 Agenda were concluded independently, they are closely interconnected. While the synergies between Paris Agreement and SDGs are many and overwhelmingly higher, there are trade-offs too (Iacobuţă et al., 2021). Importantly for low- and middle-income countries in Global South, these initiatives address both the climate emergency and issues of poverty, inequality, and socio-economic development.

1.3.1. Agenda 2030 for Sustainable Development

Unanimously adopted by all 193 member states of the United Nations in 2015, Agenda 2030 comprises 17 Sustainable Development Goals (SDGs) and 169 detailed sub-targets. Agenda 2030 serves as a guide and action plan for eradicating poverty by 2030 and for transitions to sustainability (United Nations, 2015). Agenda 2030 builds on the achievements of the Millennium Development Goals (MDGs) which ran between 2000 and 2015. Recognizing the intertwinement of challenges such as poverty, hunger, low access to services such as education, energy, and health, environmental degradation, and gender equality the 2030 Agenda has designed the SDGs such that they are "indivisible and balance the three dimensions of sustainable development: the economic, social and environmental." (United Nations, 2015, p. 1) Doubts have been raised regarding success in the implementation of

SDGs as an 'indivisible whole', calling it the most challenging part of achieving the goals of Agenda 2030 (Weiland et al., 2021).

Of the 17 SDGs, one exclusively addresses the energy domain: SDG 7 aims to ensure access to affordable, reliable, sustainable, and modern energy services by 2030. This SDG also has detailed specific targets on universal access, energy efficiency and renewable energy. In 2011, the former UN secretary general launched the Sustainable Energy for All initiative (SE4All) which now works to accelerate efforts in achieving the sustainable development goal on energy (i.e., SDG7). In September 2021, SE4ALL entered into a new partnership with the United Nations Development Programme (UNDP) which as the leading UN development institution has been playing a key role in pursuing the SDGs. Within this partnership they work to accelerate efforts towards achieving SDG 7 in Africa particularly in the Sahel. According to IEA, the world is in a critical decade (i.e., up to 2030) in terms of emissions reductions and progress in energy transitions to deliver secure, sustainable and affordable energy (IEA, 2022).

While some countries, particularly those in high-income Global North, may face fewer challenges in securing finances to pursue the SDGs, low-and middle-income countries struggle in this regard particularly. Various forms of public and private finance have been mobilized to realize these development goals. For the SDGs' predecessor - Millennium Development Goals (MDGs) - official development assistance (ODA) or foreign aid was crucial. For the SDGs, funds in trillions of dollars are required, hence the slogan 'from billions to trillions'. The United Nations, therefore, encourages all actors, in addition to ODA providers, to contribute (United Nations, 2015).

The COVID-19 pandemic has exacerbated the financing gap for low- and middle-income countries to achieve SDGs. According to the latest OECD report titled Global Outlook on Financing for Sustainable Development 2023, the drop in sustainability financing in 2020 compared to 2019 was 774 billion USD, from 4.6 trillion USD to 3.9 trillion USD (OECD, 2022b). The same source warns "SDG financing gap could reach USD 4.3 trillion per year from 2020 to 2025, an increase of USD 400 billion over OECD estimates in 2019-20." (OECD, 2022b, p. 96) According to UN's latest Financing for Sustainable Development Report FSDR report released in April 2023, "by 2027, LDCs and other low-income countries will need USD 220 billion in external financing – 30% more than what they needed in 2021." (United Nations, 2023, p. 122)

Financing gap is also a challenge with regard to the specific SDG on energy. According to a latest report by IRENA and CPI, investment "was less than one-third of the average investment needed each year between 2023 and 2030 (about USD 1.6 trillion in renewable power and the direct use of renewables […]) according to IRENA's 1.5°C Scenario. Investments are also not flowing at the pace or scale needed to achieve the improvements in

livelihoods and welfare under the 2030 Agenda for Sustainable Development." (IRENA and CPI, 2023, p. 107) Disappointingly for low- and middle-income countries, the same report adds that these countries making up 50% of the world's population received only 15% of the investment and Sub-Saharan Africa less than 1.5%. Qutizow et al. (2019) underscore the role of international cooperation in terms of promoting investments in clean energy and away from fossil fuels, promoting evidence-policy dialogues, and providing early market support for related products and services.

In contrast to developmental and growth models, the past couple of years has witnessed the rise of 'post-development agenda' ideas and alternatives to 'development' such as the Buen Vivir from Latin America, Degrowth from Europe, and Ecological Swaraj (or Radical Ecological Democracy) from India (Escobar, 2015; Kothari et al., 2014). These ideas maintain that the root cause of the multiple crises we find ourselves in today lay in pursuing development or more precisely economic growth. Even though the arguments made by pioneers of these schools of thought are thought-provoking, it is beyond the scope of this research to provide a discussion on this.

1.3.2. Paris Agreement

The Paris Agreement was adopted by 196 Parties at the UN Climate Change Conference (COP21) in Paris, France, on 12 December 2015. The overarching goal of the agreement is to limit the global average temperature well below 2°C above pre-industrial levels. The climate change conferences (COPs) which are convened under the auspices of the United Nations Framework Convention on Climate Change (UNFCCC) review progress made by UNFCCC members in the fight against climate change. The Paris Agreement is a mechanism which has the potential to speed up energy transitions globally (Kern and Rogge, 2016). Paris Agreement acknowledges in its preamble the "need to promote universal access to sustainable energy in developing countries, in particular in Africa, through the enhanced deployment of renewable energy." (UNFCCC, 2015, p. 26)

International climate policy initiatives such as the Paris Agreement and COP summits are state-led models where states are parties in implementing international agreements (Newell and Bulkeley, 2017). In transition research states are expected to play a steering role in transformative change processes (Meadowcroft, 2005). However, aid dependent states such as Afghanistan aren't in a position to provide services and achieve set goals or pursue policies independent of other relatively stronger actors such as donors, transnational organizations, and other powerful states (Newell and Bulkeley, 2017). In such settings, states can't pursue decarbonization goals if these conflict with the agenda or interests of other powerful actors.

Donors and various types of climate finances play a crucial role in achieving the visions of the Paris Agreement when it comes to the contribution of aid-recipient countries. Climate finance may come in the form development aid, grants, etc. Iacobuţă et al. (2022) find climate-related official development assistance (ODA) supports implementation of SDGs, particularly the SDG on energy (i.e., SDG7). Another important type of aid is technology transfer from high-income innovative countries where low-carbon technologies are developed to countries with weaker innovative and tech development capacities. Climate finance and technology has been transferred to Global South countries through mechanisms such as Clean Development Mechanism (CDM), Global Environment Facility (GEF), and the Green Climate Fund (GCF). Since poverty is a major challenge in Global South, there is interest and discussion on aligning poverty alleviation efforts with those on climate change mitigation and adaptation (Mitchell and Maxwell, 2010). Along similar lines, low-carbon energy transitions in settings suffering energy poverty are hoped to also contribute to low-carbon development (Doig and Adow, 2011). Important questions, however, remain about the specifics of climate finance for Global South.

There are uncertainties regarding the level of funding and finance mechanisms for climate adaptation and mitigation including low-carbon energy transitions in low-income countries. Paris Agreement in the first paragraph of its article nine states that "[d]eveloped country Parties shall provide financial resources to assist developing country Parties with respect to both mitigation and adaptation in continuation of their existing obligations under the Convention."(UNFCCC, 2015, p. 13) Latest reports by the UN and UNFCCC however indicate a finance divide both in terms of fighting climate change in accordance with the Paris Agreement and realizing the SDGs (UNFCCC, 2022; United Nations, 2022). According to the UN report, low-income countries are unable to raise resources and borrow affordably.

Agreement to establish a Loss and Damage Fund was the highlight of the latest COP – the COP27 in Sharm El-Sheikh, Egypt in November 2022. The creation of an international finance mechanism is critical for energy transitions in low- and middle-income countries who are highly vulnerable to climate change. Emerging economies and low- and middle-income countries in Africa and parts of Asia for example contribute the least to climate change but are the most vulnerable to its impacts. Such funds are needed to mitigate and adapt to climate change. While the agreement to create this fund is historic and significant, questions still remain regarding which countries will be able to benefit, which countries are (obliged) to contribute to this fund, what types of activities the fund will support, and several important aspects in terms of operationalizing the fund.

1.4. Research Methodology

In this dissertation, I explore topics covered under the broader umbrella term of energy transitions in the context of Afghanistan by a means of qualitative country-specific case study. While the specific research techniques and analytical processes are presented in full in the respective articles in chapters three, four, and five, here I outline the major components of the research methodology used to complete the dissertation. I first explain the reasons behind conducting case study research and then go into details about data collection processes.

This dissertation employs a qualitative case-study design, in an attempt to provide an in-depth analysis of Afghanistan's energy sector following the aims set in section 1.1 of this chapter. For research which is primarily exploratory in nature, qualitative case study approach is particularly suitable as such methods allow for an "in-depth description" of the phenomena and contexts under study (Yin, 2009, p. 4). Yin (1984, p. 23) defines case study research method "as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used." This method also helps researchers capture place-specific attributes of a context.

Similarly, the case study methodological approach facilitates the investigation of individual processes and the interplay of these processes in spatio-temporal contexts. Compared to other methods, case study research is most useful in gaining an understanding of the situation and in researching complexities, process-related or 'how' and 'why' research questions, and multiple levels of analysis (Merriam, 1998; Yin, 2009, 1984). In light of what has been written about this research method and the research questions defined earlier in this chapter, case study is a more useful approach to investigate the energy sector of Afghanistan about which little is known. Research in this dissertation consists of different case studies (*see* chapters 3, 4, and 5).

The research data in this thesis is drawn from three main sources: (1) documents (reports, policy documents, regulations, project documents, etc.), (2) semi-structured interviews with energy experts, (3) and observations. While the specific data collection and data analysis procedures are explained in detail in the respective articles, here sources of data which make up the overall dissertation data is presented.

Documents including but not limited to reports, surveys, government plan and policy documents, laws and regulations, websites of relevant organizations, communications, newspaper articles, press releases, evaluation reports produced by international development organizations and other transnational actors, project proposals, and project documents made up one part of collected data. Unlike their high-income counterparts, in

low-income aid-dependent countries (such as Afghanistan) project documents and proposals provide valuable information about significant infrastructural undertakings which are also in many cases carried out by aid organizations. The analysis of these documents helped with gaining a broad understanding of the situation in terms of (renewable) energy potential, actors' involvement, the general policy environment and the energy sector's regulatory framework, and the challenges the sector faced. A sample of the reviewed documents is presented in Table 2.

Table 2. Sample of documents reviewed for purposes of completing this dissertation.

Type of document	Title	Year
Report	Water Resources Management in Afghanistan; the issues and options	2002
Report	A guide to government in Afghanistan	2004
Project document	Findings, Conclusions & Recommendations from the Independent Evaluation of National Area-Based Development Programme	2004
Project document	Proposed Technical Assistance to the Islamic Republic of Afghanistan for Support to the Inter-Ministerial Commission for Energy	2006
Policy document	Energy Sector Strategy	2007
Report	Rural Electrification in Afghanistan: How do we electrify the villages of Afghanistan?	2008
Report	Capacity Assessment in the Subsector of Rural Electricity Supply through Renewable Energy Technologies	2009
Master thesis	Electric Residential Load Growth in Kabul City-Afghanistan for Sustainable Situation	2009
Report	National Area Based Development Programme (NABDP) III Afghanistan: Independent Management Review Final Report	2010
Report	Afghanistan Energy Supply Has Increased but An Updated Master Plan Is Needed and Delays and Sustainability Concerns Remain	2010
Fact sheet	Kabul Electricity Support Improvement Project Fact Sheet	2010
Report	Sustainability and Transition in Afghanistan: A Political Economy Analysis	2011
Fact sheet	Afghan Energy Capacity Building Program Fact Sheet	2011
Report	Afghanistan Resource Corridor Development: Power Sector Analysis	2012

Policy document	Afghanistan National Energy Supply Program (NESP)	2013
Policy document	Afghanistan Power Sector Master Plan (PSMP)	2013
Communication	Supporting the Inter-Ministerial Commission for Energy	2013
Project document	DABS Planning and Capacity Support (P131228)	2013
Report	Natural resource management and peacebuilding in Afghanistan	2013
Report	Afghanistan Initial National Communication to the United Nations Framework Convention on Climate Change	2013
Report	North-South Power Transmission Enhancement Project (formerly Power Distribution Project): Sector Assessment (summary): energy	n.d.
Master thesis	Potential of Solar Photovoltaic and Wind Power Plants in Meeting Electricity Demand in Afghanistan	2014
Policy document	Afghanistan Renewable Energy Policy	2015
Report	Afghanistan Initial National Communication to the United Nations Framework Convention on Climate Change	2015
Conference proceedings	Bamiyan 1 MWp Solar Mini-Grid (Afghanistan)	2015
Report	Afghanistan Sustainable Energy for Rural Development project document	2015
Press release	Renewable Energy Summit and Exhibition – "Access to Finance"	2015
Project document	Energy Supply Improvement Investment Program (Formerly Multitranche Financing Facility II: Energy Development 2014-2023): Sector Assessment (summary): energy	n.d.
Report	Assessment of Databases in 19 organizations working in Renewable Energy sector	2015
Project document	Proposed Multitranche Financing Facility Energy Supply Improvement Investment Program (Afghanistan)	2015
Project document	Afghanistan: Extractives for Development Project (P159402)	2016
Report	Assessment Report of Afghanistan Renewable Energy Union (AREU)	2016
Report	Afghanistan's energy security: Tracing Central Asian countries' contribution	2016
Report	Afghanistan: Climate Change Science Perspectives	2016

Project document	Citizens' Charter Elements Project (P160567)	2016
Report	Enabling access to private financing for private investment into renewable energy in Afghanistan	2016
Report	Developing transboundary water resources: What perspectives for cooperation between Afghanistan, Iran and Pakistan?	2016
Report	Enabling PV in Afghanistan	2017
Policy document	Renewable Energy Roadmap for Afghanistan (RER2032)	2017
Policy document	Afghanistan National Peace and Development Framework (ANPDF) 2017-2021	2017
Report	EU Country Profile 2017: Country Environmental Profile for Afghanistan.	2017
Master thesis	An Institutional Analysis of the Power Sector in Afghanistan – Barriers to achieving Universal Access to Electricity	2017
Report	Afghanistan's Second National Communication to the United Nations Framework Convention on Climate Change	2017
Report	Afghanistan Renewable Energy Development Issues and Options	2018
Doctoral thesis	Research and Analysis of Afghanistan's Wind, Solar, and Geothermal Resources Potential	2018
Project document	Afghanistan: Second Sustainable Development of Natural Resources Project (P118925)	2018
Report	Energy Security Trade-Offs Under High Uncertainty: Resolving Afghanistan's Power Sector Development Dilemma	2018
Press release	A Conference on Private Investments for Development of Sustainable Energy in Afghanistan	2018
Report	Capacity Building support to the Energy Directorates in the Energy Division of the MEW and the Provincial Energy Committees of MEW: Final Report	2018
Project document	Islamic Republic of Afghanistan: Energy Supply Improvement Investment Program (Tranche 5)	2018
Report	Aid Effectiveness in Afghanistan	2018
Report	Kandahar Solar Power Project (FAST AFG 52229): Energy Sector Overview	2019
Report	Integrating Gender and Social Dimensions into Energy Interventions in Afghanistan	2019
Communication	Energy Sector Improvement Program (ESIP) Mid-term Review Workshop	2019

Project document	Mazar-e-Sharif Gas-to-Power Project (P157827)	2019
Report	Climate-Fragility Risk Brief: Afghanistan	2019
Report	Completion Report: Supporting the Inter-Ministerial Commission for Energy	2019
Report	Afghanistan's Energy Sector: USAID and DOD Did Not Consistently Collect and Report Performance Data on Projects Related to Kajaki Dam, and Concerns Exist Regarding Sustainability	2019
Report	Afghanistan's National Inventory Report (NIR) 2019 submission under the United Nations Framework Convention on Climate Change (UNFCCC)	2019
Report	Blackout: An Assessment of the Electricity Sector in Afghanistan	2020
Project document	Islamic Republic of Afghanistan: Energy Supply Improvement Investment Program (Tranche 7) (PFRR AFG 47282-009)[3]	2020
Project document	Islamic Republic of Afghanistan: Energy Supply Improvement Investment Program (Tranche 7) (PFRR AFG 47282-009): Gender Action Plan	2020
Report	Afghanistan rural energy market transformation initiative - Strengthening resilience of livelihoods through sustainable energy access	2020
Report	Climate Change drives Migration in Conflict-ridden Afghanistan	2020
Report	Afghanistan Sustainable Energy for Rural Development: Mid-term Evaluation	2021
Report	Kandahar Solar Power Plant: Project Was Generally Completed According to Contract Requirements	2021
Media article	Solar Empowers Rural Afghanistan	2022
Fact sheet	Energy Profile: Afghanistan	2022
Fact sheet	Climate, Peace and Security Fact Sheet[4]	2023
Report	Afghanistan Socio-Economic Outlook 2023	2023

Methodologically, document analysis was especially useful for the following reasons: it helped with identifying interview partners which was difficult in the context of Afghanistan. Moreover, it was also valuable when preparing (questions) for the subsequent interviews. In this sense, document analysis was crucial for this research as access to the site and energy experts was increasingly difficult, becoming nearly impossible for some periods. Some

[3] This is a multi-tranche project consisting of 8 tranches. The author has reviewed documents on other tranches too.

[4] A 2022 version of this fact sheet was reviewed as well.

projects spanned over several years and reviewing the periodic documents of these projects (e.g., Energy Supply Improvement Investment Program by the Asian Development Bank) helped track changes over time. This method is particularly helpful for reconstructing sequences of events, as was needed for the article in chapter four. Lastly, since the overall thesis didn't follow a linear process in terms of data analysis, reviewing documents also proved useful to validate information gathered with other methods. To complement document analysis which may have its drawback if relied upon as the only approach (Bowen, 2009), interviews were conducted with energy experts.

Qualitative semi-structured interviews can provide specific insights and details that one may not find in documents. Similarly, with the help of interviews the researcher can separate out unneeded information and data. Because the interview format allows researchers to ask questions, it provides the opportunity to verify information and elicit data for the exact purposes of a study. The amount and quality of information interviews produce depend mainly on the selection of interview partners. For this reason, it is important to conduct interviews with persons who have expert understanding of the subject under research. To limit bias, Eisenhardt and Graebner (2007, p. 28) recommend "using numerous and highly knowledgeable informants who view the focal phenomena from diverse perspectives. These informants can include organizational actors from different hierarchical levels, functional areas, groups, and geographies, as well as actors from other relevant organizations and outside observers such as market analysts."

As far as interviews for this thesis is concerned, the starting point in the process was identification of interview partners which initially followed after reviewing documents. Another technique for identifying interview partners was the snowball approach where initial interviewees introduced other experts. Potential interviewees were contacted via email. The aims and objectives of the research were clearly explained. Those who agreed with the interview were then sent a list of questions along with a request that follow-up questions would be asked. Interviews were conducted via Skype or Zoom software applications and further (clarifying) questions were communicated via email or other media. Some interviews were conducted in English while others were carried out in Persian in which case the transcripts were later translated to English before they were analyzed. The entire collection of these interviews constituted the second important part of data collection for this thesis, and they were used to produce chapters three, four, and five.

With respect to the composition of interview partners, it was made sure that the governments of Afghanistan between 2001-2021 and the lead sectoral governmental agencies, international development organizations in the same period, and academia were represented. Therefore, Ministry of Energy and Water, the State energy utility DABS, and Ministry of Rural Rehabilitation and Development from the government side, ADB, USAID,

GIZ, UNDP, and World Bank from the aid organizations group, and Kabul University from academia were represented by experts. Furthermore, several of the experts had worked on some of the major energy projects mainly with international aid organizations. Table 3 lists the organizations and projects represented by interview partners.

As to the content of the interviews, questions were prepared to elicit information on a broad range of topics. These included progress and major achievements in the energy sector of Afghanistan between 2001 and 2021, challenges hindering developments in the energy sector, the role of actors particularly the governmental agencies and that of international development organizations, organizational and institutional changes in the energy sector, the importance of projects, the significance of trade and technology transfer to Afghanistan and the existing international mechanisms in this regard, internal and external political dynamics, and recommendations in terms of scale of energy technologies for the country. Lists of interview questions for the included research articles are provided in the appendices 2 and 5.

Table 3. Organizations and projects represented by interview partners.

Abbr.	Organisation/Project
ADB	Asian Development Bank
ANSA	Afghanistan National Standards Authority
AREU	Afghanistan Renewable Energy Union
ASERD	Afghanistan Sustainable Energy for Rural Development
CCAP	Citizens' Charter Afghanistan Project
CIDA	Canadian International Development Agency
Counterpart	Counterpart International
DABS	Da Afghanistan Breshna Sherkat
DED	German Development Service (GIZ's predecessor; active until 2011)
ERDA	Energy for Rural Development in Afghanistan
ESIP	Afghanistan Energy Sector Improvement Program
ESRA	Afghanistan Renewable Energy Supply for Rural Areas
ESRA	Energy Services Regulation Authority
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) (GIZ's predecessor; active until 2011)
ICE	Inter-Ministerial Commission for Energy
Integration	Integration Consulting Group
IDEA	Institutional Development for Energy in Afghanistan
KfW	Kreditanstalt für Wiederaufbau (Development Bank)
KU	Kabul University
MEW	Ministry of Energy and Water

MoEc	Ministry of Economy
MoMP	Ministry of Mines and Petroleum
MRRD	Ministry of Rural Rehabilitation and Development
NABDP	National Area-Based Development Programme
NSP	National Solidarity Programme
RED	Renewable Energy Department at MEW
REED	Rural Energy and Enterprise Development at MRRD
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WB	World Bank

Lastly, in case study research, **observations** are commonly utilized to supplement other qualitative techniques. In this method of data collection, the researcher can assume a range of roles from no involvement with insiders to a complete observer or on the other end of the continuum a complete participant (Baker, 2006). For the purposes of this research, various aspects of the energy sector of Afghanistan were observed first-hand in the years 2017 and 2018. This helped the researcher gain initial context knowledge, explore the sector, and identify important sources of information among other things. It also proved to be helpful when interpreting and making sense of findings. In some way, observations and lived experiences were also a starting point of this dissertation. I have also consistently acted as an observer of the energy sector of Afghanistan during the entire period of this dissertation.

Chapter 2

A brief history of energy system development in Afghanistan

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2. An overview of energy system development and foreign aid in Afghanistan

1893, it is claimed, is the year Afghanistan first lighted 40 bulbs with an electric energy generator that had a capacity of 20 kilo-watts (kW) (Anis National Daily, 1969). According to the same source, this generator was assembled with the help of a Mr. Brown, a foreign engineer. Later, in early twentieth century, an American engineer designed Afghanistan's first hydroelectric dam to produce electricity mainly for the Emir's residencies and offices in Kabul. 1893 is also the year Afghanistan's border to its south and east, well-known as the Durand Line, was agreed upon between the foreign secretary of British India Mortimer Durand and Afghanistan's then ruler Amir Abd al-Rahman Khan (Lee, 2018). The Durand Agreement was signed following two in a series of three Anglo-Afghan wars. Following the partition of India in 1947, the newly created Pakistan bordering Afghanistan inherited the Durand Agreement. The border would become one of the many sources of instability and violent conflicts in Afghanistan.

The above two events in 1893 – the first electricity generation instance and the drawing of the Durand Line – are recalled to underscore the significance of and provide a glimpse into the centuries of foreign assistance and interventions and conflicts in Afghanistan and how they have shaped the energy sector of the country. The past two centuries in the country's history attest to the significance of conflicts and international interventions in shaping the Afghanistan we know today (Lee, 2018). Conflicts and international interventions have been the two lasting characteristics of an Afghanistan otherwise constantly in transition. Whether one looks at the twentieth century or the twenty first, footprints of conflicts and international interventions can be seen in infrastructure development plans, foreign relations documents, basic service programmes, school or university curricula, and numerous other aspects of life.

As far as *conflicts* are concerned, Afghanistan has grappled with various conflicts of different kinds and magnitudes since at least mid-nineteenth century before the drawing of its present borders. It has experienced armed violent and lower-intensity forms of conflicts. These have included conflicts with its neighbours, buffering between military superpowers, full-scale wars, international terrorism, and sectarian and ethnic conflicts. For the best part of the last two centuries, the country has either acted as a buffer state between rulers and empires or was invaded by one (McLachlan, 1997). In 1839, the British launched an invasion of

Afghanistan to prevent Russian expansion southwards. Later, during the Cold War in the 20th century, Soviet Union and the United States played their rivalries and fought for influence in Afghanistan (Cullather, 2002). In its contemporary history, the country has experienced a bloody civil war in 1990s and subsequently the Taliban's rule, as well as increasing sectarian movements (Shahrani, 2000). It continues to struggle with instabilities and societal tensions caused by ethnic, linguistic and religious diversities (Mousavi, 1997). Most recently, in August 2021, the Taliban returned to power for the second time following years of armed opposition to and violent attacks on Western-backed governments of 2001-2021.

Similarly, *foreign aid* to Afghanistan have come in various amounts and forms for centuries. Some have called them external intervention, others outside interference; some have labelled them foreign occupation, and others development assistance. Whatever the label, the presence of international actors and large amounts of development aid have been consistently associated with the country since its birth as a modern nation state. More recently, following the inflow of vast amounts of aid in the 2001-2021 period, the country has been classified as a rentier state (Clarke, 2020). "Afghanistan has been a rentier state to some degree since at least the nineteenth century when British subsidies facilitated Abdul Rahman Khan's consolidation of the state. However, the post-2001 rent dwarfs any earlier dependency. […] Since 2001, there has been a wide array of donors and armies, different types of aid – bilateral, through multi-donor funding mechanisms, through NGOs, on and off-budget, civilian and military." (Clarke, 2020, p. 7)

Taking a bird's eye view on decades of conflicts and international aid in Afghanistan, one might wonder if one causes the other. While establishing correlation or causation between conflicts and international interventions or aid is beyond the scope of this dissertation, there is evidence that that the two have accompanied each other in Afghanistan. For example, according to Fishstein and Wilder (2012), provinces with more security problems and violent attacks received the bulk of foreign assistance.

> Because the primary objective of post-2001 U.S. aid to Afghanistan has not been development for its own sake but rather the promotion of security objectives, funding for insecure areas has taken priority over secure areas. Therefore, the bulk of U.S. civilian and military development assistance funds in Afghanistan have been spent in insurgency-affected provinces in the south and east. The last several years have seen an even greater prioritization of the insecure areas despite the lack of evidence that the aid funds being spent are promoting stability or improving attitudes towards the Afghan government and the international community. (Fishstein and Wilder, 2012, p. 5)

Looking at the broader picture, one can see a pattern of aid provided to governments of Afghanistan by foreign powers or certain political blocs to win influence when in competition with rivals or to keep the country from joining the 'others' (Clarke, 2020). Simultaneously, rivals have sought to provide aid to resistance or opposition groups (Goodhand, 2002). One such case is the aid provided by the Western bloc to resistance and pro-Mujaheddin groups to challenge and weaken the central government of Afghanistan backed by the Soviet Union after 1979, until 1990s. Goodhand (2002, p. 842) notes that "Western aid was part of a conscious strategy to undermine the communist government. By avoiding official structures and working with commanders at the local level, NGOs inevitably accentuated national–regional tensions and legitimised military strongmen." Both Goodhand (2002) and Suhrke et al. (2002), studying the history of foreign aid to Afghanistan, have pointed out instances and periods where aid contributed to tensions and conflicts.

Reflections on conflicts and international aid provide important context for studying the energy sector of Afghanistan. While most of the development projects in the last hundred years in the country have been implemented with international aid money, decades of conflicts involving in many cases the same governments providing aid and or their rivals and proxies have taken its toll on infrastructures and institutions including those of the energy sector. Energy system development largely financed by foreign donors has been influenced by ceaseless conflicts – some violent, others in the form of cold war politics. From the construction of large hydropower plants on dams in the twentieth century to the developments in the energy sector between 2001 and 2021, there is ample evidence attesting to the significant influence of conflicts and international interventions on energy system development in Afghanistan.

The Taliban, after years of insurgency and maintaining shadow governments in rural Afghanistan, took control of the whole country in August 2021. On August 15th, Taliban fighters entered Kabul and appeared in the presidential palace. Four days later, the group announced the creation of their administration under the name of the Islamic Emirate of Afghanistan replacing the former Islamic Republic of Afghanistan. In the unelected cabinet of Taliban's Islamic Emirate of Afghanistan, no non-Taliban, women or representatives of minority groups were appointed to high-level governmental positions and many ministers remain on the United Nations' sanctions list. Except for a few humanitarian aid organizations and the UN Mission in Afghanistan, international development organizations have left the country and suspended their activities.

The remaining part of this chapter proceeds as follows: section 2.1 presents a general introduction to Afghanistan and the background conditions. Sections 2.2 and 2.3 are designed to discuss the context of the energy sector with the first reviewing historical developments in the sector and the second evaluating energy potential. Section 2.4 analyzes

the 2001-2021 period in terms of the energy situation, the role of actors and institutions, and barriers to energy sector development. Subsequently, section 2.5 examines the role of development aid and international development organizations in the energy sector of the country. Finally, in section 2.6 a brief outlook concludes the chapter by assessing the prospects of energy sector development beyond 2021 and consequences of the Taliban's return to power.

2.1. General Contextual Conditions

A low-income or a "least-developed" country in UN and World Bank categories, Afghanistan is geographically mountainous and landlocked located at the crossroads of Central and South Asia. With a total area of 652,860 km^2, the country shares borders with Pakistan in the south and east, Iran in the west, China in the northeast, and Turkmenistan, Uzbekistan, and Tajikistan in the north. The Hindu Kush mountains divide Afghanistan into the Northern plains, Central highlands, and the Southwest plateau.

Of the country's roughly 32.2 million people[5], around two-thirds as per estimates by Afghanistan's latest demographic survey live in rural areas (NSIA, 2021). The population of the country is made up of several ethnic groups including Pashtun, Tajik, Hazara, Uzbek, and Turkmen. In the 2001-2021 period, a strong but haphazardly and chaotic urbanization trend saw many leaving rural areas for cities especially the capital Kabul (GIRoA, 2015). This was mainly for seeking employment opportunities in cities and due to droughts which affected agriculture. Nevertheless, a significant percentage of the population still lives in rural areas and with the withdrawal of international organizations in 2021 who provided employment and created jobs the trend has been reversed as more people return to rural villages.

Afghanistan has an arid to semi-arid continental climate with cold winters with moderate rain and snow fall especially in central highlands and the north and hot dry summers. The country is prone to droughts and highly vulnerable to climate change in general (Azimi et al., 2017; NEPA and UN Environment, 2016). According to the UN Mission in the country, Afghanistan is "the sixth most affected in the world to climate-related threats." (UNAMA, 2022) As per Afghanistan's environmental agency (NEPA) and UN Environment, annual mean temperatures have increased by 1.8 degree Celsius since 1950 and the temperatures may rise further by 2 degrees Celsius in 2050 (NEPA and UN Environment, 2016). 4,000 glaciers in Afghanistan's mountains supplying water for drinking and irrigation are rapidly melting. The total area of glaciers shrunk by 14% between 1990 and 2015 (Bjelica, 2021). These are expected to contribute to more frequent and severe natural disasters such as

[5] There are conflicting estimates of the population of the country. The last official census conducted in Afghanistan was in 1979 covering only two thirds of the country due to security issues.

droughts and floods aggravating further the existing food insecurity and poverty in general. UNDP reports that alongside economic shocks, droughts and floods were the events with greatest impacts on households in 2022 impacting 3.9 million and 1.2 million households respectively (UNDP, 2023).

Consequences of climate change are devastating for Afghanistan since around two-thirds of its population depend on agriculture for livelihood. Even though only 10% of the country's 65 million hectares land area is arable with the rest mostly deserts and mountains (Azimi et al., 2017), agriculture is the most important sector as it employs more than 75% of the population and makes a significant contribution to the country's GDP. Droughts and floods directly affect agriculture. Similarly, rising temperatures and changes in precipitation patterns affect this (for millions the single) source of livelihood. In the meantime, the rapidly growing population (with fertility rate of 4.6 in 2021), displacements and the increasing land values will intensify competition and conflicts over land. The fragile ecosystem, environmental degradation, violent conflicts, and poor socio-economic situation further exacerbates the situation.

While some socio-economic indicators had significantly improved during the 2001-2021 period, these waned once the Taliban returned and foreign aid dried up. The gains of 2001-2021 period are, among others, lower maternal and child mortality rates (e.g., 50% lower in case of children under 5), doubling up of per capita GDP between 2002 and 2019, improved literacy rates by up to 28%, increase in school enrolment, and increase in life expectancy from 56 to 65 (SIGAR, 2021a). However, since most of these, especially the economic indicators, were interlocked with aid inflow and fluctuated in tandem with the level of aid, the changed situation after August 2021 clearly reflects this.

Following the collapse of the last Western-backed government in August 2021 and the consequent suspension of donor-funded activities by development organizations, the socio-economic situation in Afghanistan has deteriorated severely. The country scores poorly, especially after the Taliban takeover, against nearly all significant socio-economic indicators including income per capita, population living below poverty line, and access to basic services such as schools, health facilities, and electricity. The share of population in poverty has grown sharply from 47.5% in the last survey conducted by the National Statistical and Information Authority (NSIA) before August 2021 to 70% or even 97% in other calculations after the return of the Taliban into power (UNDP, 2023). GDP per capita has fallen to 368 USD and the GDP growth rate nosedived to -20.7% (World Bank, n.d.).

Economic growth in Afghanistan has depended on, for decades stretching back to late 19th century but especially during the 2001-2021 period, on the inflow of foreign aid. Foreign aid accounted for 40% of the gross domestic product (GDP) and 75% of Afghanistan's public expenditures under the last Western-backed government (SIGAR, 2022). These figures were

consistent or even higher during much of the 2001-2021 period as foreign spending and aid gradually declined after 2014 when the international troops started to leave the country. Domestic contributions to the economy come largely from the agriculture sector; industry and service sectors did not develop sufficiently specifically in the 2001-2021 period, with the improvements in the latter tied to the presence of international organizations.

The latest Human Development Index (HDI), compiled by UNDP, ranks Afghanistan at 180 out of 191 countries and territories. The HDI data shows the country scored 0.478 (in 0-1 scale, 1 being the highest), performing poorly in life expectancy, education, gender equality, and the percentage of population living in poverty. Taliban's policies (e.g., banning women from workplaces, schools and universities, social life, etc.) and the lack of recognition by international community of the group, withdrawal of international development and aid organizations, and natural disasters such as droughts will further worsen the situation which will be reflected in upcoming HDI reports.

Politically, the Taliban who seized power in August 2021 are not recognized by international community as a legitimate government. The international community view the Islamic Emirate of Afghanistan established by the Taliban as the de facto authorities (DFA). Following the Taliban's return to power, the US government froze the assets of Afghanistan's central bank worth over 7 billion USD held in the Federal Reserve Bank of New York (SIGAR, 2022). Although there are instances showing improvement in the security situation, armed conflict persists. Local armed resistance is led by groups aligned with the former government. Furthermore, the Islamic State Khorasan Province – the Afghanistan branch of the terrorist group – is also challenging the Taliban government similar to the insurgency pursued by the Taliban challenging the previous governments. There is profound uncertainty regarding the political future of the country.

The Taliban have imposed restrictions on various socio-political activities. They have also banned women from workplaces, schools beyond grade six, universities, parks, sports, long-distance travel without a male companion, etc. Even international NGOs have been ordered to stop women from reporting for work which led to the suspension of their operation by for instance Save the Children and the Norwegian Refugee Council, two of the few organizations that remained after August 2021 and continued delivering humanitarian aid. Freedom of speech and media, rare areas in which Afghanistan shone in the region during the presence of international community, have been limited considerably (Freedom House, 2023). The parliament and election commissions have been abolished. Similarly, under a practically one-party system composed of exclusively Taliban members, organized political activity is severely suppressed. Thousands fearing persecution and political instability as well as a humanitarian crisis have fled the country.

2.2. Historical Developments in the Energy Sector of Afghanistan

The first uses of modern forms of energy in Afghanistan, specifically electricity, can be traced to the late nineteenth and early twentieth century. As per a 1969 article in Anis Daily, the first use of electricity in Afghanistan dates back to 1893 (Anis National Daily, 1969). The source claims the electricity generating dynamo which had a capacity of 8 kw lighting 40 bulbs was assembled by a foreign engineer named Mr. Brown (Anis National Daily, 1969; Sharifi, 2009). Two decades later, the decade 1910s witnessed the development of several electricity generation stations mainly powered by steam and water. Among the power stations built in the 1910s was the first hydropower plant constructed in Jabal Seraj, Parwan between 1911-1918 with the help of an American engineer named A. C. Jewett (Adamec, 2002; Lee, 2018).

Dam building and electricity generation from hydro sources has a relatively long history which characterized energy system development in the 20th century Afghanistan (Ahlers et al., 2014; Baron, 1975; Cullather, 2002). In fact, almost all of the country's electricity generation installed capacity in the last century came from hydro sources. In the first half of the 20th century, dam building was largely financed by the State; but this was dwarfed by the efforts in the second half of the century. The post World War II decades saw major dam constructions in the country. It started with the then King Zahir Shah's government hiring the largest American engineering firm, Morrison Knudsen, Inc., in 1946 to build a dam in Helmand Valley. Alongside the American dam building initiatives which had practically started in 1950s, "by the 1960s, Afghanistan had Soviet, Chinese, and West German dam projects underway." (Cullather, 2002, p. 530) At this point in time, the inflow of development aid per capita to Afghanistan was the highest internationally. By 1970s, there were a total of 27 medium and large dams in the country (Ahlers et al., 2014).

The large-scale dam construction of post WWII was largely spurred by a tug of war between the U.S. and Soviet Union. In the context of cold war geopolitics, both sides delivered large sums of development aid and dispatched engineers and technicians in a competition win hearts and minds. The two military powers initiated two huge river basin development projects: the U.S. concentrated on Harirod-Murghab River basin in Southern Afghanistan and invested in Helmand and Arghandab Valley Authority (HAVA) modelled after the Tennessee Valley Authority (TVA) while the Soviet Union started working on a similar initiative called Nangarhar Valley Development Authority in the eastern part of the country (NVDA) (Ahlers et al., 2014). The Soviet Union built dams on Kabul River and worked on Amu River basin. The majority of the hydro power plants profiled in the next paragraph are the products of the two US and Soviet development projects.

Most of the major hydropower plants in Afghanistan were built in the three decades 1950s, 60s, and 70s. While some of these dams were built solely for irrigation purposes, others produce energy (in some cases in addition to irrigation). The bulk of power generation capacity come from Kabul River and Helmand River respectively. Naghlu, Mahipar, Sorobi, and Darunta are the largest power plants built on Kabul River (Fichtner, 2013). On Helmand River, there are Grishk and now three units of Kajaki power plants with the last completed in 2016 (i.e., Kajaki II). Another major power producing dam is Salma which was also named Afghan-India Friendship dam, India having provided the financial assistance. Work on the dam started in 1976 but decades of war prevented its completion until 2016. Built on Hari River in Western Afghanistan, it has the capacity to produce over 42 MW of electricity and irrigate more than 75,000 hectares of land.

There was little progress in the energy sector in the years between 1979 and 2001 due to initially Soviet Union's military intervention from 1979 to 1989, followed by civil war until 1996, and the first Taliban rule from 1996 to 2001. Not only did the sector not develop, most of its institutions and hard infrastructures such as dams and transmission and distribution networks were made dysfunctional during the wars.

Following the US-led military intervention in 2001, the Taliban government was ousted after five years in power and little investment in the energy sector. 2001 marked the beginning of a new era dominated by Western players and ideas. The energy sector received large-scale investments in the form of mainly development aid. Old large hydropower plants were rehabilitated by Western financial assistance and technical expertise and new small-scale electricity generation projects based on renewable energy were implemented. To increase energy supply, substantial investments were made to import electricity from Central Asian neighbours and Iran. In the privatization wave post-2001, state-owned enterprises including the energy utility DABS were corporatized with a view to fully privatize. Women were encouraged to participate in the sector and development aid projects in many cases required a certain percentage of employees to be women. Contours of a regulatory framework were drawn with the help of international development organizations. Table 4 provides a chronology of important historical developments in the energy sector of Afghanistan. The information presented in Table 4 are drawn from various documents and reports (e.g., Fichtner, 2013; Fraser et al., 2003; GIZ, 2017; World Bank, 2018).

Table 4. Chronology of key historical events in the energy sector of Afghanistan.

Year	Event	Notes
1893	First electric generator installed.	The unit had a capacity to power 40 bulbs.

1911 - 1918	First hydroelectric station, Jabal-Seraj, built.	Located in Jabal-Seraj, Parwan, the hydropower station was built by an American engineer named A. C. Jewett.
1950	Puli-Khumri HPP	The technology used in this power plant was imported from Germany. It had a capacity of nearly 5 MW and served Baghlan province.
1957	Sarobi HPP	With 2 turbines procured from Germany with an installed capacity of 22 MW, the plant serves Kabul area.
1957	Grishk HPP	The plant with a capacity of 2,400 kW was built with assistance from the United States.
1962	Puli-Khumri II HPP	Unlike Puli-Khumri I, this plant was built with assistance from the Soviet Union. The plant's installed capacity was 9 MW.
1964	Darunta HPP	Darunta hydropower plant with a capacity of almost 12 MW was constructed with assistance from the Soviet Union. It serves the Jalalabad area.
1967	Naghlu HPP	Naghlu hydropower plant, the largest in terms of capacity, was constructed by the Soviet Union in the 1960s. It has four turbines and was rehabilitated by the World Bank in the post-2001 era.
1967	Mahipar HPP	One of the largest hydropower plants, Mahipar can produce up to 66 MW electricity from three turbines of 22 MW each. It was completed in 1967 with assistance from Germany and it supplies power to the population in Kabul city.
1973	Charikar HPP	On Parwan irrigation canal, the Charikar hydropower plant was built by Chinese assistance. It's installed capacity is a little less than 2.5 MW.
1975	Ghorband HPP	This small plant was built using three 100 kW turbines procured from India.
1975	Kajaki I & III HPP	USAID built turbine generator units 1 and 3 at the dam in 1975 and invested in a third turbine in late 2004, unit 2, following the resumption of its activities post-2001. The unit 2 turbine was commissioned in late 2016.
1976	Salma Dam	Salma dam was first constructed in 1976. It was damaged during the conflicts.
1983	Assadabad HPP	This small hydropower plant consisting of two 50 kW turbines was built on the Kunar River with the technology supplied from Germany.

2001	International development organizations resumed their activities.	Upon the fall of the first Taliban government in 2001, several international development organizations returned to or resumed their activities in Afghanistan including in the energy sector.
2008	Afghanistan's first wind power project completed in Panjshir province.	The wind farm consists of 10 turbines with a total capacity of 75 kW which powers mainly the government facilities in the Panjshir Valley.
2008	Energy Sector Strategy adopted.	This was the first energy sector strategy post-2001 which was prepared with the support of international organizations as part of the Afghanistan National Development Strategy (ANDS).
2008	State energy utility, DABS, corporatized; shares still held by ministries.	This was carried out with technical and financial assistance by mainly the World Bank, ADB, and USAID so the utility runs such that it recovers its costs and, in an attempt, to privatize the state-owned enterprises.
2009	Renewable Energy Department (RED) established at the Ministry of Energy and Water.	Following the rise of renewables and the implementation of a few small-scale renewables-based projects by donor agencies in Afghanistan, this department was established at MEW to contribute to policymaking and managing of RE projects.
2010	Construction of Tarakhil thermal power plant completed.	One of the largest thermal plants in the country with a capacity of 105 MW, it was funded by USAID. Work on the plant started in late 2007, and after completion in 2010 it was transferred to the government of Afghanistan.
2013	Afghanistan Power Sector Master Plan (PSMP) adopted.	Following a preliminary master plan in 2004, this comprehensive power sector master plan was developed with the financial assistance of ADB and drafted by Fichtner GmbH. The document contains plans for the energy sector until the year 2032.
2013	National Energy Supply Program (NESP) adopted.	NESP was prepared as part of the National Priority Program Infrastructure Development Cluster. The government of Afghanistan and partner development organizations agreed upon 22 National Priority Programmes. One of its objectives was to increase access to electricity by 60% in provinces and 80 % - 90 % urban areas by 2015.

2013	Afghanistan Renewable Energy Union (AREU) established.	A union of private companies supported initially by USAID and later by GIZ. GIZ actively supported the organization in terms of defining a governance structure, networking with national and international organizations such as the German Solar Association, and capacity building. The union had a tenfold increase in the number of its members from 12 in 2013 to more than 120 in 2021. These were mostly small companies providing primarily solar installation services.
2014	First PV project at MW scale in Bamyan	At the time, the Bamyan PV project was the largest off-grid system installed. The system was based primarily on solar with battery and also diesel as back-up. The total capacity is 1 MW providing electricity for 2,500 households, businesses, and governmental office in Bamyan city. The project was funded by the government of New Zealand and installed also by New Zealand technicians. After completion, it was handed over to the utility DABS.
2015	Afghanistan National Renewable Energy Policy (ANREP) prepared.	GIZ and USAID, among others, supported the development of this policy. The policy set an ambitious target of deploying 4500 – 5000 MW of renewable energy by 2032, which is 95% of the total energy mix of 5000–6000 MW according to the Power Sector Master Plan's projections. It aims to achieve this in two terms – Term 1 from 2015-2020 and Term 2 from 2021-2032.
2016	Power Services Regulation Act approved.	After years of delay, a Power Services Regulation Act was approved in the cabinet of Islamic Republic of Afghanistan. The main objectives of the act, as stated in its article two, are to regulate the electricity-related affairs, improve the quantity and quality of energy services, and ensure public access to energy services in return for a fair price. The legal document was prepared with the support of international donor agencies including USAID.
2016	Salma dam rehabilitated.	Th dam on the Hari River, located 157 km east of Herat city was rehabilitated with financial assistance from Indian government. It's installed capacity is 42 MW consisting of 3 turbines. The dam can also irrigate up to 80,000 hectares of land.
2017	First hybrid solar and wind project in Herat launched.	The project was implemented by Quatro and funded by the Japan International Cooperation Agency (JICA). With a total capacity of 2 MW including 1.7 MW of solar and 300 kW of

		wind, it serves the Western Herat province. The system is connected to the grid.
2017	Renewable Energy Roadmap for Afghanistan (RER2032) prepared.	The document was prepared with the financial assistance of ADB and drafted by IT Power Consulting Private Limited.
2019	First Gas-fired thermal power plant since 1970s started generation.	The first phase of Bayat-1 thermal power plant with a capacity of 41 MW went online in November 2019.
2019	First large-scale solar farm in Kandahar started generation.	The first of a couple e of large-scale solar farms in Afghanistan was partially financed by the USAID in Kandahar. The Plant has a capacity to produce 10 MW electricity which went online in October 2019.
2020	Presidential decree issued by Ashraf Ghani to splitting of Minister of Energy and Water (MEW) into two independent regulatory bodies: a Water Regulatory Body and an Energy Regulatory Body.	In early 2020, President Ashraf Ghani issued a decree stipulating the splitting of the Minister of Energy and Water into two regulatory authorities: (a) Energy Regulatory Body and (b) Water Regulatory Body. Following this, some departments of MEW were to be merged in the DABS structure. The Taliban later reversed this decision.
2020	Work began on 25 MW Herat Wind Farm.	Initial work started on the largest wind project in the country in late 2020. In 2021, the Turkish contractor 77 Construction Corporation commenced their mobilization work. The project is partially funded by USAID.
2020	Two turbines at Salma Dam resumed operation following the filling up of the	Although built in 2016, the dam started producing electricity at full capacity once its reservoir was filled with water and two of its three turbines could start generating electricity in 2020.

	dam's reservoir, adding 25 MW electricity.	
2021	Most international development organizations left or suspended their activities.	After the return of the Taliban to power following their 2 decades of insurgency, most international development organizations present in the energy sector suspended their activities and left Afghanistan.
2021	On September 9th 2021, the Taliban appointed Abdul Latif Mansoor as acting Minister of Energy and Water in their administration of Islamic Emirate of Afghanistan.	Mullah Abdul Latif Mansoor is an UN-sanctioned senior member of Taliban. In the first Taliban regime in the 1990s, Abdul Latif Mansoor served as the Minister of Agriculture.

2.3. Energy Potential

Afghanistan is considered a rich country when it comes to natural resources. The country is endowed with vast mineral deposits including copper, iron, gold, lithium, rare earth materials, and substantial fossil fuel reserves particularly coal and gas (Fichtner, 2013; Ministry of Mines and Petroleum, 2021). These resources are claimed to be worth around USD 3 trillion (Fichtner, 2013). The fossil fuel reserves comprise of coal in predominantly central parts of the country and natural gas and oil in northern parts (Fichtner, 2013). Afghanistan's Power Sector Master Plan, citing various sources including a US geological survey and the country's Ministry of Mines and Petroleum, claims coal reserves to be around 73 million tons, and gas reserves at 75 billion cubic meters proven and undiscovered technically recoverable amount of 444 billion cubic meter (Fichtner, 2013). The Power Sector Master Plan maintains the gas reserves can produce 754,700 GWh. Furthermore, a 2006 U.S. Geological Survey estimated that the country possesses nearly 1,6 billion barrels or 219 million metric tons of crude oil mostly in the northern Amu Darya and Afghan-Tajik basins (Klett et al., 2006).

With regard to fossil fuels production and consumption, despite large reserves, Afghanistan imported 97% of its oil needs in 2014 from neighbouring and regional oil exporters such as Turkmenistan, Iran, Russia, Uzbekistan, and Pakistan (ADB, 2015; Fichtner, 2013). Lacking

the required infrastructure and technical capacity, the country has not been able to extract oil. Recently, in January 2023 Taliban authorities signed an agreement with a Chinese company for oil extraction from the Amu Basin in northern Afghanistan (Hoskins, 2023). The case of gas and its development is a similar story to that of oil. Except for a gas-fired power plant inaugurated in 2019, the first and only one, the country has not been able to utilize the potential of this resource. According to Asian Development Bank, the identified gas reserves of Afghanistan can produce 400 MW of energy for 75 years (ADB, 2015). Despite this, there has been discussions on importing gas from Central Asian republics during the 2001-2021 period (ADB, n.d.). In a similar vein, so far coal has been used directly for cooking and heating, but not for electricity generation. The Taliban, since their return to power, have increased exports of coal to Pakistan (Khan, 2022). Coal is generally produced in artisanal mines, with limited or no control by the government.

Turning now to renewable sources of energy, there are relatively more up-to-date information on the potential of these sources. Afghanistan's lead ministry in the energy sector, Ministry of Energy and Water (MEW), estimates the total renewable energy potential in the country at 318 gigawatts (GW) (Ministry of Energy and Water, 2015). While details on the potential of renewable sources are provided in chapter three, in its attempt to introduce the context this section provides some macro data and additional information along with maps that were produced for MEW. I examine the potential of four sources of renewable energy in the following paragraphs: hydro, solar, wind, and biomass.

Hydro:

Surface water in Afghanistan largely comes from snow melt in Hindu Kush mountains. This also means the volume of water in the rivers varies depending on the season, with peaks in spring and early summer and some rivers flowing for only 3-4 months in the year (Ahlers et al., 2014). Afghanistan's 2008 Water Sector Strategy estimates the amount of surface water at 57 billion m3 (GIRoA, 2008). Only 33 percent of this water is used for irrigation and other purposes (Thomas et al., 2016). Similarly, the country utilizes only a small fraction of the available hydro potential for energy generation.

According to the Afghanistan Water Atlas, there are five major river basins in the country (Favre and Kamal, 2004). These are:

1. The Helmand River Basin
2. The Panj-Amu River Basin
3. The Harirod-Murghab River Basin
4. The Kabul (Indus) River Basin
5. The Northern River Basin

Afghanistan shares water from four of the above river basins with its neighbouring countries. Water from Helmand River Basin flows into Iran; from Panj-Amu to Uzbekistan, Tajikistan, and Turkmenistan; from Harirod-Murghab to Turkmenistan and Iran; and from Kabul (Indus) River Basin to Pakistan (Hayat and Elçi, 2017). Except with Iran, the country has not signed a water sharing treaty with any of the riparian countries. Afghanistan is not considered a downstream country in relation to nearly all the neighbours with whom it shares water with; it is in most cases an upstream country except for Kunar River which emerges in Pakistan, runs through Afghanistan and joins the Indus River ending back in Pakistan (Favre and Kamal, 2004).

The overall potential of hydro sources (across all scales) is estimated at 23, 000 MW (or 23GW) (Ministry of Energy and Water, 2015). The Panj-Amu River Basin offers the highest potential with more than 20,000 MW, followed by Kabul River Basin (1941 MW), Northern River Basin (760 MW), Helmand River Basin (270 MW), and Harirod-Murghab Basin (220 MW). The country's Power Sector Master Plan proposes development of 15 hydropower plants with a total capacity of more than 7,500 MW at a total cost exceeding 18 billion USD. Table 5 provides a list of these hydropower plant options. While the master plan proposed these options in 2013, only two of them – Kajaki Extension (10) and Salma (13) – have been realized at the time of writing, July 2023.

Table 5. List of hydropower plant options based on Afghanistan Power Sector Master Plan.

#	Project	River	Province	Capacity (MW)	Annual energy (GWh)	Estimated cost (m US$)
1	Baghdara	Panjshir	Kapisa/ Parwan	210	968	600
2	Surobi 2	Kabul	Laghman	180	891	700
3	Kunar A (Shal)	Kunar	Kunar	789	4,772	2,000
4	Kajaki Addition	Helmand	Helmand	100	493	300
5	Kokcha	Kokcha	Badakhshan	445	2,238	1,400
6	Gulbahar	Panjshir	Panjshir/Baghlan	120	594	500
7	Capar	Panjshir	Panjshir	116	574	450
8	Kama	Kunar	Nangarhar	45	223	180
9	Kunar B (Sagai)	Kunar	Kunar	300	1,485	600
10	Kajaki Extension	Helmand	Helmand	18.5	91	90
11	Olambagh	Helmand	Uruzgan	90	444	400
12	Kilagai		Baghlan	60	297	250

13	Salma	Hari Rud	Herat	40	197	200
14	Upper Amu	Amu Daria		1,000	4,955	2,500
15	Dashtijum	Panj		4,000	19,819	8,000

Compared to other renewable sources, hydro is currently the largest contributor to the installed energy generation capacity. With a share of over 250 MW, it represents nearly half of domestic installed capacity (ADB, 2020). Due to its mountainous geography, utilizing water for energy production is possible both at smaller run-of-river scale and large dams. Figure 3 demonstrates the hydropower potential with details on all river basins and hydropower projects in Afghanistan.

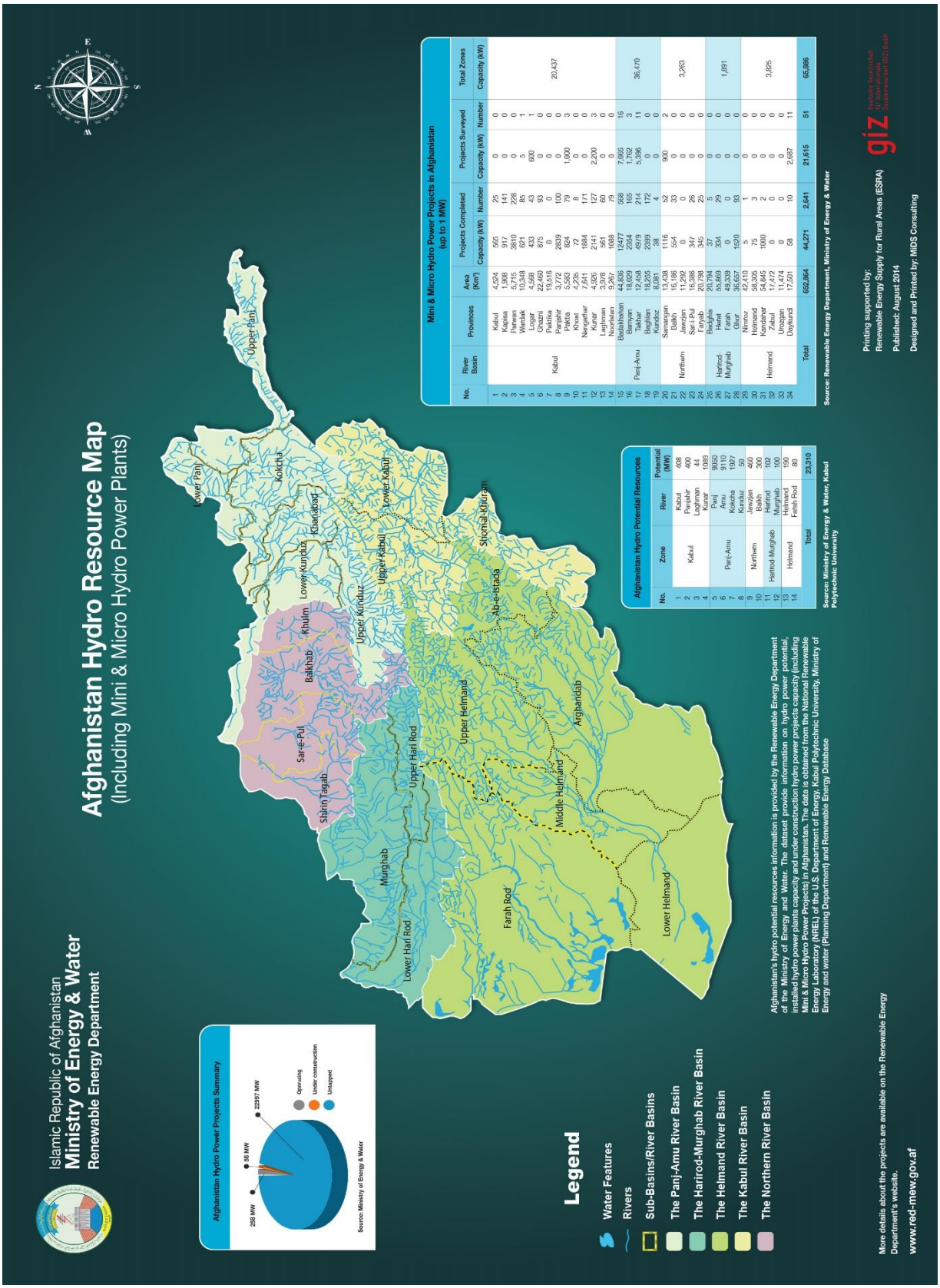

Figure 3. Afghanistan hydro resource potential map . **Source:** MEW as indicated in the figure.

Solar:

In Afghanistan, the sun shines almost throughout the year with up to 300 sunny days (Ministry of Energy and Water, 2015). This and the average solar insolation of 6.5 kWh/m^2/day means the country can produce a considerable amount of energy from this source. The estimated theoretical potential of solar is 222,000 MW (222 GW) (Ministry of Energy and Water, 2015). According to Afghanistan's Renewable Energy Roadmap (RER20232), the province of Helmand in the south boasting an estimated 33,282 MW, could theoretically produce the highest amount of solar energy while Kapisa in the north with 183 MW has the lowest potential (ADB, 2017a). More details regarding the potential of solar can be found in chapter three. Here I expand on a handful of successful utilization of solar energy potential in the country.

One of the successful early solar photovoltaic (PV) projects implemented by aid donors was in Bamyan province in central Afghanistan. In 2012, the New Zealand Ministry of Foreign Affairs (MoFA) funded the Bamyan renewable energy programme (BREP). The programme completed a 1 MW solar-diesel hybrid mini-grid (not connected to the national grid) in December 2013. The project was implemented by two New Zealand registered companies - Sustainable Energy Services International (SESI) and NetCon (Foster et al., 2015). It combines solar (main) with diesel and batteries (as back-up). The mini grid provides electricity to more than 2,500 homes, businesses, government offices, and facilities such as schools and hospitals. Upon completion, the project was handed over to the national utility DABS.

Following the success story of the Bamyan solar project, governments of Afghanistan in the 2001-2021 period pursued similar projects. Several projects were designed such that donors provided the finances, contracting companies bade to implement the project, and the completed systems to be handed over to the national utility DABS. Three such solar projects were designed in Kandahar, all exceeding 10 MW. One was a 10 MW on-grid solar PV partially funded by USAID handled by an Indian-Afghan joint venture (GIZ, 2017). The other two solar projects, each 15 MW also in Kandahar, were awarded to Zularistan a company based in Afghanistan, and 77 Construction Company of Turkey (SIGAR, 2021b). These projects received external financial support at some stage either from Asian Development Bank, USAID, or other donors. However, these were or will be completed following arrangements that DABS would buy the produced electricity bound by long-term power purchase agreements.

Meisen and Azizy (2008) investigated the uses of solar energy, as early as 2005, in remote villages of Afghanistan's Wardak province for drying fresh fruits – products which are essential for farmers in a primarily agricultural economy. They found solar technologies, which in 2023 have technically and economically improved significantly, contributed to income creation in the village, reduction in migration from villages, and easing of women's work. By 2032, it is expected that1,500 MW of solar PV at grid-connected and off-grid scales will be developed (GIZ, 2017). Figure 4 illustrates the potential of solar energy with details on each province of Afghanistan.

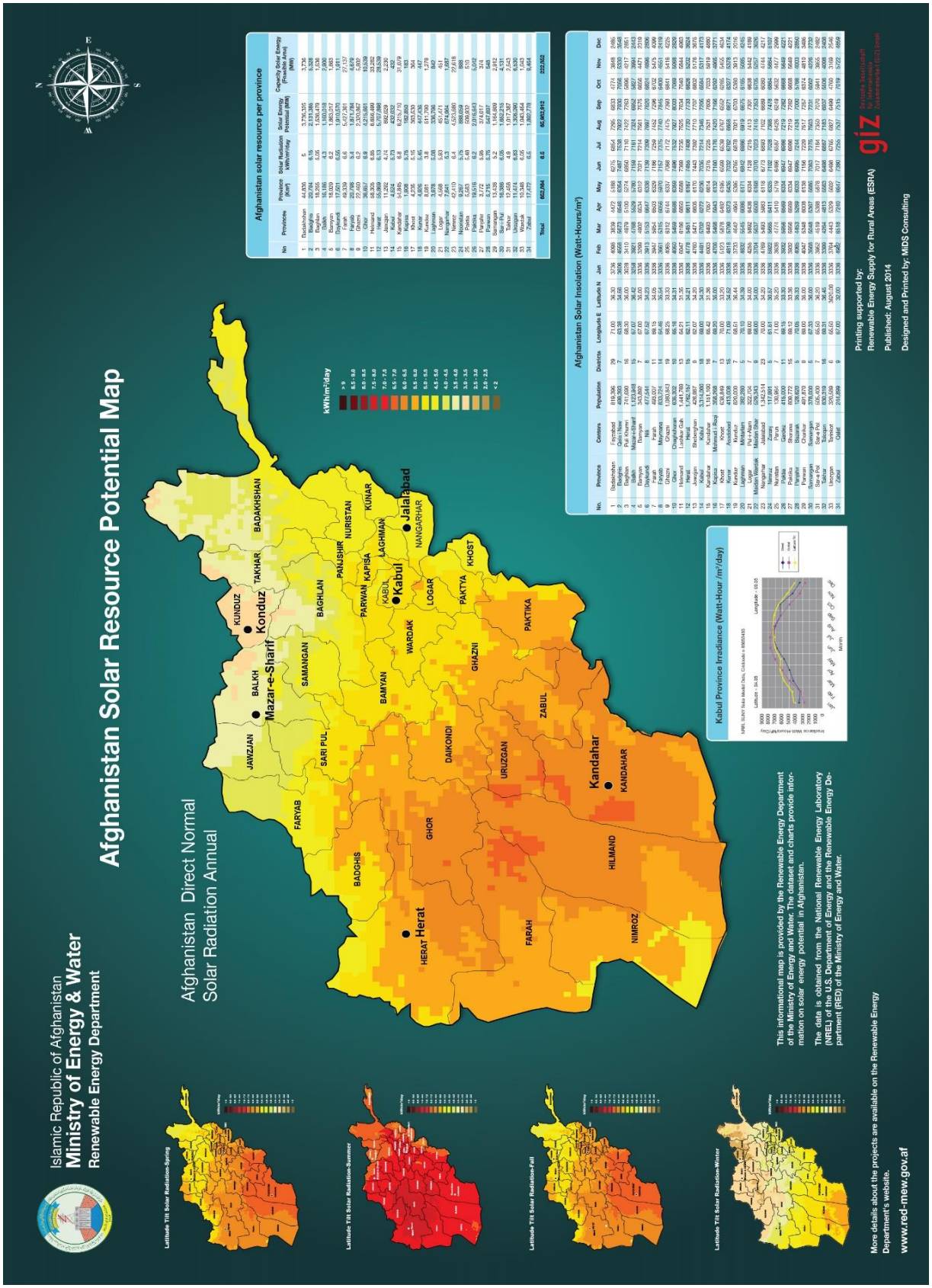

Figure 4. Afghanistan solar resource potential map. **Source:** MEW as indicated in

Wind:

Wind is another source of energy with significant potential in particularly western provinces of Afghanistan. With at least 36,000 km^2 of windy land and 5 MW/km^2 generation capacity, the country's Renewable Energy Policy claims that up to 67,000 MW (67 GW) could be produced from wind (Ministry of Energy and Water, 2015). There are 16 wind monitoring stations in different parts of the country (ADB, 2017a). Farah, Herat, and Nimruz, all in the Western part of the country, offer the best sites for wind projects (ADB, 2017a). However, Afghanistan has not taken advantage of this potential to meet even a fraction of its electricity needs with wind energy. More details regarding the potential of wind can be found in chapter three. In the following I discuss developments related to wind energy including the completion of Panjshir wind farm – the first wind energy project in Afghanistan.

Compared to hydro and solar, wind has received much lesser attention from both the government of Afghanistan and development agencies. According to DABS, the installed capacity of wind energy operating in Herat and Parwan provinces is less than 1 MW (ADB, 2019). The capacity of these wind turbine systems is in most cases less than 500 kW. Afghanistan's Renewable Energy Roadmap proposes developing wind energy in configurations such as wind farms, wind mechanical pumps for irrigation purposes, and small mechanical wind turbines (ADB, 2017a). The roadmap recommends the development of 600 MW of wind at utility scale.

Turning to wind energy development projects in the country, the first wind turbine system was installed in Panjshir province in 2008. In 2007, a New Zealand company called Empower Consultants Ltd. and the Panjshir Provincial Reconstruction Team started work on this project and it was completed in late 2008. There are ten turbines in the system which put together account for the 100-kW installed capacity. The beneficiaries of this project are mainly local government offices in the valley. The Panjshir wind far has served as a pilot project for future wind energy development in the country.

Almost a decade later, a 2 MW hybrid solar and wind project was completed in Herat. The first of its kind at this scale, the 2 MW hybrid system combines 1.7 MW of solar and 300 kW of wind. The system is connected to the grid. This project was funded by Japan International Cooperation Agency (JICA) and implemented by the company QUATRO (DABS, 2020). It was inaugurated in 2017 after which hundreds of families and businesses benefit from the electricity generated. The system is located in the Guzara district of Herat, close to Herat Industrial Park. Similarly, prior to the collapse of the previous government, progress was made to complete a 25 MW wind farm in Herat province. Some documents were signed, and the project was awarded to 77 Construction USA Corp. The fall of the government in August 2021 has stalled this and similar projects under construction. Figure 5 shows the potential of wind energy in Afghanistan including information on each province and wind speed variations in select locations across the country.

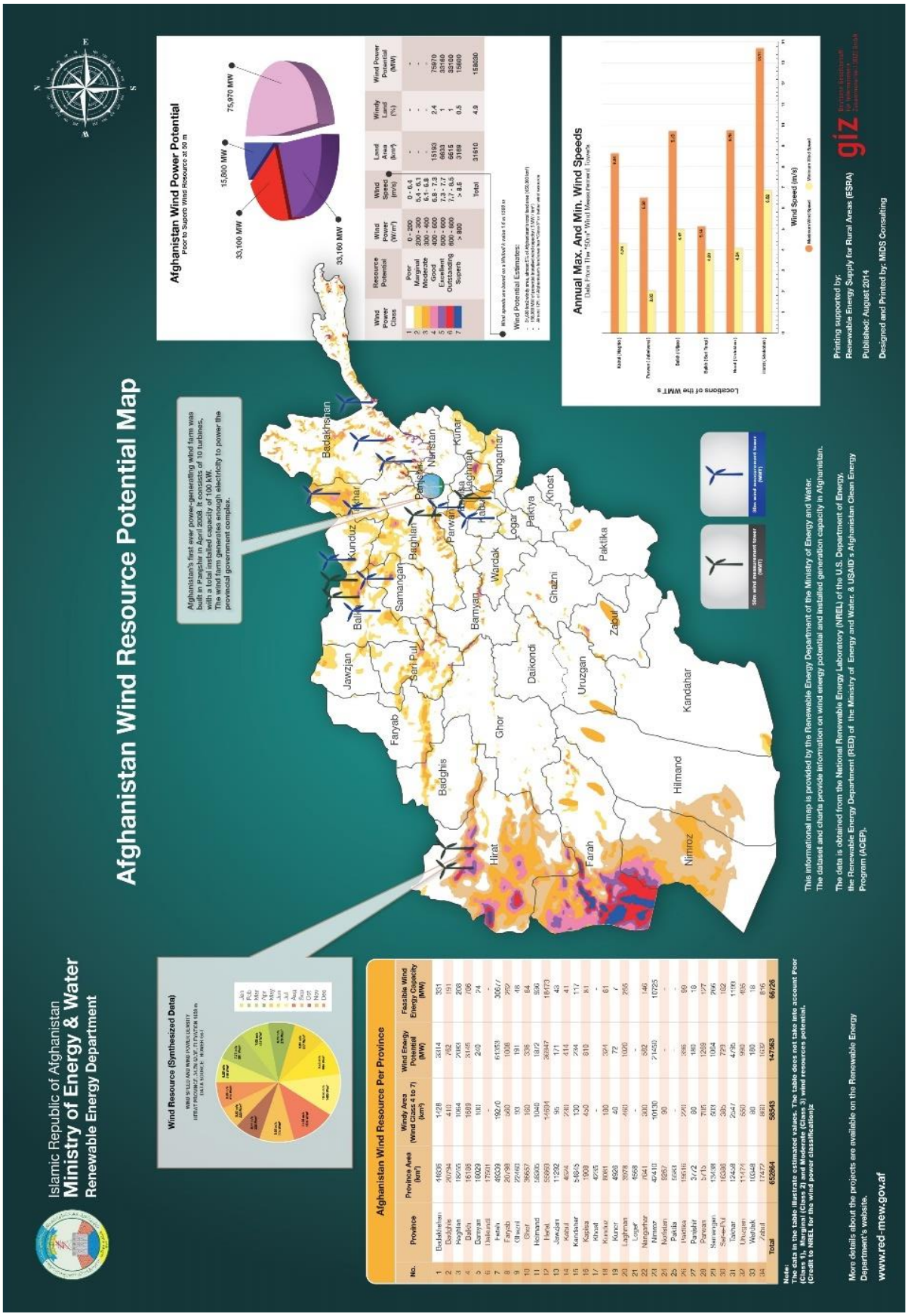

Figure 5. Afghanistan wind resource potential map. **Source:** MEW as indicated in the figure.

Biomass:

Biomass is one of the main sources of energy in Afghanistan. It is traditionally used for cooking and heating in nearly all households, particularly in rural areas. Specific sources are in the form of fuelwood, charcoal, crop residues, and animal manure. Since almost two-thirds of the population in the country engage in agricultural activities and animal husbandry producing regular feedstock, there is potential to supply a percentage of the country's energy needs from biomass. According to the Renewable Energy Policy of Afghanistan, around 4,000 MW (4 GW) can be produced from biomass (Ministry of Energy and Water, 2015). More details regarding the potential can be found in chapter three. Here I briefly review the Renewable Energy Roadmap on biomass energy for the country.

Afghanistan Renewable Energy Roadmap recommends the following biomass technologies with varying scales: at utility scale, it recommends power generation from agricultural residues, methanation of organic manure or agricultural waste, and bio-methanation of municipal solid waste (ADB, 2017a). At mini-grid scale, it suggests combing biomass with diesel in hybrid mode arrangements. Lastly, as standalone options it recommends biogas for space heating and improved cook stoves for cooking. So far, only a few biogas plants have been installed for households in eastern provinces (ADB, 2017a). These were delivered with the assistance of Bremen Overseas Research and Development Association (BORDA), the Ministry of Rural Rehabilitation and Development (MRRD), and some NGOs. Figure 6 presents biomass resource potential in Afghanistan distinguishing based on the potential of various sources including crop residue, animal manure, and municipal solid waste.

In addition to hydro, solar, wind, and biomass, there are some active geothermal systems along the main axis of Hindu Kush mountains which can be utilized to generate electricity or heat. Traditionally, geothermal wells have been used for therapeutic purposes and medical bathing. Production of energy from this resource has not happened so far. Pointing to the available potential of renewable energy sources, various government policy documents argue that Afghanistan can not only meet its own energy needs and minimize imports, but it can also export energy to countries such as Pakistan.

The Afghanistan Renewable Energy Policy, prepared during the 2001-2021 governments before the return of Taliban, set an ambitious goal of deploying 95% renewables in the projected total energy mix of 2032 which was calculated at 5,000 – 6,000 MW by the Power Sector Master Plan (Ministry of Energy and Water, 2015). It envisages a two-phase development path where in phase one (2015-2020) the government teams up with the private sector in Public-Private-Partnerships (PPP) models and in phase two (2021-2032) a full commercialization state is reached in which the private sector takes the lead.

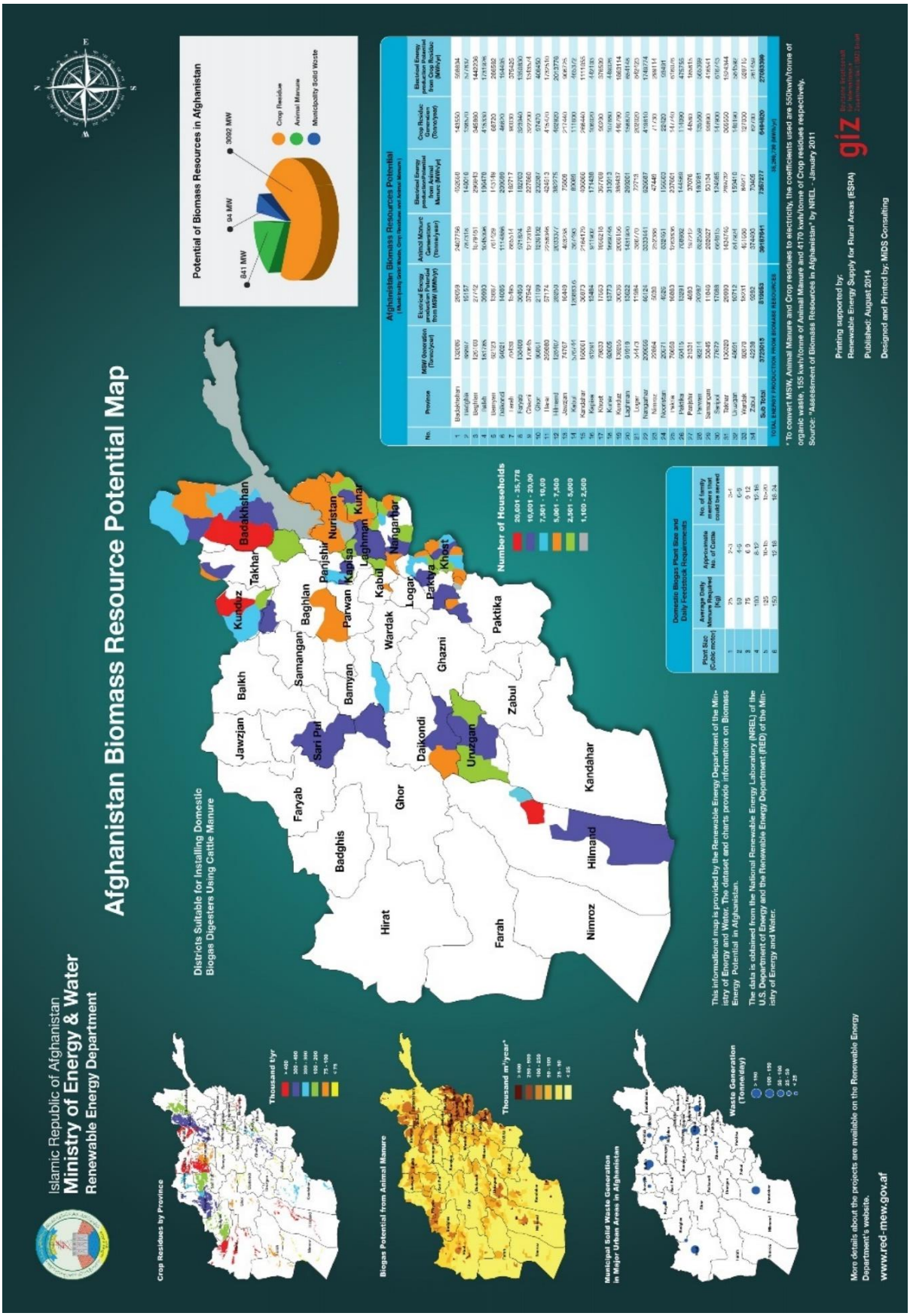

Figure 6. Afghanistan biomass resource potential map. **Source:** MEW as indicated in the figure.

2.4. Developments in Afghanistan's Energy Sector between 2001 and 2021

This subsection examines the 2001-2021 period in terms of energy system development reviewing the energy situation and progress, key actors and institutions, and barriers impeding development projects in Afghanistan's energy sector.

2.4.1. The Energy Situation

Grid-based electricity access and per capita electricity consumption in Afghanistan are among the lowest in the world. Roughly 70% of the population do not have access to the grid, of which most reside in rural areas (NSIA, 2021). While a governmental survey claims nearly 98% access to electricity rate, ADB which is a key player in the energy sector of Afghanistan notes "access to electricity increased from 30% to 45%" between 2015 and 2018 without mentioning if this is grid-connected (ADB, 2020, p. 3; NSIA, 2021). Per capita electricity consumption rose from 100 kWh in 2015 to 265 kWh in 2018 (ADB, 2020). This compares poorly against 694 kWh of South Asia average or 591 kWh of fragile and conflict affected situations or more so the 3,105 kWh of world-wide average (World Bank, n.d.).

The country scored 44.2 at securing electricity connection for a new business in the World Bank's Doing Business 2020 report, ranking 173rd in the world (World Bank, 2020). In the reliability of supply and transparency of tariffs index, it scored 0 out of a possible 8. The report adds that it costs businesses a staggering 2,546.4 % of national per capita income (i.e., between 13,000 and 14,000 USD) to connect to the grid. Those connected to the grid, largely urban population, experience frequent and prolonged periods of power outages and load shedding. In this context, with the support of international development organizations, the country entered into agreements with neighbouring countries to import electricity.

Domestic generation: The domestic installed capacity as of late 2020 was approximately 699 MW. In most reports about the energy sector of the country a figure of in the range of 520 -550 MW is reported. However, a SIGAR report in July 2021one month before the collapse of the Western-backed government notes that inauguration of three power plants has brought the total installed capacity to 699 MW (SIGAR, 2021c). The report, based on information from the Afghanistan Inter-Ministerial Commission for Energy (ICE), details the three power plants as follows: "the first phase of Bayat-1 Thermal Plant (41 MW) that came online in November 2019, the USAID-funded Kandahar Solar PV Plant (10 MW) that came online in October 2019, and the Salma hydroelectric dam (25 MW) became fully operational in early October 2020"(SIGAR, 2021c, p. 200). It must be noted some power plants do not operate at full capacity implying the real energy generation is lower than the installed capacity.

Different sources of energy contribute to the total installed capacity. Large hydropower plants represent around 280 MW, thermal plants 353 MW, and renewable energy 65 MW (SIGAR, 2021c). All the large hydro plants were built in twentieth century except the Salma Dam. Most of them, however, needed rehabilitation and additional works to produce electricity. The 280 MW produced in thermal plants is derived from imported diesel and furnace oil at a generation cost four to five times that of imported electricity (ADB, 2017b). And the share of renewable energy is made up of more than 5,000 small scale solar, micro hydro, and wind projects (World Bank, 2018). However, the domestic supply cannot meet the energy demand. According to ADB (2020), the total demand was 2500 MW and forecasts estimate it to grow to 3,500 MW by 2032. Much of this gap between demand and supply is met by electricity imports.

Imports: Afghanistan continues to, also under the Taliban regime, import most of its electricity from Central Asian republics to its north and Iran to its west (UNDP, 2022). For much of the 20 years between 2001 and 2021, the country imported significant amounts of its total electricity demand from Uzbekistan, Turkmenistan, Tajikistan and Iran. According to UNDP's Socio-Economic Outlook 2021-22 released in January 2022, Afghanistan imported 80% of its electricity demand. In fact, with slight variations, this was a steady trend in late 2000s and much of the 2010s decades (Fichtner, 2013). The cost of imported electricity, however, have increased rapidly from 16 million USD in 2007 to nearly 270 million USD in 2019 due to changes in price and amounts of imports (Integrity Watch Afghanistan, 2020a). For example, an ADB project document highlights an increase in imports from 3,800 gigawatt-hours in 2015 to 5,000 gigawatt-hours in 2018 (ADB, 2020).

To meet the shortfall, Afghanistan has imported roughly between 700 MW and 1000 MW of electricity. The largest exporters are Uzbekistan (34%), Tajikistan (31%), Iran (20%), and Turkmenistan (15%) (ADB, 2020). Since Tajikistan exports primarily its surplus hydro power in Spring and Summer (from April to October), its export levels to Afghanistan are not stable. Imports from Tajikistan, Uzbekistan, and Turkmenistan supply the Norther-East Power System (NEPS) and Iran and Turkmenistan supply Herat and Nimroz grids. The power purchase agreements (PPA) signed with the neighbouring countries have been extended multiple times over the past 20 years; in some cases they run for several years, while in others they need extension or annual amendments (Fichtner, 2013). The government of Afghanistan, represented by DABS, paid around 240-280 million USD annually for electricity imports in much of the 2010s decade (Jahanmal, 2020).

Grid structure, transmission, and distribution: Afghanistan has not developed a unified national grid. The electricity supply structure consists of a series of islands fed by asynchronous sources largely coming from Central Asian republics and Iran and in few cases domestic sources. While the number of these 'islands' have decreased over the years as the

government and donors invested large sums to connect them (Aminjonov, 2016), the largest of these islands remain unconnected. The USAID and United States Department of Defense have invested heavily "to connect the country's Northeast Power System (NEPS) with its south-eastern counterpart, the Southeast Power System (SEPS)." (SIGAR, 2021c, p. 137)

NEPS is made up of 17 small islands or load centres including Kabul, Mazar-e-Sharif, and Jalalabad with Kabul being the major load centre (Aminjonov, 2016). Imports at varying voltage levels of 220 kV, 110 kV, and 35 kV from mainly Uzbekistan and Tajikistan feed NEPS (Aminjonov, 2016). SEPS, on the other hand, provides electricity to two major demand centres of Kandahar and Helmand. The grid is served by domestically produced electricity at the Kajaki hydropower plant at 110 kV voltage level. Linking these grids, delayed by several years, was expected to be completed by an approximately 500-kilometer transmission line.

The other major so called 'islands' are Herat and some provinces in mostly the north of the country. In case of Herat, the system is supplied by imports from Islamic Republic of Iran and Turkmenistan at 132 kV and 110 kV. And the Northern parts of the country including Faryab, JawzJan, Sar-e-Pul, and Andkhoy are fed by electricity coming from Turkmenistan at 110 kV (World Bank, 2019). 20 provinces of 34, including Shindand district of Herat province and Farah district of Farah province in Western Afghanistan, are not connected to the grid (ADB, 2020). Figure 7 illustrates the islanded structure of the country's energy system, supply source, and the transmission lines.

The fragmented configuration of Afghanistan's power sector presents challenges to sector planning, one of which is synchronization. On the one hand, power systems of the exporting countries to Afghanistan are not synchronized (except Turkmenistan and Iran which match). The imports from the Central Asian republics and Iran come at different speeds and frequencies. On the other hand, the speeds and frequencies of domestically generated power do not match with imports. A World Bank report provides the following details regarding this particular challenge:

> A further challenge related to Afghanistan's energy sector is its transmission and distribution system which is small, fragmented, and underdeveloped. In total, there are 790 km of 220 kV, 140 km of 132 kV, 1,331 km of 110-kV lines, 1,895 km lines at 15 kV to 44-kV as well as about approximately a further 6,000 km of lower voltage lines installed. Of this, about 2,170 km of transmission line and about 3,700 km of distribution line are operating. (World Bank, 2019)

As far as ***distribution*** is concerned, the latest national survey released in April 2021 claims 97.7% of the population countrywide have access to electricity, of which 33.5% are connected to the grid and the rest relying predominantly on solar and battery (NSIA, 2021). As per the survey, there is a significant gap between the urban and rural population in terms

of access to electricity: 90.5% in urban areas and 16.1% in rural areas. While for lighting, 97.7% of the energy sources were "clean fuels and technology", for cooking and heating these figures read 31.1% and 6.5% respectively. For heating and cooking, solid fuels (traditional biomass and coal) are the dominant sources of energy both in rural and urban areas. Fuelwood, charcoal, agricultural waste, and animal dung are the most common energy sources. In 2020, 96% of the national population used the mentioned sources for heating and around 70% for cooking, with similar figures in 2016-2017 for heating and 5% improved in terms of cooking.

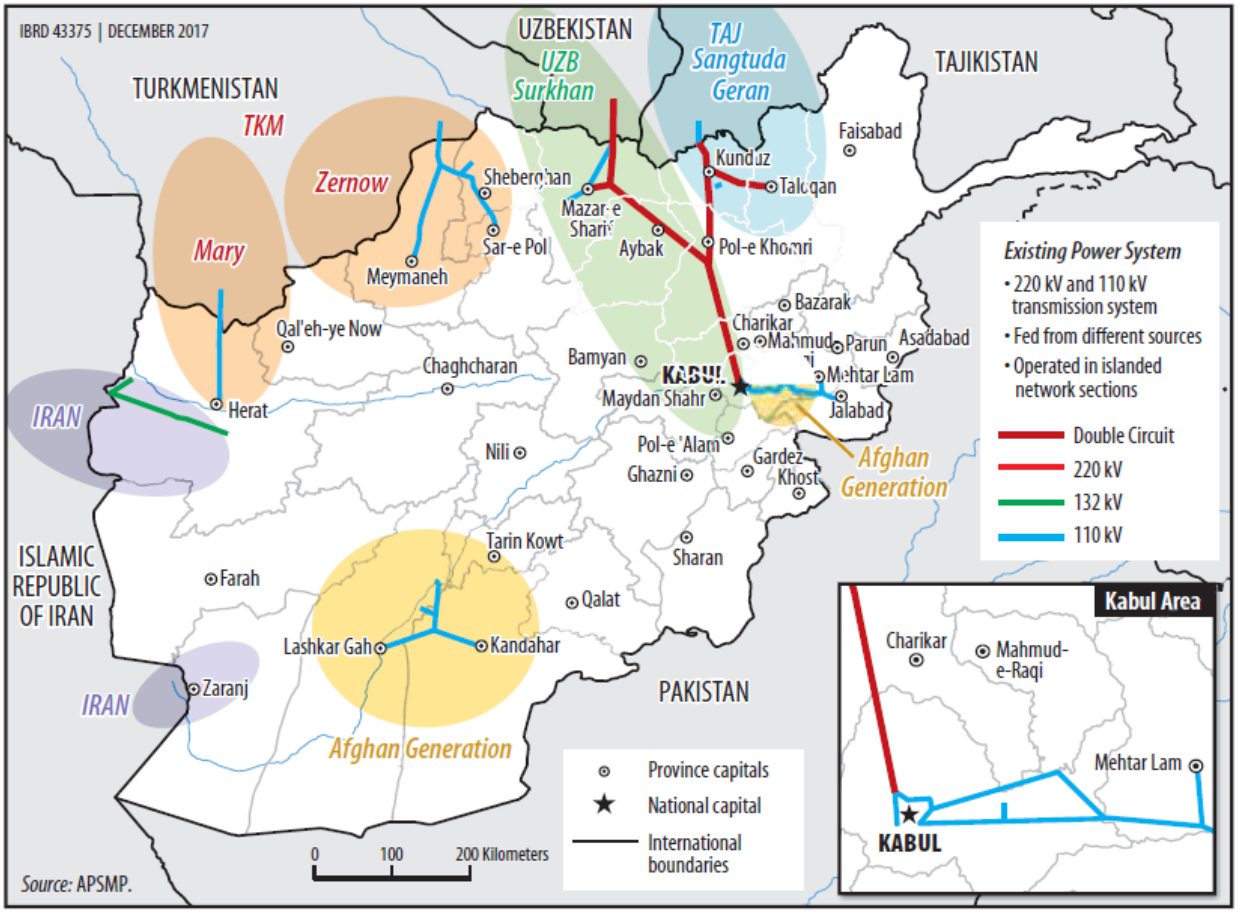

Figure 7. Electricity grids in Afghanistan. **Source**: World Bank (2018) based on Fichtner (2013).

In terms of urban-rural divide regarding solid fuels for cooking and heating, around 85% of the rural population used solid fuels for cooking compared to less than 20% in urban areas. The percentage of urban households using solid fuels for cooking is low because imported liquefied petroleum gas is their primary source in this regard. In the heating sector, nearly than 82% and 97% of urban and rural populations respectively used solid fuels (NSIA, 2021). The previous national survey which was called Afghanistan Living Conditions Survey

published its last report in 2018 studying the period 2016-2017. This was discontinued and a new survey titled "Income and Expenditure & Labor Force: surveys Report" replaced it; its only report so far has studied the year 2020.

Despite significant progress in minimizing power system losses, the percentage of losses due to technical and commercial reasons is the highest in the region (ADB, 2020). While the losses were reported to be at a staggering 70% in 2002, it is now half of that at around 34-35%. Some of the reasons for this are overloads, "outdated and poorly maintained transmission and distribution networks, electricity theft, and improper metering", cases of unmetered supply, and problems in billing and revenue collection (Integrity Watch Afghanistan, 2020a, p. 12). Consequently, the national utility DABS has relied heavily on government and donors support even after it was incorporated in 2008 so it could perform on cost-recovery basis.

Policy and Regulatory Framework: International development organizations have helped develop a policy and regulatory framework for the energy sector of Afghanistan. During their 20 years of engagement, several important policy documents of the sector have been prepared. Similarly, essentially every organization involved in the energy sector, particularly governmental agencies, received substantial assistance in terms of policy development, capacity building, financial aid, and technical assistance in operation and maintenance, project implementation, and monitoring and evaluation. Non-governmental organizations (NGOs) and bodies promoting private sector's involvement in energy projects such as the Afghanistan Renewable Energy Union (AREU) also benefited significantly from assistance provided by international organizations. As a result of substantial international support, the contours of a regulatory framework for the sector were drawn and important pieces of it were put in place.

Energy sector strategy was one of the first policy documents in the sector, developed as part of the Afghanistan National Development Strategy (ANDS) in 2007. To study and plan the power sector, a comprehensive Power Sector Master Plan (PSMP) was prepared in 2013 by Fichtner, a German company commissioned by Asian Development Bank (Fichtner, 2013). Furthermore, in 2015 GIZ assisted the Ministry of Energy and Water in preparing its Renewable Energy Policy (Ministry of Energy and Water, 2015). In 2016 the Power Services Regulation Act was adopted (ADB, 2020). This legal document describes the sector structure, differentiates the role of different actors, and makes the rules governing the participants and ownership clear (ADB, 2019). In 2017, ADB contracted an Indian consultancy firm, IT Power Consulting Private Limited (ITP), to develop a Renewable Energy Roadmap for Afghanistan (RER2032) (ADB, 2017a).

Other developments concerning regulatory framework include the adoption of a Public–Private Partnership Law (PPP Law) in 2016 (or according to other sources 2017) (Integrity

Watch Afghanistan, 2020b), Afghanistan Rural Renewable Energy Strategy in 2017, a mining sector roadmap and a gas development master plan[6] in 2017 (ADB, 2020), Minerals Law, Hydrocarbons Law, and Hydrocarbons Regulations in 2018, and State-owned Corporations Law also in 2018. In addition, a Five-Year Power Sector Plan (2018– 2023) was prepared in 2018 to plan energy projects and international cooperation in this time period (ADB, 2019). For a list of institutional and organizational changes induced by international development organizations in the 2001-2021 period, see Appendix 4 which accompanies research carried out for chapter four.

2.4.2. Actors and Institutions in Energy Sector

In the 2001-2021 period, there was a diversity of actors in the energy sector of Afghanistan. The most important actor group was international development organizations and bilateral donors. Meanwhile, several governmental institutions including a national utility continue to manage regulation, planning, project implementation, and energy generation, transmission, and distribution. Private sector was and remains reluctant to enter the sector for the reasons mentioned so far. Nevertheless, a few organizations and companies sprung up and engaged in investment, networking, and representing the private sector. Research and development (R&D) played and continue to play a negligible role. Kabul University is one of the few organizations producing knowledge and contributing otherwise to the sector. Similar to private sector, the presence and role of civil society, non-governmental and non-profit organizations were and continue to be very limited. Chapter three discusses the role of some of the main actors. Here, I attempt to paint a general picture of the participating actors and institutions in the energy sector and provide details in addition to what is discussed in chapter three.

Governmental Agencies*:* The main governmental actors in the energy sector are five key ministries and the national utility DABS. The five key ministries are Ministry of Energy and Water (MEW), Ministry of Rural Rehabilitation and Development (MRRD), Ministry of Mines and Petroleum (MoMP), Ministry of Economy (MoEc), and Ministry of Finance (MoF). Ministry of Energy and Water (MEW) is the nodal governmental agency involved in generation, transmission, distribution and regulation. It must be noted that this ministry was split into two separate independent directorates in 2020 by a presidential decree during the administration of President Ashraf Ghani. After overthrowing Ashraf Ghani's government, the Taliban have reinstated the ministry.

[6] ADB designed a project in 2015 to develop a gas sector master plan similar to the Power Sector Master Plan they prepared in 2013. However, the gas sector master plan has not been made available to the public and efforts to access this document was unsuccessful.

Leaving aside the prevailing ambiguity and overlaps, the role of the different governmental organizations in the energy sector can be broadly differentiated as follows (Ershad, 2017; GIZ, 2017): MEW is the lead organization, in charge of overall planning for and development of the sector (both in rural and urban areas). A Renewable Energy Department (RED) was established at MEW in 2009 which focuses on all aspects of renewable energy projects. MRRD works primarily in districts and villages in rural areas and on small-scale energy projects. For larger projects in rural areas, MRRD must coordinate with MEW or DABS. The ministry also coordinated and, in some cases, administered energy projects by aid organizations in rural areas. MRRD, similar to MEW, has directorate for renewable energy in rural areas called the Rural Energy and Enterprise Development (REED) Directorate. The national utility, DABS, is responsible for operation and maintenance of power plants and for generation, transmission, and distribution. Even though it was corporatized to avoid losses and operate on a cost-recovery basis, it remains completely state-owned. MoMP oversees projects involving coal, gas, or oil. MoEc and MoF do not engage in project implementation but are involved in planning and coordination as well as budget in the case of the latter.

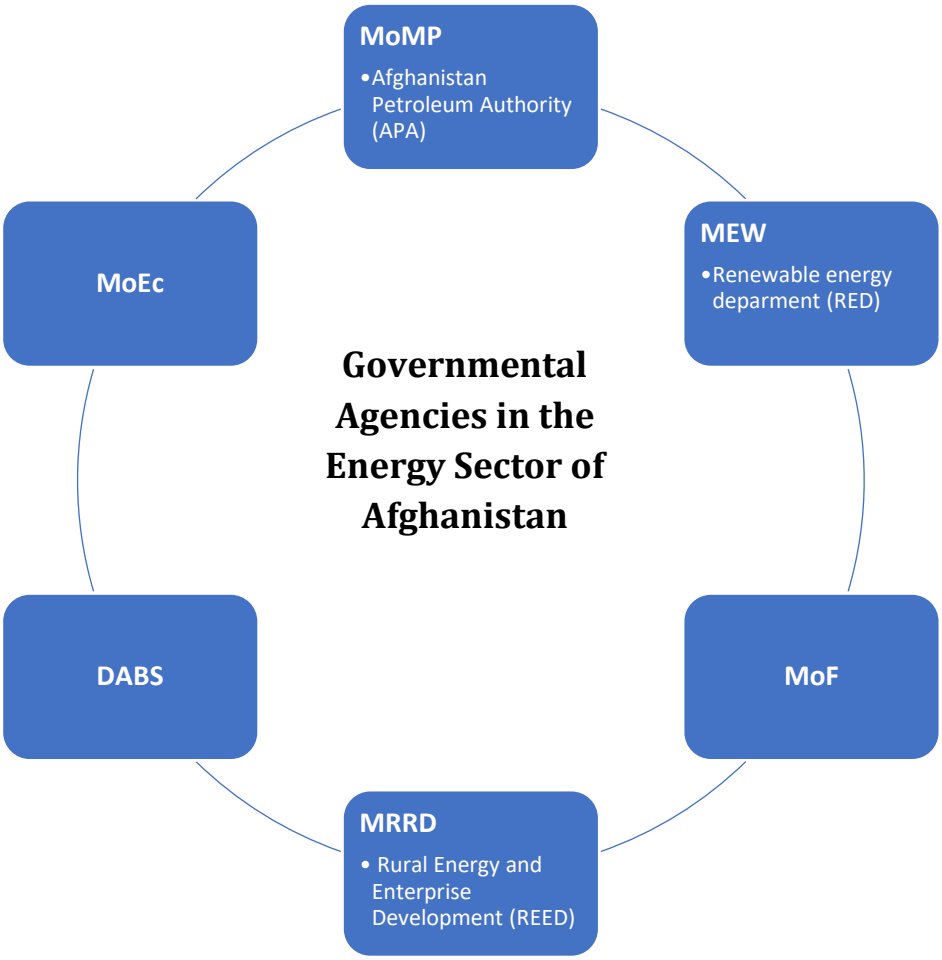

Figure 8. Governmental agencies in the energy sector of Afghanistan. **Source**: illustration by author.

International Development Organizations and bilateral donors: Many international development organizations and bilateral donors implemented energy projects and contributed to other areas in the energy sector of Afghanistan between 2001 and 2021. The major international actors are the Asian Development Bank (ADB), the World Bank, the United States Agency for International Development (USAID), German development agencies (Gesellschaft für Internationale Zusammenarbeit (GIZ) and the German Development Bank or Kreditanstalt für Wiederaufbau (KfW)), United Nations Development Programme (UNDP) the Japan International Cooperation Agency (JICA), and the government of India. Chapter three presents details on the role of each major international actor. The following organizations also contributed to the energy sector development, albeit at a smaller scale: The United Nations Environment Programme (UNEP), Canadian International Development Agency (CIDA), Bremen Overseas Research and Development Association (BORDA), Groupe Energies Renouvelables et Environnement [Group for Renewable Energy and Environment] (GERES)-Afghanistan, SlovakAid, etc. Figure 9 provides an illustration of the major international development organizations in Afghanistan's energy sector.

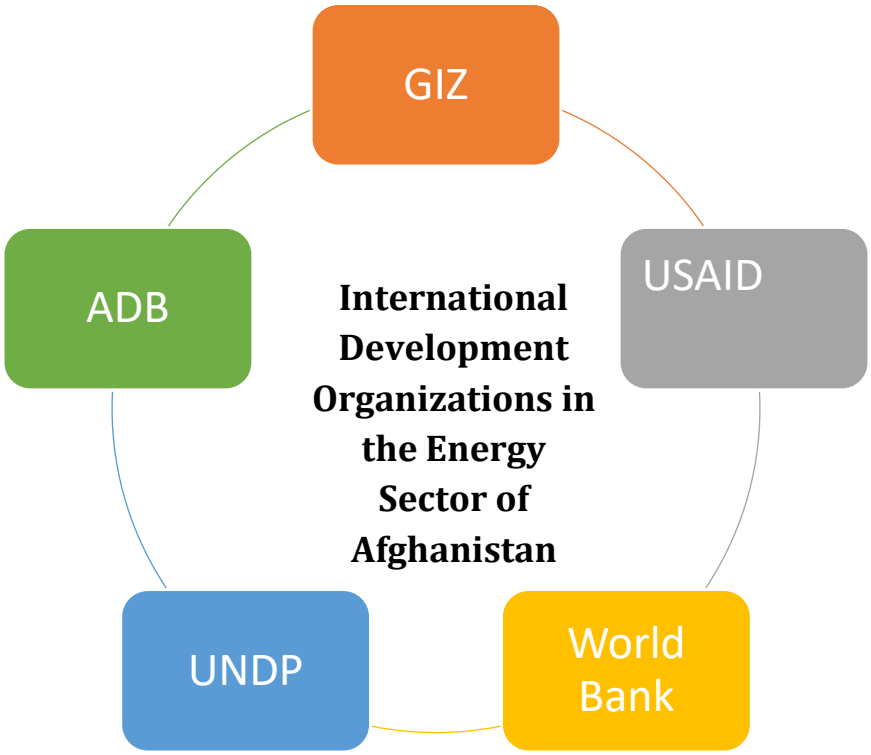

Figure 9. International Development Organizations in the Energy Sector of Afghanistan. **Source**: illustration by author.

The private sector: As it has become clear so far, private sector by and large did not take interest in investing in the energy sector of Afghanistan due to primarily persistent unstable security situation, weak and unprepared regulatory framework, absence of financial

support, prevalence of corruption, and other uncertainties. This is particularly discouraging as the total investment needed to realize the objectives of the National Energy Supply Program covering up to 2032 exceeds 10 billion USD (GIRoA, 2013). An assessment by Integrity Watch Afghanistan in 2020 wrote:

> The private sector could not invest in the energy sector of Afghanistan until recently. In 2011 first efforts for private sector involvement in the Sheberghan IPP were made outside of the regulatory framework. In 2011 and 2012 private companies started to approach MEW directly asking for a generation license. MEW could not issue licenses because the Electricity Law was not approved, and there was no legal basis for MEW to proceed without a regulatory framework. A number of generation licenses were issued on an exceptional basis when MEW got instructions from a cabinet meeting decision in 2014. However, the ERA [Electricity Regulatory Authority], which was stipulated in the Electricity Law, has still not been established by MEW, and the private sector has not been able to make a significant contribution to the sector. (Integrity Watch Afghanistan, 2020b, p. 9)

The few private sector actors engaged in energy projects include an umbrella organization connecting private companies, a few large international organizations, and some nascent domestic small businesses largely active in only the solar industry. The umbrella organization, Afghanistan Renewable Energy Union (AREU), was established in 2013. The organization received substantial technical and financial support from USAID initially and GIZ's (Institutional Development for Energy in Afghanistan) IDEA project over the course of its operations until 2021. AREU started with 12 private companies in 2013, but by 2021 there was a tenfold increase in the number of its members. The union assisted investors, both international and local, in preparing checklists for necessary permits such as description of the procedure, estimate time, and associated costs (World Bank, 2018).

Even though the number of small domestic businesses investing in energy grew and few large international and domestic companies signed agreements with the government of Afghanistan to produce energy, their contribution both in terms of investment and outcome was dwarfed by that of aid organizations. As per the directory of the AREU (http://directory.areu.af/) the following are some of the smaller businesses active in renewable energy: Qaderdan Rural Technology and Development Workshop, Zularistan LTD, Tavan Sepehr Solar, Quattro Construction, PARSA, Omid Khurshid Noor Ltd, and Dorokhshan Solar. The two larger domestic companies involved in energy projects were (1) Ghazanfar Group who worked on the Mazar 50 MW gas to power project in cooperation with International Finance Corporation (IFC) and (2) Bayat Power who worked on Sheberghan 40 MW gas to power project (Integrity Watch Afghanistan, 2020b). International companies who invested in the energy sector of Afghanistan were, among others, Dynasty Oil & Gas

Private Limited (India) and 77 Construction Company (Turkey) They invested in Kandahar solar farm and Kajaki II 100 MW Hydropower Plant respectively. Most of these investments were carried out following long-term power purchase agreements with the government of Afghanistan requiring the investor, in most cases as an Independent Power Producer (IPP), to build, own, operate, and maintain and at a certain time transfer the project to DABS.

Other actors: other actors including civil society and academic institutions either did not grow sufficiently or did not prioritize engaging in energy issues as there were consistently more pressing matters. Civil society remained weak and aid-dependent, similar to other sectors (Clarke, 2020). A rare engagement of civil society or grassroot movement groups with energy issues was the large protest in 2016 against the rerouting of an electricity transmission line. Religious centres and mosques, encouraged by the government and development organizations, occasionally disseminated information on renewable energy and energy efficiency. In academic sphere, one of the few institutions actively contributing to the sector was Kabul University. In 2011, a USAID project established the Kabul University Renewable Energy Laboratory; in 2013, an Energy Engineering Department kicked off at the University; and a Training Center for Renewable Energy in Afghanistan (TCRENAF) was created at the University in 2018. Kabul University, in collaboration with the Slovak Technical University in Bratislava, organized The Afghan Conference on Solar Technologies in November 2020.

Overall, throughout the 20-year period ambiguity regarding the role of the different governmental agencies and the presence of several international development organizations made coordination difficult. In 2006 a coordination body, hosted at MEW for the best part of its existence, called the Inter-Ministerial Commission for Energy (ICE) was created and supported mainly by ADB (ADB, n.d.). It was designed to support collaboration among governmental agencies, development organizations, and the private sector in terms of "(i) sector planning and harmonization to avoid overlapping, (ii) sequencing of investments, and (iii) analytical work related to Afghanistan's energy sector." (ADB, n.d., p. 3) Later in 2015, a similar structure to coordinate renewable energy projects was created under the tile of Renewable Energy Coordination Committee (RECC) (World Bank, 2018).

However, establishment of bodies such as ICE did not help as off-budget projects by development partners bypassing the government budget (and planning) continued to be implemented and the overlapping and unclear mandates of the governmental agencies were not resolved (Integrity Watch Afghanistan, 2020b, 2020a; World Bank, 2018). Furthermore, the absence of a regulatory body in much of the 2001-2021 period was strongly felt adding to uncertainty and deterring investment. A World Bank study assessing the renewable energy sector of Afghanistan summarized this challenge as follows:

> "Planning and management of RE development is spread across a number of agencies, all of which are in need of institutional strengthening., and lack of coordination among them can lead to long lead times for projects. This ad-hoc approach also spills into lack of donor coordination, which has resulted in concurrent, sometimes overlapping work being done with supporting development partners. Shortcomings in the institutional framework also impact potential investors since there is no clear one-stop shop for RE development. There are also many accompanying regulations and laws will need to be passed to ensure its effective implementation. Issues such as the nature and structure of the regulatory authority, tariff setting mechanisms, and the rights and obligations of the GoA and DABS with respect to private sector developers all need to be defined and codified." (World Bank, 2018, p. 6)

2.4.3. Barriers to Energy Sector Development

Various barriers and challenges have slowed down progress in the energy sector. One of the major obstacles delaying and, in some cases, blocking project implementation in the sector has been the persistent unstable security situation throughout 2001-2021 period. This has discouraged donors, deterred private investment, and undermined government's efforts. In the SIGAR reports which contain information on the USAID energy projects and the energy sector in general, one theme that consistently appears over the past years in nearly all reports reviewed is attacks on energy projects by the then armed opposition group, Taliban, who are now ruling the country (SIGAR, 2021c). Security threats to energy projects and infrastructure have come in the form of large-scale attacks, kidnapping of workers, death threats, etc. The national utility for example reported 35 cases of electricity pylons being damaged or destroyed in explosions in just six months prior to July 2021 (SIGAR, 2021c).

In addition to security, weak institutional and human capacity also holds back progress. Years of war have driven out skilled workers, deprived a huge portion of the population to learn to read or write, and crippled institutions. The national utility, for example, experienced serious challenges in operation and maintenance due to inadequate technical expertise (Integrity Watch Afghanistan, 2020b). Despite numerous capacity building programmes by international aid agencies in all major energy-related governmental offices including the MEW, DABS, MRRD, and MoMP, low capacity of these institutions and their employees is often cited as a challenge in various reports (ADB, 2020; GIZ, 2017; Integrity Watch Afghanistan, 2020b).

A further major challenge one regularly comes across in reports on Afghanistan's energy sector is gaps in the sector's legal and regulatory framework. First, there is an ambiguity with regard to the role of governmental institutions. Several of these institutions including MEW, DABs, and MRRD plan and manage energy projects. Importantly, a functioning energy

regulatory authority was absent until the final years of the 2001-2021 governments. Second, some laws, regulations, and policies which were expected to be prepared years ago are still missing (ADB, 2019). Third, there is a lack of coordination among participating institutions. The ambiguity and, in certain instances, overlaps and contradictions in mandates lead to long lead times for projects, affect coordination with development partners, and put off potential investors from private sector (ADB, 2019; Integrity Watch Afghanistan, 2020b).

Not only is coordination between the government and donors weak, but it is also the case among donors leading to duplications and fragmentation of efforts. In interviews conducted for this dissertation, government officials complained that development donors did not align their assistance with the policies and programmes of the government. There is also dissatisfaction with the prevalence and significant amount of off-budget development aid which are projects that bypass government's budget. In some cases, officials and reports accuse the donors of following their own agenda irrespective of the needs in the country (Integrity Watch Afghanistan, 2020b). Since dozens of aid and organizations representing in many cases different countries were active in the energy sector of Afghanistan and that too implemented off-budget projects, effective coordination and preventing duplications proved challenging.

A further barrier is the difficulty in accessing finance. So far, projects implemented in the energy sector have been financed by international development organizations such as USAID, GIZ, World Bank, and ADB or in few instances the government of Afghanistan. In absence of banks or formal financial institutions that offer financing, private sector players are unable to initiate projects (ADB, 2019). Even in public-private partnership arrangements in which the government carried the bulk of financial responsibility, interest rates of 15% for loans were too high for private investors (GIZ, 2017). Lack of private insurance and guarantees against commercial risks further deter private investment (ADB, 2019).

Rampant corruption was prevalent in both governmental institutions and donor projects which severely undermined progress (Integrity Watch Afghanistan, 2020b). It started from bidding and contract award processes and spread to project implementation and further to billing, meter installation, meter reading, and distribution network extension (Integrity Watch Afghanistan, 2020b). SIGAR reports cited throughout this dissertation further attest to the prevalence of corruption.

Other challenges include wide disparities in terms of energy access between urban rural populations and uneven distribution. Uneven and discriminatory distribution based on the ethnicity of populations in provinces have previously resulted in catastrophic consequences. For instance, a peaceful protest in Kabul demanding electricity for the central province of Bamyan predominantly populated by Hazara ethnic group was the target of a large bomb explosion killing and injuring hundreds (Mashal and Nader, 2016). The protest was

organized to demand reversing a decision by MEW rerouting an electricity transmission line - Turkmenistan-Uzbekistan-Tajikistan-Afghanistan-Pakistan (TUTAP) - contrary to the recommendation by the Power Sector Master Plan (Fichtner, 2013).

Another challenge is that some power plants such as large hydropower plants and the Tarakhil thermal plant do not operate at their full capacity (SIGAR, 2015; World Bank, 2018). The plant has a capacity of over 100 MW, but during between 2010 and 2013 it produced only 2.2% of its capacity (SIGAR, 2015). Technical barriers include lack or poor quality of domestic transmission network, geographic limitations and coverage, and asynchronous systems in operation (ADB, 2019; Aminjonov, 2016). Accessibility and transportation challenges are exacerbated by lack of asphalted roads. Project developers and contractor also experience difficulties in procurement for various reasons. The Coronavirus pandemic (COVID-19) worsened the situation (ADB, 2020).

Some other areas where improvement is needed are as follows: The use of traditional sources of energy such as biomass create environmental and health problems especially in rural areas where access to modern forms of energy is much lower. This puts women and children at greater risk. There is concern about absence of gas and oil production and refining capacity within the country given the substantial fossil fuel reserves in northern provinces. And excessive reliance on imports puts Afghanistan at a weaker position and jeopardizes its energy security. Both electricity and fossil fuels are imported, around 80% of supply in the case of the former and around 97% in the latter (Aminjonov, 2016).

2.5. The Role of Development Aid and International Development Organizations in Afghanistan's Energy Transitions

Having received financial assistance for at least the past two centuries, Afghanistan is no stranger to foreign aid and international development organizations. In the 19th century, Britain provided aid to Afghanistan for more influence against Czarist Russia. In the 20th century, similar rivalry between the US and the Soviet Union during the cold war brought large amounts of aid to Afghanistan. Most recently, at the beginning of a new chapter in its turbulent history which started towards the end of 2001 when the Taliban regime was overthrown following the 9/11 attacks, dozens of development organizations and billions of aid money flooded the country. The aid started flowing in in different forms and types - civilian, military, bilateral, multilateral, through non-governmental organizations (NGOs) and development banks, on-budget, and off-budget (i.e., aid bypassing the recipient country's government). This is arguably the biggest international effort since the post-World-War Two Marshal Plan that aided Western Europe's reconstruction.

As to what the total amount of aid disbursed to Afghanistan during the 2001-2021 period is, there are conflicting and inconsistent figures. Based on statistics from the Organization for Economic Co-operation and Development (OECD) database, at least 71 billion US dollars have been disbursed to Afghanistan as official development assistance (ODA) for the period 2001-2021 (OECD, n.d.). Figure 10 illustrates the annual official development assistance to Afghanistan over the 2001-2021 period. The World Bank database reports a slightly higher but somewhat comparable figure of 85.76 billion USD official development assistance to Afghanistan in the same period (World Bank, n.d.). However, these figures do not include military spending which is allegedly much higher (Ruttig and Bjelica, 2018).

A record that can be considered as a general trend over the entire 20-year period, Adam Pain found that "between 2000 and 2009, an estimated total of $274.7 billion in aid and military funding was spent in Afghanistan. An estimated 9.6 percent of this was ODA [official development assistance], 88.6 percent ($243.3 billion) was spent on foreign military operations and a further 5.6 percent ($16.1 billion) on security-related aid that is not ODA eligible" (Pain, 2012, p. 8). The Special Inspector General for Afghanistan Reconstruction (SIGAR), who presents regular quarterly reports to the US Congress, has evaluated the 20-year of US government involvement in Afghanistan both in military and civilian affairs. A recent "what we need to learn" report claims the US government has spent "$145 billion trying to rebuild Afghanistan, its security forces, civilian government institutions, economy, and civil society. The Department of Defense (DOD) has also spent $837 billion on warfighting," (SIGAR, 2021a, p. 1) The military aid was spent for Afghanistan Security Forces Fund (ASFF), Train & Equip (DOD), Afghanistan Freedom Support Act (AFSA), International Military Education and Training (IMET), and Drug Interdiction & Counter-Drug Activities (DOD-CN) (Karimi, 2020).

In terms of aid modality, funds were disbursed and managed in two ways: on-budget and off-budget. On-budget aid provided funding for programmes administered by the Ministry of Finance or trust funds such as the Afghanistan Reconstruction Trust Fund (ARTF) or Law and Order Trust Fund for Afghanistan (LOTFA) (Bizhan, 2018). Significant portions of the on-budget aid which was considered as national budget or core budget were earmarked by donors for specific projects and in some cases a small percentage of it was at the discretion of the government. On the other hand, off-budget aid was delivered in ways that largely bypassed governmental public financial management systems (Bizhan, 2018; Karimi, 2020). Aid delivered as off-budget was managed by UN agencies, the aid agencies such as USAID, GIZ, and DFID, or by NGOs and private contractors. The percentage of off-budget aid was significant and many bilateral donors preferred to channel most of their aid via off-budget modality instead of on-budget (Bizhan, 2018). The share of aid delivered via off-budget mechanisms was 79% over which the government had no control and did not consider itself accountable for (Bizhan, 2018; Karimi, 2020).

In the case of off-budget aid, donors' main reasons for choosing this modality were the limited capacity and the prevalence of corruption in public sector and the freedom off-budget aid provides to implement projects of choice separate from the recipient government's agenda (Karimi, 2020). However, in the long run off-budget aid fuelled further occupation in many different layers (e.g., main contractors, subcontractors, etc.) and in some cases worsened the already weak capacity in the government by draining skilled employees of government. Off-budget aid delivery undermined transparency as even the Parliament of Afghanistan were deprived of their " power of purse" over such projects (Bizhan, 2018). Bizhan (2018) adds that off-budget aid also compromised institution building and reinforced political and institutional fragmentation.

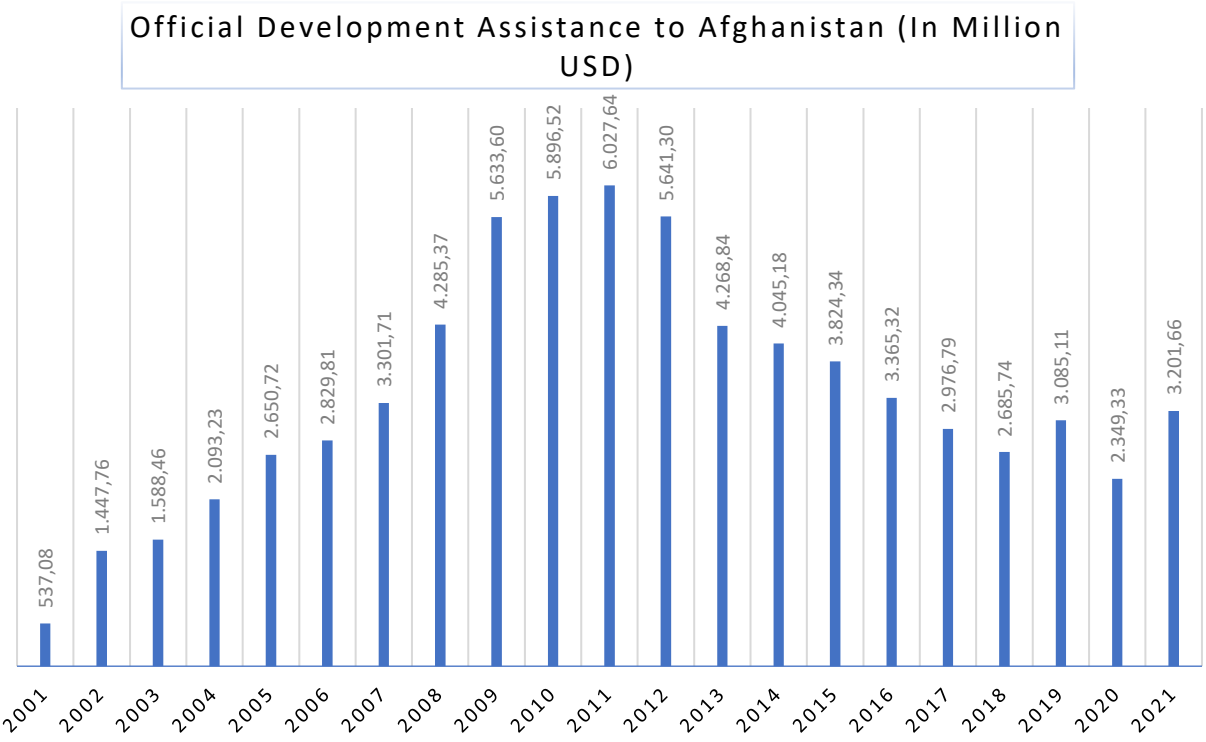

Figure 10. Official Development Assistance to Afghanistan in the 2001-2021 period. **Source**: (OECD, n.d.)

As far as the composition of donors is concerned, more than 30 countries and bilateral and multi-lateral donors disbursed aid to Afghanistan between 2001 and 2021 (ATR Consulting, 2018). The main donors have been the United States (US), Japan, Germany, European Union (EU), the United Kingdom (UK), multilateral organizations such as the World Bank and the Asian Development Bank (ADB), Canada, India, the Nordic countries, Australia, etc. The US was by far the largest donor followed by Japan, Germany, and EU. For a list of top donors, see table 6 which is compiled by Bizhan (2018). It should be noted that not all aid committed were actually disbursed; for instance, only around two-thirds of commitments in the period 2002-2008 were disbursed (Waldman, 2008).

In the energy sector, it would be no exaggeration to attribute most of the development to technical and financial assistance provided by aid agencies and bilateral donors. Reports from 2016 indicate the total amount of aid provided to the energy sector reached figures upward of 4 billion USD (Aminjonov, 2016). However reliable data is scarce, and the same figure is quoted in reports of 2020 and 2021 despite declining but uninterrupted aid from 2016 to 2021. Based on estimation from various sources, the total amount of aid to the energy sector from 2001 to 2021 could be in the range of 4 to 7 billion USD (Integrity Watch Afghanistan, 2020b; SIGAR, 2023). The United States Agency for International Development (USAID) and the U.S. Department of Defense (DoD) have obligated around 3 billion USD since 2002 (SIGAR, 2016a, p. 182). A cumulative 2.2 billion USD grant has been provided by the Asian Development Bank (ADB) all of which was on-budget supporting the government's targets of national energy supply program (ADB, 2016). Other major donors in the energy sector were the World Bank, Gesellschaft für Internationale Zusammenarbeit (GIZ), Kreditanstalt für Wiederaufbau (KfW), the Government of India, and Japan International Cooperation Agency (JICA).

Table 6. Top donors to Afghanistan (in million USD), 2002–2010. **Source**: Bizhan (2018)

		2002–2013	*2002–2011*		*2002–2010*		*2002–2010*	
Rank	*Donor*	*Pledge*	*Commitment*	*Total disbursement*	*On-budget disbursement*	*Off-budget disbursement*	*On-budget disbursement (as percentage)*	*Off-budget disbursement (as percentage)*
1	United States of America	56,100	44,356	37,118	2,455	34,663	7	93
2	Japan	7,200	3,152	3,152	900	2,252	29	71
3	Germany	5,029	2,130	762	287	475	38	62
4	European Union/European Commission	3,068	2,883	2,594	774	1,820	30	70
5	United Kingdom	2,897	2,222	2,222	861	1,361	39	61
6	World Bank	2,800	2,137	1,700	1,700	0	100	0
7	Asian Development Bank	2,200	2,269	1,005	955	50	95	5
8	Canada	1,769	1,256	1,256	491	765	39	61
9	India	1,200	1,516	759	0	759	0	100
10	Norway	938	775	636	232	404	36	64
11	Netherlands	864	1,015	1,015	426	589	42	58
12	Italy	753	645	540	212	328	39	61
13	Iran	673	399	377	0	377	0	100
14	Denmark	533	438	438	252	186	58	42
15	Sweden	515	635	635	171	464	27	73
16	Australia	369	744	656	112	544	17	83
17	Spain	308	220	194	84	110	43	57
18	United Nations	305	446	182	2	180	1	99
19	Pakistan	289	5	0	0	0	0	0
20	Saudi Arabia	268	140	103	25	78	24	76
21	China	252	139	58	0	58	0	100
22	Russian Federation	239	151	147	4	143	3	97
23	Switzerland	197	118	102	7	95	7	93
24	Agha Khan Development Network	190	140	140	0	140	0	100
25	Finland	152	160	160	48	112	30	70
26	Turkey	143	213	180	0	180	0	100
27	France	134	323	174	62	112	36	64
28	United Arab Emirates	97	134	117	0.4	117	0	100
29	Islamic Development Bank	87	70	17	17	0	100	0
30	South Korea	85	116	83	6	77	7	93
31	Others	327	305	283	59	224	21	79
	Total	**89,981**	**69,252**	**56,805**	**10,142**	**46,663**	**18**	**82**

On the question of where and for what purposes development aid in the energy sector was spent, four areas received the bulk of aid. In no particular order, these were: (1) construction of transmission lines and substations and the sector's physical infrastructure in general, (2) investments in domestic energy generation, (3) policy development and capacity building including technical assistance, and (4) payments for energy imports including diesel fuel and electricity. While the major international development organizations implemented diverse projects in several of the above four areas, some actors preferred certain areas more than others.

USAID and ADB, for example, have spent large sums of their contributions in building hard infrastructure such as transmission lines, substations, and distribution networks (ADB, 2022; SIGAR, 2021c). USAID worked extensively on the Northeast Power System (NEPS) and the Southeast Power System (SEPS) and the interconnection of the two. ADB invested in constructing around 2,500 km of power transmission lines enabling imports from Tajikistan, Turkmenistan, and Uzbekistan. The World Bank completed a project on rehabilitation of the largest hydroelectric plant, the Naghlu HPP. In the area of policy development and capacity building, an active actor was GIZ although others contributed as well. GIZ also paid particular attention on implementing small-scale renewable energy projects especially in northern provinces of Mazar-e-Sharif, Kunduz, Baghlan, Badakhshan, and Takhar. The Power Sector Master Plan (PSMP, 2013) and the Renewable Energy Roadmap for Afghanistan (RER2032) were prepared with the financial assistance of ADB.

2.6. Energy sector outlook in post-2021 Afghanistan and the Taliban 2.0

Before the Taliban swept into Kabul and took full control of the country in August 2021, many feared the gains made over the preceding 20 years would be lost. This has, to some degree, come true especially in terms of the level of investment, basic rights and freedoms, socio-economic improvements, etc. The following is an attempt to evaluate the consequences of the Taliban return, the implications for the energy sector, and the (suspension of) international development organizations involvement. I discuss these in terms of changes in investments in general and development aid in particular, the environmental sustainability direction of energy sector development (renewables vs fossil fuels), and possible changes in the make-up or standing of actors.

Investment: Taliban's takeover of power for the second time in three decades in August 2021 has brought with it many significant changes in the energy sector of Afghanistan. First and foremost, it has fundamentally altered the investment landscape in the energy sector as almost all development organizations who were the largest source of finance have

suspended their operations in the country. The Taliban government's financial capacity is even more limited compared to the previous governments with international sanctions further weakening them and the situation is still too uncertain for private sector. So far, the bulk of aid provided to Afghanistan after August 2021 has been of the humanitarian type channelled through UN agencies and NGOs bypassing the Taliban government (Clarke et al., 2023).

The obvious and immediate implication is that energy projects will not receive adequate funding, nowhere near the amount it received during the past two decades. Some of the ongoing projects as of August 2021 will remain incomplete until aid organizations resume operation or the de facto Taliban authorities find other means of finance. For instance, 32 climate change mitigation and adaptation projects with a total budget of close to 900 million USD were suspended following the Taliban takeover (Ruttig, 2022). According to Afghanistan's Power Sector Master Plan adopted in 2013 during the Republic era, most of the investments are required in the last stage, stage D (2025-2032) of the plan, in order to realize the energy access and other objectives (Fichtner, 2013). Financing energy projects will be a huge challenge for the Taliban as was proven in the incident Uzbekistan cut off the electricity supply to Afghanistan due to non-payment (SIGAR, 2023).

Renewables vs Fossil Fuels: Secondly, as international aid organizations pulled out of the country and the Taliban have shown increasing keenness in signing energy deals with China and Russia, renewables might lose the advantage of the preferred first choice for energy projects. Some development organizations in 2001-2021 era, such as GIZ, implemented largely only renewable projects aligning their works with global efforts to fight climate change and biodiversity loss. However, the Taliban who are not recognized as a legitimate government by international community have eagerly agreed to energy deals with those showing interest. The regime has, thus far, agreed deals with at least three countries all involving fossil fuels.

One of the recent deals the Taliban have signed is with Russia for importing gasoline, diesel, gas and wheat (Yawar and Greenfield, 2022). As per the agreement, Russia supplies to Afghanistan "one million tonnes of gasoline, one million tonnes of diesel, 500,000 tonnes of liquefied petroleum gas (LPG) and two million tonnes of wheat annually." The Taliban regime have signed a second deal in early 2023 with a Chinese firm allowing it to extract oil (Hoskins, 2023). The agreement would allow Xinjiang Central Asia Petroleum and Gas Company (CAPEIC) to drill for oil in the Amu Darya Basin in northern Afghanistan. Similarly, coal production, largely carried out unprofessionally and unregulated, and exports to Pakistan have seen a marked increase (Khan, 2022). The Taliban after returning to power have imported 57% more fossil fuels in the first quarter of 2022 compared to the same period in 2021 when they were not in power, largely from Iran and Pakistan (Oxford

Analytica, 2022). These developments indicate that the Taliban regime's energy policy, if there is one which is not published, doesn't favour renewables.

Changes in the Make-up and Standing of Actors: Thirdly, the return of the Taliban led to the exit of several key international actors and the suspension of their activities in the energy sector as well as changes in the composition of domestic players. One of the first things the Taliban regime did after overthrowing the previous government was announcing a cabinet including a minister of energy and water indicating a reversal of the decision by President Ashraf Ghani splitting the ministry into two independent authorities. In January 2020, approximately 19 months before his government's collapse, Ashraf Ghani issued a controversial presidential decree splitting Ministry of Energy and Water into two regulatory authorities: (a) Energy Regulatory Body and (b) Water Regulatory Body (Integrity Watch Afghanistan, 2020a). By appointing a minister for the Ministry of Energy and Water in September 2021, one month after their return to power, the Taliban effectively restored the ministry.

Another significant change the Taliban made was banning women from workplaces including the ministry of energy and water. This did away with years of efforts empowering women and reaching some degree of gender equality. These included implementing quotas requiring a certain percentage of employees in projects to be female, providing safe and appropriate workplace conditions, capacity building measures, and wider national institutional changes. Not only banning women from workplaces is a blatant violation of their basic rights and freedoms, it can also result in an economic loss between 600 million to 1 billion USD nationally (UNDP, 2022).

With regard to the withdrawal of international development organizations and the suspension of their activities, the absence of not only their financial but also technical capacities will be strongly felt in a sector where they had played a vital and leading role for the past two decades. The Afghanistan governments between 2001 and 2021 relied on international experts heavily: whether it was preparing feasibility studies or designing projects, developing sector policies, training employees, or importing energy technologies international organizations played the leading role. With the large-scale brain drain following the August 2011 events and the withdrawal of international development organizations, the Taliban will be strongly challenged to deliver basic services or make progress in the sector. China and Russia who have shown interest in investing in the energy sector and other international players will likely play a stronger role, but filling the gap development agencies left will be a tough undertaking in the short term. It is expected the policies and objectives the pre-Taliban governments defined for the sector will not be pursued by the Taliban regime in the absence of the financial and technical support the previous governments enjoyed.

Overall, there is deep uncertainty regarding energy system development in the country. Future developments will depend on what the Taliban de facto authorities will and can do in terms of attracting (international) investment, guaranteeing improved security, relaxing or maintaining their radical position on women working and attending schools, and pursuing a low-carbon or fossil fuels-based energy development.

Chapter 3

The renewable energy sector in Afghanistan: Policy and potential[7]

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3. The renewable energy sector in Afghanistan: Policy and potential

Abstract:

Afghanistan has one of the lowest rates of access to and usage of electricity in the world. Fuelwood, charcoal, agricultural, and animal waste still dominate in meeting energy needs for cooking and heating, with a large percentage of the population using kerosene, candles, and gas for lighting. Yet the situation has changed significantly since the U.S. and coalition combat operations that began at the end of 2001. The period through to the present day has seen a fivefold increase in the electrification rate; agreements with Central Asian countries and Iran for importing electricity; the implementation of thousands of small-scale renewable energy projects in rural areas; the development and rehabilitation of several large-scale energy projects; the (partial) development of the institutional, policy, and regulatory landscape; and the expansion of transmission lines and distribution networks. Although accurate information is scarce, Afghanistan has both substantial fossil fuel reserves and renewable energy potential. The country's wind power potential alone looks likely to exceed projected power demand for several decades ahead. Similarly, both the estimated hydropower and solar photovoltaic (PV) potential each exceed projected 2032 power demand. The institutional context of the Afghanistan energy sector is complex, comprising multiple ministries, government agencies, aid agencies, and intergovernmental organizations. Nonetheless, given suitable coordination, the technologies, natural resources, and capabilities are available for transforming the sector and the lives of many people.

This article is categorized under:

Energy Infrastructure > Climate and Environment
Energy Policy and Planning > Economics and Policy
Energy Policy and Planning > Systems and Infrastructure

3.1. Introduction:

This short article provides an overview of Afghanistan's energy policies, institutions, actors, focusing particularly on renewable energy potential and particularly on electric power supply. One of the world's least developed countries, Afghanistan, is mountainous, landlocked, and located at the crossroads of Central and South Asia. The country shares borders with Pakistan in the south and east, Iran in the west, and China in the northeast. Turkmenistan, Uzbekistan, and Tajikistan are to the north. Of the country's 29.2 million population, more than 20 million live in rural areas (Central Statistics Organization, 2016). With cold winters and hot summers, Afghanistan has an arid and semiarid continental climate and is vulnerable to climate change and climatic variability (National Environmental Protection Agency, 2013). Access to and usage of electricity is one of the lowest in the world (Asian Development Bank, 2015a). Development has been constrained by decades of war and conflict; the country's infrastructure as a result has been left in ruins, including that of the energy sector. Development of infrastructure and human capacity continue to suffer from conflict and security challenges. In the decade and a half after the fall of the Taliban regime in 2001, with the support of international community, substantial progress has been made but significant challenges remain.

Progress since 2001 means that 30% of the population are now connected to the power grid, compared to 6% in 2002 (World Bank, 2016). Installed power generation capacity has increased from 430 MW in 2001 to estimates that range from 622 (World Bank, 2016) to 520 MW (Asian Development Bank, 2015a) in 2015, mainly from hydropower (49%), thermal sources (furnace oil, diesel, and gas), and distributed renewables. As a result of improvements, power system losses plunged to 25% in 2014 compared to 70% in 2002, revenue collection rates increased from 50 to 90% in the same period, and revenues themselves have risen by 15% per quarter since 2009 (Asian Development Bank, 2015b). Overall consumption in 2015 reached 5,000 GWh. Afghanistan's Power Sector Master Plan (PSMP) projects gross demand in 2032 to stand at around 6,000 MW[8] compared to 1,500 MW peak demand in 2015 (Fichtner GmbH, & Co. KG, 2013; World Bank, 2016). The PSMP envisages an increase in the rate of electrification from 30 to 83% of the population in 2032, with the share of locally generated power rising from 20 to 67% (Fichtner GmbH, & Co. KG, 2013).

The legal and regulatory framework of the energy sector is taking shape, with the development of the electrical energy services regulating law, Afghanistan PSMP, renewable energy policy, and national energy supply program. Several other important documents such

[8] The PSMP finalized in 2013 forecasts the peak demand in 2032 to be 3,500 MW, but more recent government policies in 2016, such as MEW (2016a), quoting the PSMP declares the peak demand in 2032 to be 6,000 MW. As anticipated in the PSMP itself, it is assumed that the Plan has been updated.

as National Energy Policy, Gas Development Master Plan (2015–2035), Renewable Energy Roadmap, and Rural Renewable Energy Framework are under development (Ershad, 2016; Inter-ministerial Commission for Energy, 2016a). Key stakeholders in the energy sector of Afghanistan include five ministries, five key development partners, representatives of private sector, and civil society organizations. The only power utility, Da Afghanistan Breshna Sherkat (DABS), which solely operates and manages electric power generation, import, transmission, and distribution in the whole country[9], has been corporatized in order to improve effectiveness and efficiency in its operation. Similarly, formation of Afghan Gas Enterprise (AGE) in 2011 is expected to contribute to the development of the gas sector.

It would be no exaggeration to attribute most of the development in the energy sector to technical and financial assistance provided by aid agencies and bilateral donors. The United States Agency for International Development (USAID) and the U.S. Department of Defense (DoD) have spent around $3 billion since 2002 (Special Inspector General for Afghanistan Reconstruction, 2016a); a cumulative $2.2 billion level of grant assistance by the Asian Development Bank (ADB) aims to support government targets under the national energy supply program (Asian Development Bank, 2016); other major donors including the World Bank, Gesellschaft für Internationale Zusammenarbeit (GIZ), and Kreditanstalt für Wiederaufbau (KfW) from Germany, and the Government of India have also contributed extensively (Asian Development Bank, 2015c).

Nevertheless, despite huge investments and significant progress, Afghanistan is still a net energy and electricity importer. It imports nearly 80% of its electricity from neighboring countries: 16% from Iran, 25% from Tajikistan, 12% from Turkmenistan, and 27% from Uzbekistan as of 2014; only 20% was generated inside the country from mainly hydro and thermal (diesel-fired) power plants (Asian Development Bank, 2015b). As the share of domestic generation is small, it is a challenge to electrify the whole country from imported power. The power system is also not synchronized with those in any of the four neighboring countries that it imports from, making it costly and challenging to import. Afghanistan lacks a unified national electricity grid: the system currently comprises of 10 isolated grids or islands. Asynchronous operation of isolated grids constrains efficient power interconnections and trade and has contributed to an increase in costs and reduction in reliability (Asian Development Bank, 2015b). Poor grid reliability means load shedding is still common and therefore few people have given up their private generators - if they have them.

Annual per capita electrical consumption of 154 KWh in Afghanistan is among the lowest in the world, compared to 667 KWh of South Asia average and 3,100 KWh of world-wide

[9] DABS was converted into an independent commercial company. It is still owned by the government.

average (2012 data) (World Bank, 2016). There are substantial disparities between rural and urban population in terms of access to and usage of electricity. In rural areas, where around 67% of GDP comes from and more than 77% of the population lives, fewer than 11% of the population have access to grid power, while in large urban areas up to 90% have such access (World Bank, 2016).

Last but not least, a weak legal framework continues to trouble collaboration among the diverse set of stakeholders, discouraging local private sector participation and foreign investment and leading to poor governance. Sector-specific laws and regulations are not yet fully developed, making sector planning and harmonization difficult. Partly for this reason and for a lack of capacity in government agencies, more than 65% of sector investments funded by development partners bypass the government's core budget and planning systems (Asian Development Bank, 2015c). In such cases, the government has little influence and receives limited information on energy projects, plans, and activities. These off-budget investments sometimes overlap with the government's projects or other donors' on-budget projects.

One can summarize the key challenges to Afghanistan's energy sector as: (a) a vast difference in rural and urban energy access, particularly electrical power access; (b) lack of financial and technical capacity; (c) constraints in transmission and distribution systems; (d) poor regulatory environment; and (e) insufficient domestic generation despite huge potential. Overarching all of this is a security situation that remains fraught and uncertain. In Section 2 we provide an overview of the main policy actors involved in energy policy and implementation (Figure 1).

FIGURE 1 Afghanistan's first wind farm in 2008: 10 turbines in Panjshir Valley. The windfarm was installed by Empower Consultants in NZ and delivers 75 kW of electricity for government facilities in the Panjshir Valley (Scoop Business, 2008). Photograph by Daniel Wilkinson (U.S. State Department), U.S. Embassy Kabul Afghanistan, Public Domain (https://commons.wikimedia.org/w/index.php?curid=22226462)

3.2. Policy Actors

There is a diversity of actors in the energy regime, notably the government of Afghanistan, aid agencies and market actors, which include private sector investors and consumers. Within government, the ministerial responsibilities outlined below operate in parallel and as we refer to below, the German development aid agency GIZ has been working with energy sector actors to improve coordination. Hence, the government has now recognized and mandated the Renewable Energy Coordination Committee (RECC) to improve coordination between ministries and other institutions. Nonetheless, it should be borne in mind that there are multiple interests operating, with differing specific priorities.

3.2.1. Governmental organizations

Several governmental agencies are involved in the energy sector. Some of the key organizations with their responsibilities are listed below:

- Electrification of the country is mainly the mandate of Ministry of Energy and Water (MEW). It is the nodal ministry with the responsibility of generation, transmission, distribution, and regulation (Ministry of Energy and Water, 2013). It prepares strategies, policies, action plans, and laws; creates a platform for decision-making, plans, and implements energy projects; and supports aid agencies with security, land acquisition, and licensing issues. Established in 2009, Renewable Energy Department (RED) in MEW is tasked with developing renewable energy resources of the country.
- Part of the responsibility of Ministry of Rural Rehabilitation and Development (MRRD) is developing energy infrastructure in rural areas. Touted as one of the most successful development programs in the whole country, the National Solidarity Program (NSP) executed by the MRRD is a community-based approach to project delivery, with the aim of better alignment of projects with the needs of rural communities and increased involvement of villagers in project design and implementation (Beath, Christia, & Enikolopov, 2015). The NSP has been evaluated as particularly successful in improving access to drinking water and electricity, acceptance of democratic processes, perceptions of economic well-being, and attitudes toward women (Beath et al., 2015). Community-based renewable energy projects in Afghanistan are generally considered to have improved energy supply for the communities targeted and have had modest positive socioeconomic impacts (Shoaib & Ariaratnam, 2016). In addition to NSP, an energy-specific project of the MRRD called Afghanistan Sustainable Energy for Rural Development (ASERD) launched in 2015 expects to provide sustainable energy services to 200 rural communities in the next couple of years (Ershad, 2017). Within MRRD, the department responsible for rural energy development is Rural Energy and Enterprise Development (REED). Projects of up to 1 MW can be implemented by the MRRD; projects with capacity beyond 1 MW fall under the domain of MEW (Ministry of Energy and Water, 2015).
- DABS is the only power utility in the country. It is a state-owned corporatized organization that operates and manages the power sector, including power generation, transmission, and distribution throughout the country on commercial basis (Ministry of Energy and Water, 2015).
- The Ministry of Mines and Petroleum (MoMP) is tasked with establishing mining policy, negotiating mining contract tenders and managing the country's extractive industries. It is responsible for the administration, oversight, and regulation of Afghanistan's mineral resources. Establishing hydrocarbon policy and regulating the

hydrocarbon sector is the exclusive responsibility of Afghan Petroleum Authority (APA) of the MoMP. The AGE, which conducts production, processing, and transportation activities, and the General Directorate of Oil & Gas Survey, which conducts exploration and development operations, are both directly overseen by the APA and are responsible for managing the state-owned gas operations in Afghanistan. The MoMP and the APA collect revenues from extractives sales, taxes, and royalties in addition to their regulatory responsibilities (Special Inspector General for Afghanistan Reconstruction, 2016b).

- The Ministry of Finance (MoF) plays an important role in determining and agreeing to development projects and providing funds in the national budget for energy-related projects.
- The Ministry of Economy (MoEc) is a cross-cutting ministry responsible for planning donor-assisted projects (i.e., including for the energy sector).

In addition to the above organizations, the Ministry of Urban Development and Housing is responsible for street lighting in Kabul and space heating of Kabul's five residential blocks; the Ministry of Commerce and Industries imports liquid fuels; and the Cabinet of Ministers and High Economic Council of Ministers review selection, funding, and approval of energy projects (YEW Consultancy Service Pvt. Ltd., 2016).

3.2.2. Aid agencies and intergovernmental organizations

Aid agencies have played a critical role in the development of the energy sector of Afghanistan, as have the United Nations Development Programme (UNDP), Food and Agriculture Organization (FAO) of the United Nations, Department for International Development (DFID) of the UK, Government of India, Japan International Cooperation Agency (JICA), and New Zealand Aid (NZaid) (Gencer, Irving, Meier, Spencer, & Wnuk, 2016; Inter-Ministerial Commission for Energy, 2016c). In the following section, we provide an overview of the five key aid agencies and their roles:

- ADB is the largest on-budget development partner in the energy sector, having committed nearly $1 billion up to 2015 and a further $1.2 billion from 2015 to 2025 (Asian Development Bank, 2015c). Major projects of this donor have focused on (re)construction of transmission lines and distribution networks.
- USAID in cooperation with the U.S. military has supported the sector in terms of building and expanding electricity generation (e.g., Sheberghan gas development project) and distribution network mainly in the south of the country. The agency has also implemented projects to support connecting Afghanistan's northern and southern grids—the Northeast Power System (NEPS) and the Southeast Power System (SEPS). Furthermore, it has assisted governmental agencies with capacity

building and management. With USAID's assistance, the Afghan power utility has improved its revenue collection and increased the number of its customers by 54% from 2009 to 2015 (USAID, 2017).

- The World Bank is another major development partner that has contributed to the power rehabilitation programs, transmission lines expansion, and regional power transmission projects (e.g., CASA-1000).
- GIZ is a German organization that receives funds from Germany's Federal Ministry for Economic Cooperation and Development (BMZ) and supports the government of Germany in achieving its development objectives. In Afghanistan, GIZ has focused on implementing decentralized small-scale renewable energy development projects in Northern provinces. At the national level, GIZ has recently initiated the Institutional Development for Energy in Afghanistan (IDEA) program to advise stakeholders on developing political and legal prerequisites for better energy supply. IDEA aims to: (a) strengthen institutions by "having them jointly clarify their roles and mandates, formalize responsibilities and define tasks more precisely"; (b) improve coordination and cooperation; (c) support private sector by helping in preparation of legal and financial frameworks for investments; and (d) improve information sharing for consumers and businesses (GIZ. Institutional Development for Energy in Afghanistan (IDEA), 2000[10]).
- A German government-owned development bank, KfW, has, like GIZ, invested mainly in decentralized power supply projects in Northern provinces. Where Germany's Federal Armed Forces are concentrated, the country's development projects including that of energy sector have mainly been implemented in the Northern provinces of Kunduz, Takhar, Badakhshan, Baghlan, Balkh, and Samangan (Asian Development Bank, 2015c).

3.2.3. Market actors

Against the background of insecurity, political uncertainty, limited institutional capacity, and rent-seeking behavior, foreign and domestic private investors have been reluctant to invest in Afghanistan. Furthermore, the necessary framework to encourage and protect private investment and ensure profitable returns is not in place. The absence of private investors is keenly felt in a sector in which heavy investment is needed: unless the private sector joins in, the government and aid agencies will not be able to fill the funding gap of approximately $10 billion needed by 2032 (Asian Development Bank, 2015b; Fichtner GmbH, & Co. KG, 2013).

[10] I acknowledge that this is an incorrect citation as the project IDEA was first designed in 2015.

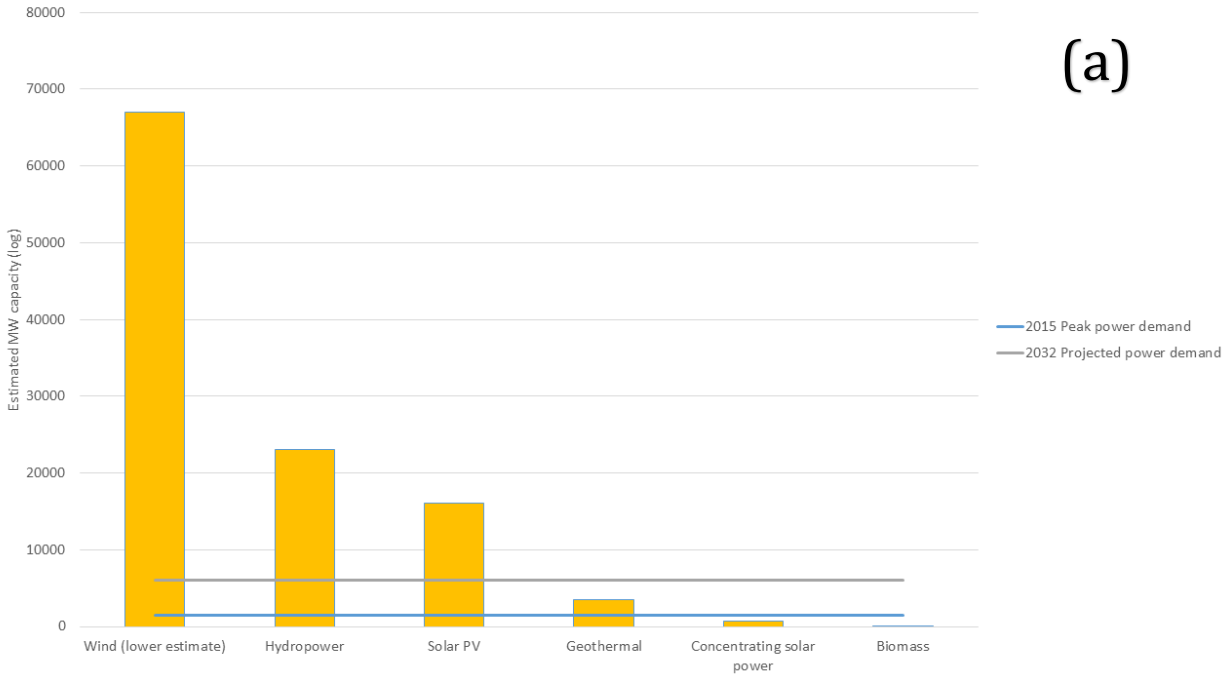
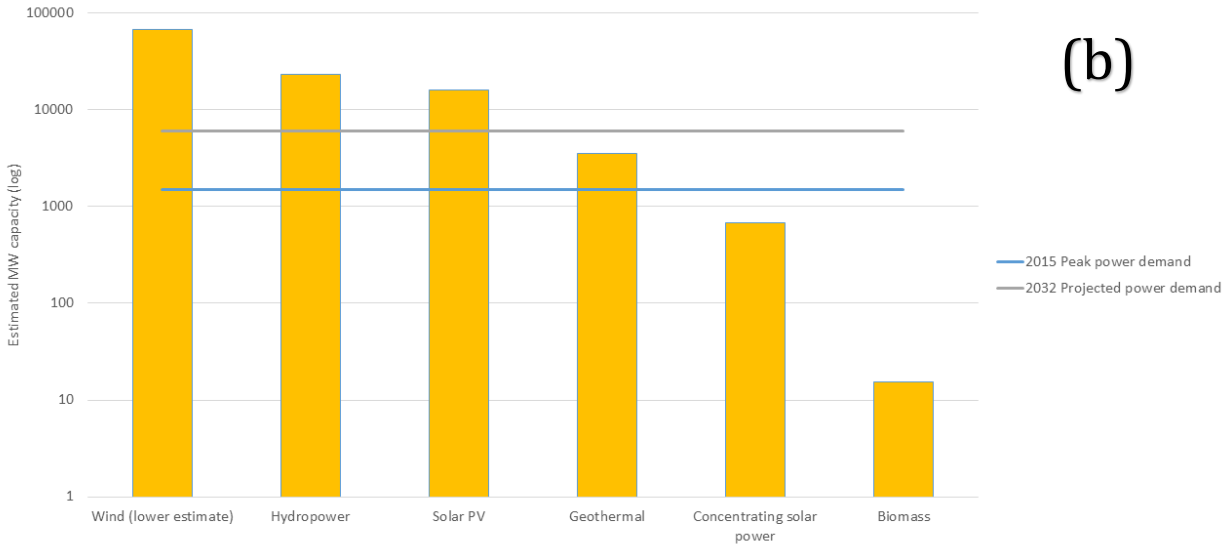


FIGURE 2 (a) Renewable power potential (nominal installation capacity) for Afghanistan relative to 2015 and projected 2032 demand (log scale). **(b)** Renewable power potential (nominal installation capacity) for Afghanistan relative to 2015 and projected 2032 demand (normal scale). Sources for (a) and (b): hydropower (Ministry of Energy and Water, 2015); solar PV and CSP (Anwarzai & Nagasaka, 2016); wind (Chaurey et al., 2017); geothermal (ICE, 2016); biomass (Ministry of Energy and Water, 2015). Except for solar PV and CSP, these are nominal installation capacity values that do not take into account operational availability factors. For solar PV and CSP, source GWh values have been legitimately divided by 8760 because the GWh values already include availability factors. Where multiple estimates exist, the conservative values as described in main text are used. Overall, the values should be seen as indicative only, given the difficulties that the source texts refer to in relation to accessing accurate, relevant data.



In Section 3, we examine principally the renewable energy potential of Afghanistan, which is significant relative to projected demand. Figure 2a,b summarizes this potential, using more conservative values where a range exists, as even the conservative potential far outstrips projected demand up to 2032.

3.3. Renewable Energy Potential

Afghanistan has significant renewable energy resources as well as fossil fuel reserves, although reliable data is scarce, a concern shared by Afghanistan National Development Strategy (ANDS) (Afghanistan National Development Strategy, 2008). Here we focus primarily on distributed renewable energy potential, as this arguably offers the quickest way to deliver electricity and heating fuel to the dispersed rural population that still constitutes the largest fraction of the country, without the need for installing an extensive national power network. This is neither to argue against a national grid nor to forget that fossil fuel reserves exist in the country. According to studies by the U.S. Geological Survey and the Afghan MoMP, an estimated 1.6 billion barrels of crude oil and 0.5 billion barrels of petroleum (natural gas liquids) are available in reserves (Klett, Ulmishek, Wandrey, Agena, & Steinshouer, 2006). The undiscovered technically recoverable natural gas reserves in the country are estimated to be 444 billion m^3, mostly in the Amu Darya basin (Klett et al., 2006). Regarding coal, a rough estimation of 73 million tons in reserves and 35,000 tons production in 2008 is reported in the PSMP (Fichtner GmbH, & Co. KG, 2013).

Nonetheless, relative to the construction of fossil fuel-fired power stations and widespread grid connections across challenging terrain, stand-alone, off-grid or small island-grid, solar, micro-hydro (MHP), and wind energy technologies have short installation times, lower operating costs, and technical simplicity (Bhandari, Richter, Möller, & Oswianoski, 2015; Ershad, Brecha, & Hallinan, 2016). Large-scale hydro projects also have long lead times but are included below for information. Since 2001, about 5,000 renewable energy projects, mainly MHP and solar, with a total capacity of 50 MW, have either been completed or are under construction (Asian Development Bank, 2015b). Development of renewable energy in Afghanistan faces challenges such as lack of policy clarity and consistency, poor coordination between the stakeholders, shortage of technical capacity, weak grid infrastructure, and climate change and variability (Asian Development Bank, 2014). Nonetheless, the Afghanistan National Renewable Energy Policy (ANREP) sets a target of up to 95% renewable energy in the energy mix by 2032 (Ministry of Energy and Water, 2015).

3.3.1. Hydro (all scales)

It is estimated that hydropower potential in Afghanistan is 23,000 MW, the large majority of which would be from large dams (Ministry of Energy and Water, 2015). At present, there is only 254 MW of installed power capacity, which is seasonal and has a capacity factor of less than 40% (Asian Development Bank, 2015b). This includes newly installed MHP and older, large hydropower plants. Since 2005, a large number of MHPs have been built under the donor-supported NSP of MRRD. When fully operational, these are expected to provide electricity for 7% of the population (Bhandari et al., 2015). Factors such as international water issues with the neighboring countries and shortage of resources in the government, however, impede development in this subsector. All of the country's river basins are transboundary and use of them therefore has a regional dimension; except with Iran, there are no agreements with the neighboring countries on the use of water resources (Yıldız, 2015). Drought and seasonal conditions also affect the level of rivers and their usefulness (National Environmental Protection Agency, 2013), as does the need for maintenance (a generic factor).

3.3.2. Solar

Afghanistan is considered to be a "sunbelt" country (Burns, 2011). The annual average Global Horizontal Irradiance (GHI) in Afghanistan is 1,935 kWh m^{-2} day^{-1} and the national average seasonal maximum and minimum are 7.84 and 2.38 kWh m^{-2} day^{-1}, respectively (Ershad et al., 2016). In some provinces in the west and south, GHI summer peaks reach about 9.0 kWh m^{-2} day^{-1}. Preliminary estimates by the U.S. National Renewable Energy Laboratory (NREL) suggest roughly 220,000 MW of solar potential in the country (Asian Development Bank,

2014). Anwarzai & Nagasaka (2016), using Multicriteria Decision Analysis (MCDA) and Geographical Information System (GIS), calculated the total annual generation potential at 146,982 GWh, including 140,982 GWh from photovoltaic (PV) and 6,000 GWh from concentrating solar power (CSP) technologies. Figure 2a,b uses the scoped-down installation capacity values from the latter (Anwarzai & Nagasaka, 2016), not the initial values of NREL (Asian Development Bank, 2014).

3.3.3. Wind

There are large areas in Afghanistan with promising potential for wind energy. A study for the Renewable Energy Department of MEW estimates the energy potential of wind to be around 67,000 MW (Chaurey et al., 2017), while NREL assess the potential to be 158,000 MW (Elliott, 2011). The latter study which has produced high-resolution wind resource maps using advanced modeling and analysis techniques, classifies 5% (31,600 km^2) of Afghanistan total land area (650,000 km^2) as "class 4+" which offers "good-to-excellent" potential for utility-scale applications. The major wind resource areas are located in the western provinces of Nimroz, Farah, Herat, and the northeastern provinces of Balkh and Takhar. The wind corridors are near Jabalsaraj, Sarobi, and Tirgari in the east and near Qalat, Gadamsar, Walakhor, Golestan, and Gorzanak in central and southern parts. The same study adds that 12% of the country's total area has good potential, "class 3," for off-grid applications. As even the more conservative value of Chaurey et al. (2017) far outstrips national power demand projections, we use this in Figure 2a,b. Other studies are also available: Tetra Tech, contracted by ADB in 2009, used the map and data from the NREL study and used GIS with other available data to identify economically viable wind energy production sites (Tetra Tech, 2009). Taking several factors into consideration, including security issues, this identified two sites in Kabul, three sites in Heart, and five sites in Mazar-e-Sharif that have the best current potential. Another study found 342,521 GWh annual production potential for Afghanistan (Anwarzai & Nagasaka, 2016).

3.3.4. Geothermal

Active geothermal systems are located in the main axis areas of the Hindu Kush Mountains (Saba, Najaf, Musazai, & Taraki, 2004). Low to medium geothermal sites with the surface manifestations in the form of hot springs and visible heat leakage are widespread all over the country, but the potential of geothermal energy reserves has not been studied. Saba et al. (2004) believe that the potential of geothermal energy in Afghanistan is "enormous" and its use for electric and nonelectric applications is "feasible" and "realistic." The country's renewable energy policy acknowledges the geothermal potential and notes that 70 "spots" and three big possible regions are available (Ministry of Energy and Water, 2015). The Inter-

Ministerial Commission for Energy estimates the potential at around 3,500 MW and indicates that power plants with generation capacity of 5–20 MW can be built in each spot (Inter-ministerial Commission for Energy, 2016b). The country's rural renewable energy policy proposes direct-use applications of geothermal energy in industries such as food processing, fruit drying, refrigeration, fish hatchery and farming, carpet and wool processing, recreation, and tourism (Ministry of Energy and Water, 2013).

3.3.5. Biomass

Use of solid biomass for cooking and heating, particularly in rural Afghanistan, is very high—in some areas 90% of total energy consumption (Milbrandt & Overend, 2011). In addition to health problems, using solid fuels such as firewood, shrubs, and dung exacerbates desertification in an already climate change-vulnerable country. To curb this problem, new energy technologies with higher energy efficiency such as biogas, electricity, insulation of buildings, and improved cook stoves may prove effective. One of the more widely cited studies on biomass resource potential assessment in Afghanistan was conducted by NREL (Milbrandt & Overend, 2011). Using GIS technology and statistical analysis on agricultural, environmental, and socioeconomic data, the authors calculate an estimated 134 GWh annual electrical energy from only municipal solid waste (MSW). They also estimate that around 896,000 small biogas plants can be installed using cattle manure, with the potential to supply 26% of the population with clean energy. The study does not see forest resources and crop residues as good options for producing energy, for economic and climate reasons. Afghanistan's National Renewable Energy Policy estimated that 4000 MW of energy can be generated from biomass resources including 3090 MW from agricultural waste, 840 MW from animal waste, and 91 MW from MSW (Ministry of Energy and Water, 2015). Again we take the lower value for Figure 2a,b, in this case by NREL.

With Figures 2a,b in mind, wind, hydro, and solar have most potential; however, the hydro estimate includes large dams that often pose substantial risks of cost over-runs as well as significant environmental impacts (Ansar, Flyvbjerg, Budzier, & Lunn, 2014). When considering the options, "soft" factors such as incentivizing maintenance, as well as technological robustness and ease of repair or replacement are important. This principle would tend to support the ADB Technical Assistance Report on renewable energy (Asian Development Bank, 2014), namely that, in general, for the rural majority, village-level wind or solar systems with diesel generator back-up are likely to be good options for power supply, with the choice between the two depending upon site characteristics (Asian Development Bank, 2014). However, more fully exploiting indigenous wind, solar and other renewable resources would reduce the need to rely on fossil fuel back-up generally (Ershad et al., 2016), something that the PSMP (Fichtner GmbH, & Co. KG, 2013), which relies heavily

on fossil fuel-based electrical import from neighboring countries, arguably could have given more attention to (Ershad et al., 2016).

Finally, it is important to note that most of this review concerns power supply and that in rural areas heating and cooking technologies are rarely based on electric power, but rather mostly wood and charcoal (Milbrandt & Overend, 2011). For these purposes, village-scale biogas digestors fueled by animal waste are reported to have good potential, with biogas produced from animal waste having more than double the calorific value of dried dung cake, which is usually combusted for heat (Milbrandt & Overend, 2011).

3.4. Conclusion

Although renewable energy resource potential estimates for Afghanistan vary widely, the country nonetheless appears to possess the potential to generate more power than it will consume for decades to come. In principle, imported power and its own fossil fuel reserves could contribute to provision of the necessary base load, as could distributed storage, which we have not discussed here. What remains to be seen is the relative weight given to the different options, renewable and nonrenewable, as the country continues to develop. Similarly, the extent to which energy sector development can take place within a complex institutional and organizational framework also remains to be seen. Arguably, the case for distributed renewables remains strong in any scenario, particularly if attention is paid to engaging communities in such a way that the need for infrastructure maintenance is prepared for.

CONFLICT OF INTEREST

The authors have declared no conflicts of interest for this article.

FURTHER READING

The website of the Islamic Republic of Afghanistan Ministry of Energy and Water, Renewable Energy Department, provides further information on Ministry structure, related agencies, co-operating organizations, energy policy, regulation, publications, tenders and so on: http://www.red-mew.gov.af/

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Chapter 4

Building energy institutions in a conflict zone: the case of Afghanistan[11]

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4. Building energy institutions in a conflict zone: the case of Afghanistan

Abstract

How do international development organisations develop institutional capacity in conflict zones? Here we take a descriptive, topological perspective on the question. For twenty years prior to the capture of Afghanistan by the Taliban in August 2021 the international community directed substantial resources to Afghanistan, seeking to build a democratic state. Here we examine selected, energy-related aspects of those institution-building processes, taking the country as a case study of institutional development for energy and other transitions that is explicitly driven by particular values. We use the transition topology approach to map energy-related institutional development over two decades. We find that this institutional development can be categorised in terms of three main themes: development of a regulatory framework for the energy sector; privatisation of energy systems; and women's empowerment in terms of knowledge, skills and engagement in energy sector provisioning. The case contributes to an understanding of the types of institutional changes that transnational actors seek to induce, how they do this, and what types of outcomes can be achieved.

Keywords: Institutional change; transition topology; international development organisations; transnational actors; foreign aid; Afghanistan's energy transitions

Highlights

- Maps energy system institutional work in Afghanistan over the 20 years prior to Taliban capture
- Topologically traces the effects of projects, networks, events and organisations as institutional forms
- Finds three prominent themes: regulatory development, privatisation, and women's empowerment
- The case illustrates the role of transnational actors in energy system transitions

4.1. Introduction

The agency of different types of actor is a topic that has received increasing attention in the transitions literature. However, few transitions studies have focused on actors' attempts to instil new values alongside and underpinning changes in institutional practice. Fewer still have addressed this in a developing country context. Here we focus on an aid-recipient country between 2001 and 2021 – Afghanistan - in which numerous transnational actors were involved in providing resources for a range of sociotechnical transitions. These transnational actors included development aid agencies, intergovernmental organisations, and multilateral development banks.

Transitions involve, from an institutional perspective, de-institutionalising existing configurations and institutionalising new ones (Fuenfschilling, 2019). How actors exert agency in such institutional change processes is partly context-specific. While we may be able to generalise across contexts in terms of the key forms of institutional work, contextual processes nonetheless exert their own influence. Transnational actors in aid-recipient countries often have access to very substantial resources, but they must also operate in contexts of low institutional capacity, where there may be armed conflict and sometimes stark differences between their own organisational, cultural, and political assumptions and values and those of local institutional contexts. How all of this plays out will significantly affect the success and durability of any particular sociotechnical transition.

Here, we show how transnational actors in Afghanistan seek to induce institutional change that reflects their values. We focus specifically on energy transitions, where the range of values promoted by transnational actors includes those such as gender equity and democratic participation. For this purpose, we draw on (i) Regional Transition Paths to Sustainability (RTPS) by Strambach and Pflitsch (2020) and the related methodological approach of transition topology; and (ii) emerging work on transnational actors within the geography of transitions (Hansen and Nygaard, 2013; Raven et al., 2012; Wieczorek et al., 2015).

Following the above, we assume that institutional change can be made visible in form of organisational changes. By coordinating individual actors and resources (Scott, 2013), organisations can support both the disruption of existing institutions as well as the stabilisation of new ones. Accordingly, by applying the transition topology approach, we seek to make visible the organisational and institutional changes that have been induced by these actors over a twenty-year period (2001-2021).

The study sits partly within the broader literature of the role of civil society in sociotechnical transitions, some of the literature on which is reviewed by Köhler et al (2019). This literature describes how publics exert influence as part of civil society via different forms of

organisation and activity, including via grassroots organisations (Smith, 2012), social movements and advocacy organisations. These can support different types of innovation by providing protective spaces where new practices or sociotechnical systems can be nurtured, or they can hinder change by bolstering regime resistance via active opposition. The need to include diverse perspectives in the design of new futures is a premise of transition management (Kemp et al., 2007), raising the question of how exactly to do this (Upham et al., 2015).

Regarding the case of Afghanistan, most of the major energy policies of the country have been developed in the last 20 years, again pushed by the development organisations, whose collective administrative capacity has outstripped that of the government. These agencies have changed the governance structure for energy supply, commercialising the large State energy utility DABS (Da Afghanistan Breshna Sherkat) in accordance with a liberal market model, while seeking to transfer 'best practices' from Asia, the EU and elsewhere. A key institutional process that we examine, therefore, is energy system privatisation and associated market development, advocated by donor agencies, and moving the country from its planned economy as a legacy of occupation by the Soviet Union, to its recent condition of a market economy being constitutionally obligated. The large-scale, centralised and state-owned energy utility, DABS, is not the only player anymore, as independent power producers can now obtain permits for energy generation, distribution, and operation in a regime shift from reliance solely on large hydropower and electrical power importation from central Asian countries and Iran, to one in which solar PV, natural gas and smaller scale systems are prevalent.

We also consider the role and aim of female empowerment in energy system institutionalisation: aid donor projects in Afghanistan have had over the last 20 years a consistent, pro-female gender component, backed again by constitutionally obligated measures, with a gender quota system in parliament. Of course this was prior to the Taliban's takeover of power in August 2021, after which the parliament was dissolved. Before this dissolution, aid donors and government representatives worked in girls' schools, teaching technical skills and seeking to raise the technical capacity of both genders. Of the three forms of institutional change, this is possibly the most uncertain in its consequences for the energy system and in terms of its longevity, given the return of the Taliban. Nonetheless we view gender empowerment as having the potential to change the cognitive-cultural aspects of institutionalisation in ways yet to be seen. The converse of this also applies: others have documented the way in which gender-related illiteracy and lack of technical skills can hold back adoption of small-scale energy technology, despite its potential (Pilloni et al., 2020).

This remainder of the paper is structured as follows. The next section provides background on the role that transnational actors play in institutional change, as part of which we also

review literature on processes of organisational change leading to institutional change. Section three elaborates our methodological approach and introduces our case study, the energy sector of Afghanistan. We then present our findings in the form of transition topologies and their accompanying narratives in section four. These topologies are developed for the three findings and in each topology one key event is highlighted to show the processes of institutional change. These are: Development of a regulatory framework for Afghanistan's energy sector (4.1), Privatisation of energy systems (4.2), and Women's empowerment (4.3). Section five discusses the findings in terms of their contribution to understanding which institutional changes transnational actors seek to induce, how they do this, and what types of outcomes are achieved in terms of changes to energy system institutions.

4.2. Transnational actors, sustainability and institutional change in conflict-laden development contexts

As the volume of research on sustainability transitions in Global South increases, the particularities of such transitions and the conditions in these contexts become clearer. One such particularity is that of transnational linkages, typically the inflow of technology, finance, and knowledge from the North often delivered by transnational actors such as development organisations (e.g., USAID, GIZ, development bank such as World Bank, NGOs, etc.) (Bell, 2007; Hansen et al., 2018). Development organisations, mainly via their access to resources, influence transitions in low-income aid-dependent countries (Marquardt et al., 2016; Mori, 2020; Tigabu et al., 2017). In this regard, the development of niches and regimes in Global South countries is particularly influenced by processes and interests for which the locus of decision-making power is outside the country (Manning and Reinecke, 2016; Nygaard and Bolwig, 2018; Sengers and Raven, 2015). This is not to say sociotechnical regimes and niches in Global North countries are confined to national or local boundaries (see e.g., Fuenfschilling and Binz, 2018; Raven et al., 2012). However, due to the Global South's stronger reliance on external aid, technology and knowledge, the influence of transnational linkages become greater. Overall, the foregoing arguably calls for relational conceptual frameworks that emphasise and account for the role of context-specific elements, to which geographical perspectives are well-suited.

With the Regional Transition Paths to Sustainability (RTPS) approach, Strambach and Pflitsch (2020) have developed a conceptual framework that is particularly suitable for the analysis of place-based institutionally-driven transition processes. Drawing on approaches from historical institutionalism (Mahoney and Thelen, 2009; Streeck and Thelen, 2005), the RTPS framework describes institutional change as happening in a non-disruptive way. It assumes that transitions rely on multiple smaller, gradual changes that only add up to a more

fundamental change over time. The framework thus offers an alternative explanation of how transitions come about compared to common approaches in transitions research (like the Multi-level Perspective and Technological Innovation Systems frameworks) that build on a distinction between niches and regimes. It furthermore enables to put particular focus on micro-macro level interactions; both regarding how micro-dynamics affect systemic outcomes over time as well as how macro-contexts affect micro-level agency. In addition, the RTPS framework describes agency as distributed among multiple actors and thus also enables to integrate less coordinated and heterogenous civil society actors.

Transitions studies have also made apparent the important role that organisations play in processes of institutional change (e.g., Brown et al., 2013; Kivimaa et al., 2019; Strambach and Pflitsch, 2020). Strambach and Pflitsch (2020) suggest that a focus on organisational change can help to elucidate how institutional work activities on the micro-level are stabilised and instantiate gradual changes on a systemic level of a development path. According to Greenwood and Suddaby (2006, p. 30), an organisation is "an archetypal configuration of structures and practices that give coherence by underlying values regarded as appropriate within an institutional context". Based on this definition, Strambach and Pflitsch (2020) emphasise the relationships between organisational and institutional change. Organisational change can be seen as both result and enabler of institutional change. On the one hand, organisations seek legitimacy for their activities in their institutional environments (Suchman, 1995). By responding to pressures in these environments, they indicate institutions as well as institutional change (DiMaggio and Powell, 1983). On the other hand, by forming an organisation, actors can mobilise others and increase the target orientation of their activities. Organisations can thus also be a mean by which to conduct institutional work.

The transition topology provides a methodological approach to capture such processes. By mapping organisational changes and their causal relations over time, the approach enables a place-based and gradual mapping of institution-driven transitions. Like in network analysis, this theoretically-informed mapping allows the identification of basic patterns. Based on these patterns, conclusions can be drawn about the mechanisms that drive, for example, transition processes in different contexts (industrialised countries vs. emerging economies) or about different drivers (e.g., civil society vs. state led) transition processes.

Seeing transnational actors as potential drivers of institutional change in socio-technical transitions in development contexts leads us to the following research questions: (a) What types of change may transnational actors seek in relation to energy?; (b) what forms of organisational changes may be initiated by transnational actors to induce institutional change?; and (c) what aggregate outcomes of transnational actors' distributed actions can emerge?

4.3. Methodology and Case

4.3.1. Research Case: The energy sector of Afghanistan

When the international community and development organisations arrived in 2001, Afghanistan had lost infrastructures, state institutions and human capital during the first Taliban rule (1996-2001), the civil war (1992-1996), and the war against the Soviet forces (1979-1989). By 2001 almost entire infrastructures of the country were in ruins; millions had lost their lives and millions more had fled the country; and state institutions could no longer function. In addition to the initial post-9/11 'war on terror' mission, the international community led by the US also took on the mission of state-building. Numerous infrastructure development, institutional building, technology transfer, and capacity building projects have been implemented in various sectors since 2001.

In the electricity subsector alone, the donors have spent more than 4 billion US dollars (Integrity Watch Afghanistan, 2020). More than a dozen of transnational actors have been active in the energy sector of Afghanistan for the past twenty years, of which the major actors have been, in no particular order, United States Agency for International Development (USAID), World Bank, Asian Development Bank (ADB), German development organisations Gesellschaft für Internationale Zusammenarbeit (GIZ) and Kreditanstalt für Wiederaufbau (KfW), and United Nations Development Programme (UNDP) (Fahimi and Upham, 2018). These actors have implemented numerous projects both to (re)build the hard infrastructure in the sector and increase access to energy as well as to develop the regulatory framework and capacity in the government and private sector institutions.

4.3.2. Methodological procedure

To investigate how transnational actors initiate institutional change, we employ the approach of transition topology (Strambach and Pflitsch, 2020). This is a process based approach, which is mainly about understanding how things evolve over time and what or who drives this evolution (Langley, 1999; Langley et al., 2013). The approach therefore combines a rich narrative description with a detailed reconstruction of event sequences in form of a directed graph. The latter – like a topological map (e.g., a subway plan) – represents structural relationships between elements in an abstract space. It furthermore builds on the proposition, articulated above, that organisations both indicate and enable processes of institutional change. It thus uses organisational forms as a means to reconstruct processes of institutional change. The topology presents indicators for different forms of organisational change. In addition, the topology contains proxies for institutional change, such as the enactment of new laws or the implementation of a new voluntary standard. Moreover, it

makes visible different forms of relations between these changes (e.g., when change processes build on each other or when change processes stem from the same organisation). In this way, it illustrates how organisational and institutional change processes build on each other over time and makes it possible to identify where these sequences (that lead to certain outcomes over time) originate. The approach can therefore be used to identify and compare development patterns and specific dynamics between transition paths of different regions, actors, industries, socio-technical systems, etc.

In this vein, Strambach and Pflitsch (2020) have suggested that temporality of organisations also matters. Permanent organisations that are equipped with resources rather serve to maintain and stabilise transformative dynamics. *New formal organisational entities* can however also attempt to change practices and thus institutions. If they aim for the latter, they first need to establish a certain degree of legitimacy for their actions (Strambach and Pflitsch, 2020). New formal organisations contribute to institutionalisation of new practices and add to the diversity of institutional settings.

Instead, temporary organisations open up new possibilities by bringing actors together outside their daily routines and giving them the opportunity to see things from a different perspective. We distinguish between two forms of temporary organisations: (1) temporary events and (2) projects.

Temporary events, such as fairs, festivals, or conferences, are characterized primarily by the fact that they encourage spontaneous and unplanned interactions among participants (Lange et al., 2014). In this way, they provide opportunities for realigning and disentangling normative and cultural elements of institutions, exploring knowledge complementarities, assigning meanings, and collective sense-making (Strambach and Pflitsch, 2020, p. 5). The fluid composition of participants that is characteristic for this form of organisation prevents the formation of fixed working structures and relationships between actors. Temporary institutionalised events can therefore serve to break up entrenched institutional structures and develop new social practices.

Projects, which are widely used in the portfolios of development organisations, are a specific form of temporary organisations "that allow companies and other individuals or collectives to organise in a flexible and ad hoc manner" (Söderlund and Sydow, 2019, p. 259). They are based on a specific task, much like formal organisations are committed to goals, and are evaluated against deadlines and milestones (Grabher, 2002). The focus on a specific goal, the clearly defined project organisation, and the purposeful selection of project participants distinguish projects from the temporary events described above. Organisations can use projects to carry out institutional entrepreneurship or work activities (Söderlund and Sydow, 2019). Thus, projects are more focused on achieving institutional change than

temporary events. They also offer organisations an opportunity to test whether it is worth investing more resources in stabilising this institutional change.

Finally, *network forms of organisation* are situated between permanent and temporary forms of organisation, as they bring together actors from different organisations on a temporary basis, but usually have more stable structures than the temporary organisations mentioned above. Unlike projects, networks are focused on longer-term goals and are not limited in time from the outset (Söderlund and Sydow, 2019). Organisational networks coordinate interactions and transactions among participating actors (Powell, 1990). As with temporary organisational forms, actors can be introduced to new and potentially competing or conflicting institutional logics in networks. Networks thus have the potential to act as breeding grounds from which new formal structures can grow, which in turn can lead to the stabilisation and institutionalisation of new practices.

For the purposes of this study, we identify organisational and institutional changes as outlined in Table 1. Here, in addition to institutional change events, we consider the following four forms of organisational changes (Grabher, 2002; Strambach and Pflitsch, 2018): (a) new formal organisational entities, (b) organisational networks, and temporary organisational forms such as (c) temporary events and (d) projects (see Table 1). In the Findings section, these are referred to with an assigned number in parentheses as per Appendix 4 and represented in the figures by icons as per Table 1.

Table 1: Definition and characteristics of organisational and institutional changes

Forms of Organisational Change	Definition/Characteristics
New formal organisations	This refers to the creation of entirely new organisations or the establishment of new departments within an existing organisation. Compared to networks and temporary organisational forms, new formal organisations are more stable and have their own financial, technical, and administrative resources.
Organisational networks	Networks are a more fluid form of organising than are formal organisations. They bring actors with a common interest together. Networks, here, are identified from the time of their launch or the date of their accession to established networks.
Temporary events	Temporary events are a form of temporary organisation referring to launch of (a series of) events for a specific purpose. In such events different actors find the opportunity to interact with other actors.

Projects	Projects are a form of temporary organisation with a clear start and end date. A project is based upon a particular task but can be comprised of several components.
Institutional Change Events	Events that reflect a change in rules, norms, or cognition such as the implementation of a new law or a new standard.

The study was carried out in four steps. First, we undertook desk research of each of the webpages of the five largest development organisations active in Afghanistan, identifying projects and activities in the energy sector undertaken between 2001-2021. Reviewing these findings helped to identify interview partners and relevant documents. In a second step, we conducted interviews with the experts and stakeholders identified in the first step. Among the interviewee partners representing development organisations, the government of Afghanistan, and academia, it was ensured that all of the five development organisations that we focus on here were represented by at least one interview partner who was working or had worked with them. A total of fifteen interviews were conducted (of 52-108 minutes each). The scheme of questions can be found in Appendix 2. In addition to interviews, we also looked at documents including reports (e.g., project evaluation reports), policy documents, and assessments produced by the five development organisations, the government of Afghanistan, and other organisations. We have listed these documents in Appendix 3. This was supplemented by personal communication (e.g., email correspondence) and phone calls for clarification and extra information as required.

In step three we analysed and coded the qualitative data with MAXQDA software, with the approach being an iteration of bottom up and theory-led coding, whereby similarities are grouped as themes that relate to the topological approach, i.e., the types of institutional and organisational change events listed above. After coding, three general themes emerged. These themes revolved around development of regulatory framework for the energy sector, privatisation of energy systems, and women empowerment. Following this, in step four, we developed topologies for each theme based on the interview data, documents, and the material collected in step one. Events identified for these topologies were differentiated as organisational or institutional change based on the definitions in Table 1. These events were then assigned to certain actors or actor groups depending on which actor was the (main) initiator of the event. Connections between events were constructed based on qualitative analysis of the data: connections were established if events built upon previous events, for the most part written in documents and/or stated in interviews. Gaps in the data or inconsistencies were clarified by additional document research or queries. The methodological procedure can thus best be described as an iterative process, as illustrated in Figure 1.

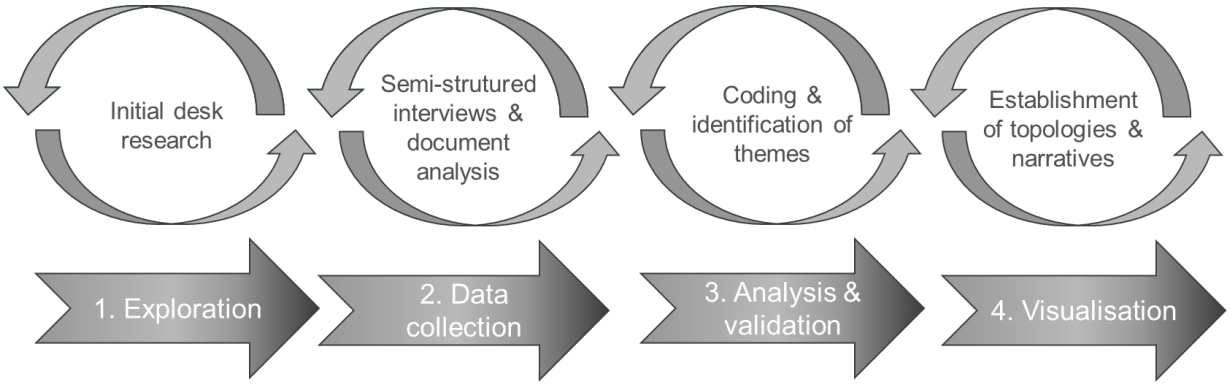

Figure 1. Methodological procedure for establishing transition topology.
Source: Based on Strambach and Pflitsch (2020)

Furthermore, a narrative description for each topology is presented in the next section. In each narrative description, given limited space, we elaborate on one key organisational or institutional change event in the relevant topology as an example. The complete lists of these organisational and institutional change events for each topology are provided in the appendices.

4.4. Findings

In this section we answer the research questions on (a) types of change sought, (b) forms of organisational changes initiated, and (c) emergent outcomes in terms of the following subsections: *development of a regulatory framework for Afghanistan's energy sector (4.1), privatisation of energy systems (4.2), and women's empowerment (4.3).* All three sub-sections constitute answers to research questions (a-c). The presentation is descriptive and is discussed subsequently. Narrative descriptions of key events in the topologies have been limited to one per section. Partly due to the challenges of sourcing primary and secondary data in a conflict zone, we do not claim to have captured all organisational and institutional change events in the energy sector induced by transnational actors. In some cases, joint efforts with participation of multiple national and transnational actors have produced organisational and institutional changes that can include but have not been initiated by one of the major five. In the topologies, such cases have been organised under "Actors including the major five". In other cases of joint efforts where one actor has played a leading role, either in terms of resources, precedency or otherwise, organisational or institutional changes have been listed under the name of that actor. In nearly all cases of organisational or institutional change, the interviewees reported that national actors (e.g., Afghanistan governmental agencies, non-governmental organisations, or civil society actors, etc.) were involved.

4.4.1. Development of a regulatory framework for Afghanistan's energy sector:

Along with a fivefold increase in access to electricity and further energy infrastructure expansion, development of the energy sector's regulatory landscape in Afghanistan is widely talked about as an important achievement by development organisations. In 2001, after decades of war, the regulatory framework of Afghanistan's energy sector, similar to other sectors, was non-functional. With the Bonn Agreement of 2001 under the auspices of the United Nations and the ensuing involvement of international community, transnational actors such as the World Bank, ADB, USAID, GIZ, and UNDP resumed their activities in Afghanistan (see institutional change events 4-8 in figure 2), launching numerous projects including in the energy sector. These efforts helped the regulatory framework of the country's energy sector to take shape.

Figure 2 shows that especially the second decade of development organisations' involvement (i.e., 2011-2021) saw the development of several important policy and legal documents such as the Power Sector Master Plan (see e.g., institutional change event 61) or the Renewable Energy Policy (73) and the establishment of key organisations including the Afghanistan Renewable Energy Union (67) and the Energy Services Regulation Authority (122) in the energy sector.

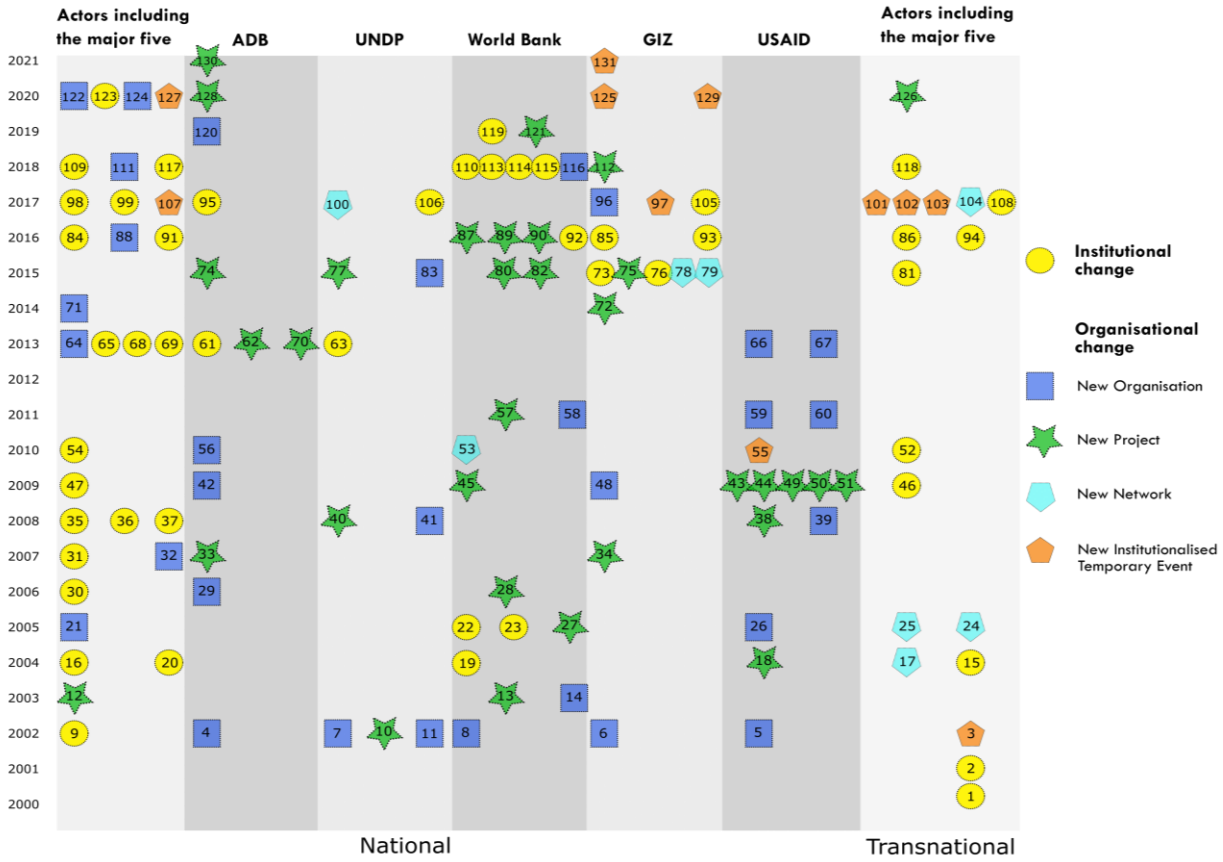

Figure 2. Map of organisational and institutional changes in terms of regulatory framework development for the energy sector of Afghanistan.

Before diving deeper into key events, we present some general observations looking at the topologies in this subsection (figure 2 and 3). First, we see a relative increase in the institutional change events in the latter years compared to the early periods. Upon closer inspection of events, it becomes clear that some of these institutional change events are directly related to previous organisational changes: for example, adoption of laws as a result of projects (e.g., events 34 and 75 leading to 76, 85, 93, 94, 105 and 108 in figure 3). Second, the topology makes it apparent that a relatively higher number of projects were carried out in the period 2006-2016. These projects induced further institutional and organisational changes at later points in time, as we will elaborate in more detail below. Third, we also see an increase in the number of temporary events in the last five years leading to 2021. They are, as shown in figure 3 and observed in the data, consequences of the projects in the earlier phase. Fourth, it becomes clear from the topology that interactions among transnational actors have been limited (see e.g., figure 3 where a project by GIZ rarely contributes to organisational or institutional changes by other actors). However, we also see some exceptions, one of which we highlight in the next section (4.2). Fifth, looking at the left column of the topology in figure 2, the cluster of yellow circles up until 2010 indicate that the majority of institutional changes in the early stages of transnational actors' involvement are the outcome of efforts by multiple actors including local agencies as per the data. Looking at the entire period too, except for the World Bank and GIZ between 2015-2019, it is "Actors including the major five" that have induced the highest number of institutional changes. What follows is a brief account of major organisational and institutional changes induced by transnational actors to develop the regulatory framework for Afghanistan's energy sector.

Although the focus of development organisations in the first decade (i.e., 2001-2011) was to increase access to electricity and (re)build the energy sector's infrastructure, several important steps to develop the sector's regulatory framework were also taken in this decade. Figure 2 shows that the groundwork for the development of the regulatory framework was already laid early on with the implementation of the first minerals law (22), hydrocarbons law (23), and power sector master plan (19). See appendix 4 for details of all organisational and institutional change events. Furthermore, we see that the commercialisation of the energy utility (i.e., the then Da Afghanistan Breshna Moassessa (DABM)) and its conversion from a state-owned enterprise to a company (i.e., the current Da Afghanistan Breshna Sherkat (DABS)) started in 2008 (37). This commercialisation – a step towards privatisation - is detailed in the next subsection. In the same year an energy strategy was prepared as part of Afghanistan National Development Strategy (36). The original Afghanistan National Development Strategy (35) which needed donors' approval is in fact Afghanistan's Poverty Reduction Strategy Paper – a document, widely used with regards to low-income countries,

required by the International Monetary Fund and World Bank for debt relief and aid provision purposes. The energy strategy as part of this document was the first comprehensive study of and strategy for the sector prepared with the support of donor agencies including the World Bank. Organisational and institutional changes such as these can thus be considered as the building blocks laid in the first decade after 2001 upon which the main efforts to develop the sector's regulatory landscape in the second decade were based.

In the second decade of the development agencies' involvement the focus shifted from building infrastructure to institution-building. As an interviewee noted: "in the latter 10 years, more focus was paid to system building and capacity building. A great deal of funds has been allocated to and spent in these areas". To illustrate in more detail how aid organisations use temporary organisations in the form of projects and temporary events to induce institutional changes in this latter phase, we present the example of a project by the German development organisation GIZ in figure 3.

Figure 3 illustrates launching of the project Institutional Development for Energy in Afghanistan (IDEA) (75) by GIZ in 2015 as a successor to its previous project in 2007 - Afghanistan Energy Programme Renewable Energy Supply for Rural Areas (ESRA) (34). ESRA's activities concentrated on (A) developing the regulatory framework for the energy sector such as policymaking, coordination and establishing communication channels, and preparation of electrification planning, (B) developing standards foundations for the sector such as working with the National Electro-technical Committee and Standards Committee, adoption of global energy standards, and testing and certifying electro-technical products, (C) electricity customer service matters including awareness raising campaigns on productive use of electricity or gender and electricity and implementing pilot projects including mini-hydro and solar photovoltaic projects and (D) training trainers and technicians in the newly equipped Renewable Energy Vocational Centre at the Ministry of Energy and Water.

IDEA, similar to projects implemented by most other donor agencies in Afghanistan, was comprised of several components. Component A of the IDEA project, as per an interviewee, aimed at strengthening and implementing policies and strategies in the energy sector: "[F]or component A which was sectorial framework conditions, we worked for [the development of] renewable energy policy, renewable energy strategy, national energy policy, feed-in regulation, and the last one was the EE [energy efficiency] code" (see e.g., the arrows from project 75 to institutional change events 76 and 85 indicating this project led to these institutional changes). Under this component, several action plans, policies, and strategies such as Feed-in Tariff Policy, Afghanistan National Renewable Energy Strategy, and Afghan National Renewable Energy Action Plan were drafted but not enacted.

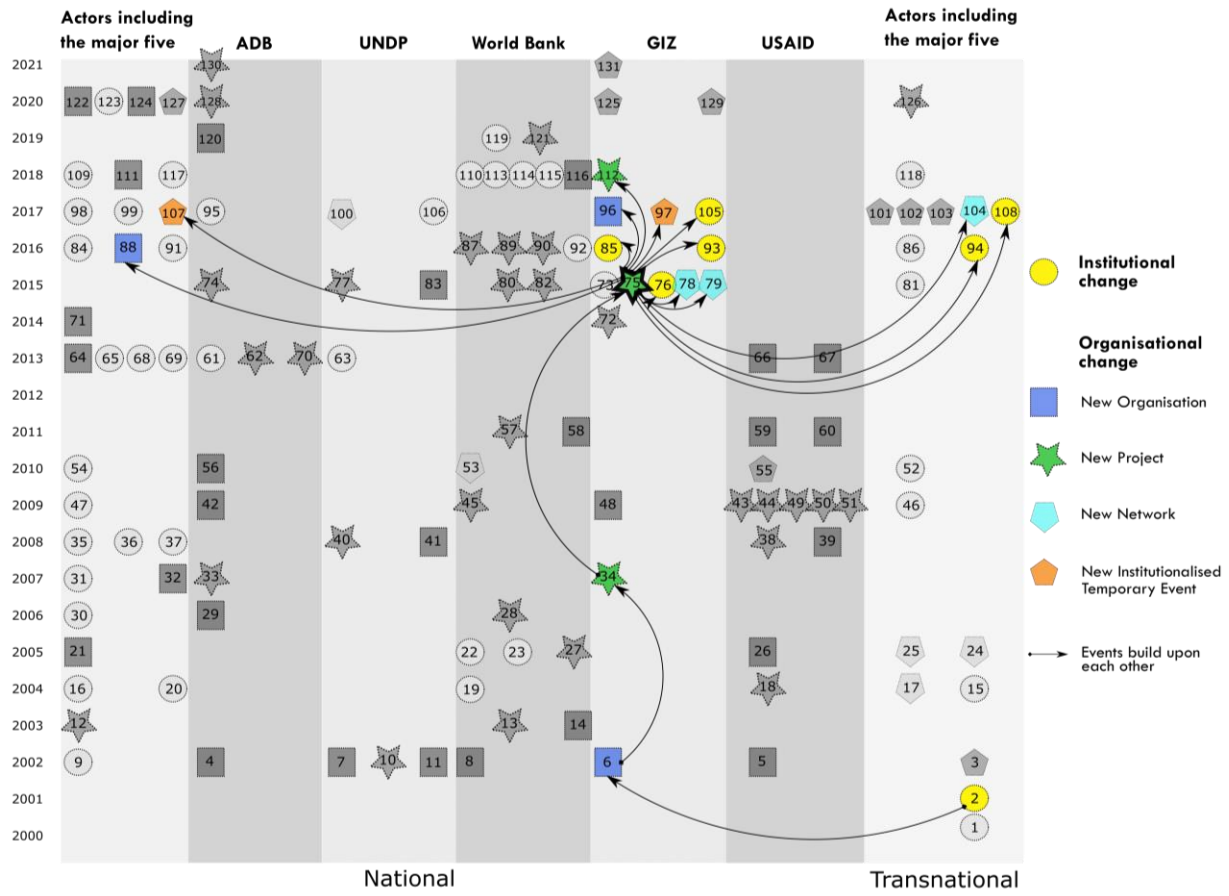

Figure 3. Map of organisational and institutional changes in terms of regulatory framework development for the energy sector of Afghanistan with a key event highlighted to show change processes and relations.

The three other components of IDEA were inter-institutional cooperation and stakeholders' coordination (component B), knowledge management in terms of awareness raising regarding renewable energies and energy efficiency (component C), and private sector development (component D). Under component B, IDEA created coordination structures such as the Renewable Energy Coordination Committee (see organisational change event 78 in figure 3) at national level and Provincial Energy Committees (79) at local level. Under component C, IDEA established Afghanistan Energy Information Portal (96), similar to earlier efforts by USAID in 2005 where they established the Afghanistan Energy Information Center (26). GIZ, under the same component of IDEA project helped launch Afghanistan Sustainable Energy Week (ASEW) (here project 75 contributes to the launch of temporary event107) – a series of events - for the first time in 2017. Afghanistan Sustainable Energy Week held a series of various events for diverse audiences such as women, private sector, schoolgirls, and general public. These events were organised to, among other purposes, raise awareness about the benefits of renewable energy technologies and energy efficiency. Government officials and representatives of development organisations visited schools and

held sessions for schoolgirls on saving energy, renewable energy and how they and their mothers could contribute to in these regards. The second series of the sustainability week (ASEW II) (129) was launched in 2020. These findings and those in the following subsections speak to two of our three research questions in terms of what changes transnational actors seek in relation to energy and what forms of organisational changes they initiate.

IDEA, under its component D, assisted with the development and institutionalisation of Afghanistan Renewable Energy Union (AREU) (67, established with the support of IDEA's predecessor ESRA, other donors, and actors). It is a union of private sector companies active in the renewable energy, mostly solar, which was created with 12 members in 2013. The union was supported by the USAID in the beginning. However, since shortly after its creation, GIZ has been the main donor supporting its development and institutionalisation. In addition to developing Afghanistan Renewable Energy Union's governance system and structure, IDEA supported the nascent union in establishing relations with various national, regional, and global organisations such as Afghanistan's Ministry of Energy and Water (93), Afghanistan National Standards Authority (117), Kabul University, Afghanistan Chamber of Commerce and Investment, Renewable Energy Academy, German Solar Industry Association or Bundesverband Solarwirtschaft e. V. (94) in 2016, Mercy Corps in 2017 (108) and International Organization for Standardization Afghanistan (118) in 2018. "Now, more than 120 companies are only working under this structure of the Afghanistan Renewable Energy Union" stated an interviewee. In 2018, GIZ concluded IDEA and replaced it with another project called Energy Sector Improvement Programme (112) in which component two of four components was dedicated to development of the private sector. Appendix 4 provides a list of organisational and institutional change events in the regulatory development topology.

4.4.2. Privatisation of energy systems

With the arrival of mostly Western transnational actors in 2001, Afghanistan shifted to a market economy. The country had followed a state-led development model for decades prior to the turn of the century as several governments between 1960s and 1990s were backed by the then Soviet Union. Adopted in 2004, three years after the arrival of international community, article ten of Afghanistan's new constitution, read "the State shall encourage, protect as well as ensure the safety of capital investment and private enterprises in accordance with the provisions of the law and market economy". This structural shift, encouraged and supported by transnational actors, set off major changes in the economic system in general and the energy sector in particular. For instance, state-owned enterprises (SOEs) which played a significant role in delivering services prior to 2001 were commercialised or privatised with the help of mostly Western transnational actors. It is claimed that "[o]ne of the most important, early initiatives of the U.S. support to private

sector development was the privatisation or liquidation of the majority of the 65 Afghan SOEs, which were considered moribund and inefficient…. DFID, GIZ, and USAID launched privatisation-focused programs in Afghanistan early in the reconstruction period" (SIGAR, 2018, p. 98).

Of the 65 state-owned enterprises, the state-owned energy utility, the then Da Afghanistan Breshna Moassessa (DABM), was a key player in Afghanistan's energy sector. With the support of multiple transnational actors, chief among them the World Bank and USAID, DABM was commercialised and converted to a company called Da Afghanistan Breshna Sherkat (DABS) (27). As the topology in Figure 5 illustrates, a World Bank project (20) in 2005 was one of the first efforts made towards the commercialisation of the State energy utility. Even though the utility's shareholders still continue to be four governmental ministries, the commercialisation was carried out such that the utility can operate on commercial cost-recovery basis and be completely privatised in the future. This development at the national level led to privatisation processes at provincial level.

Before we take a closer look at the privatisation efforts, it is worth presenting a few general observations from the topologies. First, looking at figure 4, we observe that institutional changes are largely occurring as a result of cooperation between multiple actors including the major five (see the left column of the topology in figure 4). Second, we see a noticeable increase in the number of projects between 2009 and 2019 (see, in figure 4, the increase in number of projects by the World Bank and USAID in this period). Third, in this topology too, temporary events emerge later in the last five years. These events are organised by mainly USAID and GIZ, at both national and international levels. Fourth, as figure 5 shows, two different development organisations (i.e., 3 and 7) implemented two different projects in different years (i.e., 20 in 2005, 26 in 2007) to bring about one institutional change– corporatisation of the State energy utility (27). And fifth, as illustrated in Figure 5, an institutional change (i.e., 27) induced by multiple actors becomes the basis on which other individual actors build their activities. It may be noted that this differs from the more general trend whereby actors have usually built upon their own work. The issues of a lack of coordination between donors and cases of duplicative efforts were often raised by interviewees.

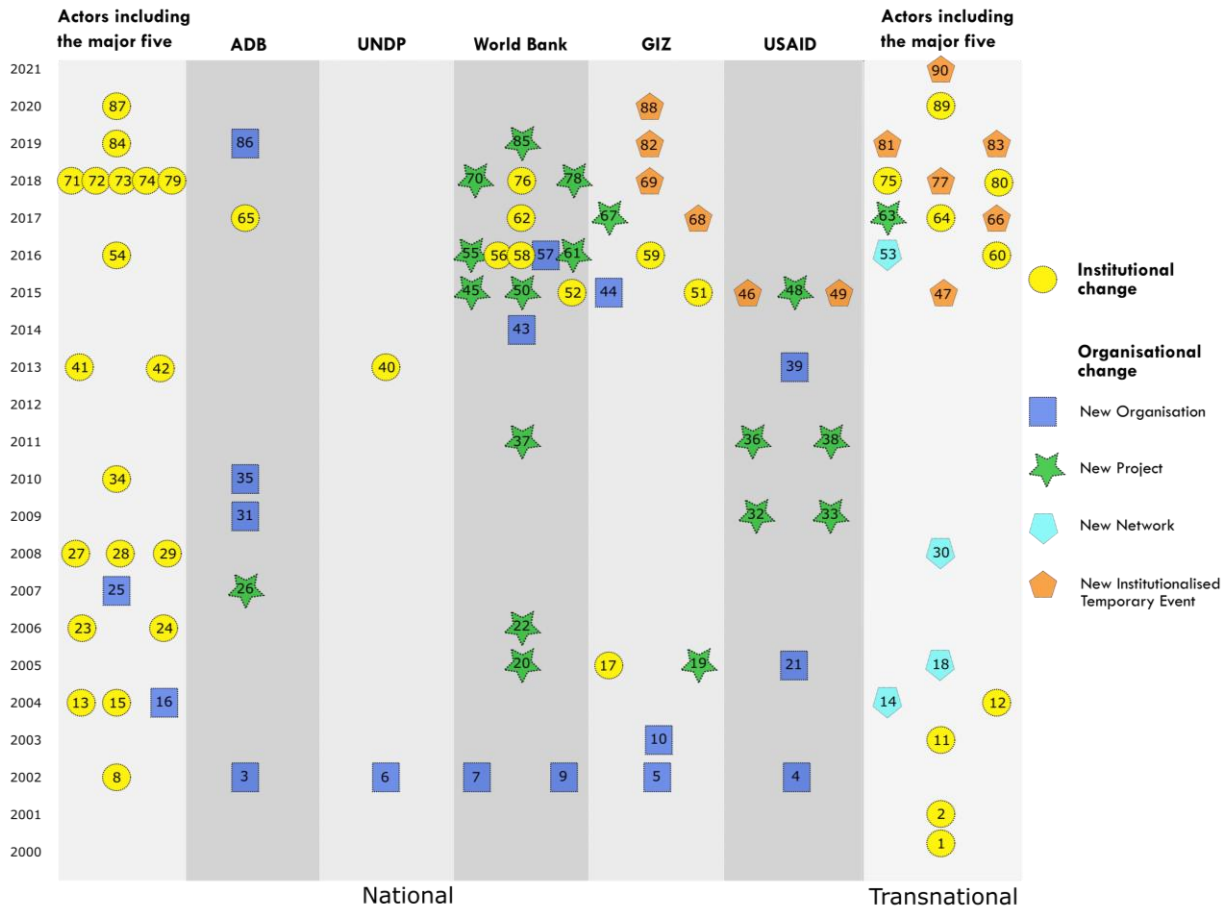

Figure 4. Map of organisational and institutional changes in terms of privatisation of energy systems in Afghanistan.

Figure 5 illustrates one example of privatisation efforts in the energy sector of Afghanistan by transnational actors. Looking at figure 5, we see that in 2009 the USAID launched two projects to assist with the commercialisation of Kabul Electricity Directorate (see projects 32 and 33). From this topology we also observe that privatisation of the national energy utility provided the basis for privatisation efforts at provincial level (see the arrows from 27 leading to 32 and 33). Over a decade later, the privatisation efforts resulted in handing over of an entire provincial energy system to a non-state actor – Badakhshan Energy (see 27 leading to 84 in figure 5). Badakhshan Energy, a subsidiary of the Aga Khan Fund for Economic Development, with transnational linkages has modelled the acquisition on Pamir Energy's case in the neighbouring Tajikistan. This handover of a provincial energy system to a private company, the first of its kind in Afghanistan, can also be traced back to earlier donors-backed public-private partnership (PPP) efforts in the energy sector (e.g., 43, 56, 57, 62) in addition to the commercialisation of DABS.

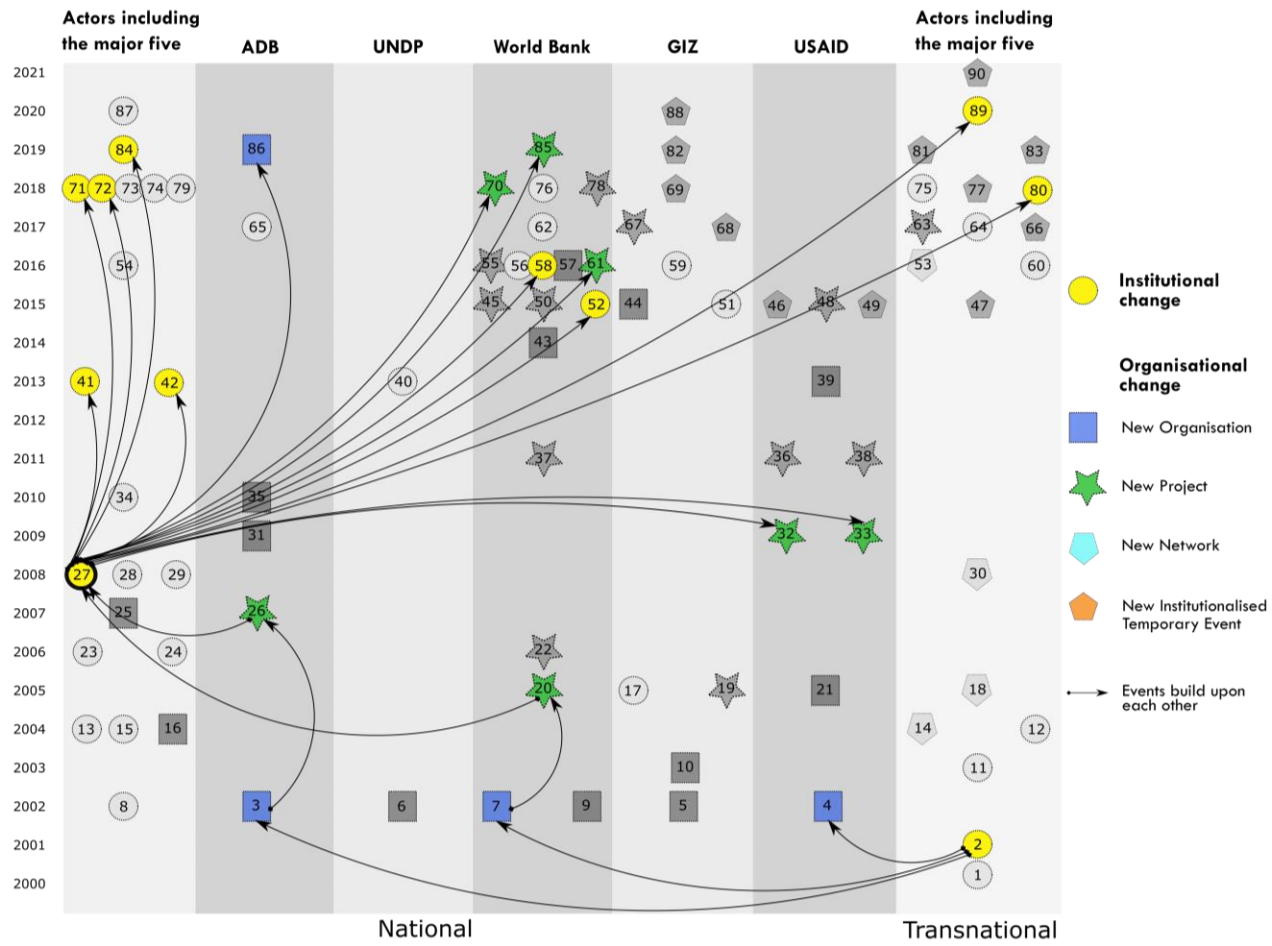

Figure 5. Map of organisational and institutional changes in terms of privatisation of energy systems in Afghanistan with a key event highlighted to show change processes and relations.

Efforts to promote PPP initiatives coupled with the development of PPP regulatory structure including the establishment of a PPP unit (57) and the development of a PPP law (56) paved the way for the involvement of independent power producers (IPPs) in the energy sector. Two private companies, Bayat Power and Ghazanfar Group, recently signed memoranda of understanding (MoU) with the government of Afghanistan represented by DABS (52 and 58) to produce electricity from domestic gas resources in the north of the country. These developments in addition to the preparation of long-term power purchase agreements, signings of MoUs, and revision of PPP law, among other things, encouraged private sector engagement in the energy sector. See appendix 4 for a list of organisational and institutional change events in privatisation topology.

4.4.3. Women's empowerment

Transnational actors, particularly development organisations initiated numerous programmes to empower women in Afghanistan. Before we dive deeper, a brief description of the context helps in understanding the situation and post-2001 empowerment efforts. Afghanistan, in terms of what role women play in the society, can be considered a conservative country ranking very low in gender equality indexes. The return of the Taliban to power in August 2021 has reversed most of the advances regarding women empowerment.

In the post-2001 era, women empowerment quickly became a buzzword. Immediately after the Bonn Agreement of 2001, the establishment of a ministry dedicated to women was agreed upon (3). This was one of the first major steps towards women empowerment in the country. Through the Ministry of Women's Affairs and other channels, transnational actors actively lobbied for a 27% quota for women in the legislature (Bush, 2011). Furthermore, these actors supported Afghanistan in ratifying several international human rights and women rights documents including the Convention on the Elimination of All Forms of Discrimination against Women in 2003 (13). Development organisations supported and encouraged participation of women in their projects. "Gender equality issue has been very much at the centre of attention in every program or initiative supported by international community such as multilateral development banks or international aid agencies who worked in Afghanistan. We may not be able to find a project, initiative or programme that has been either financially or technically supported by them in which we do not come across the term gender equality" stated an interviewee.

In their projects, including projects on non-gender issues, development organisations actively sought to encourage recruitment, capacity building, and contribution of women. For instance, in a project spearheaded by the World Bank and the government of Afghanistan, National Solidary Programme which is dubbed as one of the most successful development projects, women found the opportunity to play a major role in community development projects and socioeconomic life in general. Women constituted around 40% of the members of community development councils established within this framework (IEG Review Team, 2018). National Solidary Programme (NSP) created around 35,000 community development councils across Afghanistan with the total number of community development council members reaching around 350,000 in 2013 (IEG Review Team, 2018). Women were strongly represented in these councils in most areas and at different levels. These were expected to gradually transform into Village Councils, a governance unit at the village level envisioned in the Constitution of Afghanistan.

Looking at figure 6, we see a similar trend to the topologies presented above in terms of institutional changes occurring as a result of cooperation among multiple actors (see the left

column in figure 6). However, contrary to the previous topologies, the number of institutional changes in the women empowerment topology decreases over time. However, as in the other topologies, the number of temporary events increases in the second decade of transnational actors' involvement. Similarly, one can see that the number of projects between 2006 and 2018 were higher than the periods in the beginning or the end of donors' involvement. Comparing this topology with the ones presented above, it becomes clear that actors engaged less in creating new organisations. With regards to network creation, we notice a comparable number of networks created for empowering women and the other two topologies. One such network was created by GIZ in 2017 and another by the World Bank in 2018 on which we elaborate next.

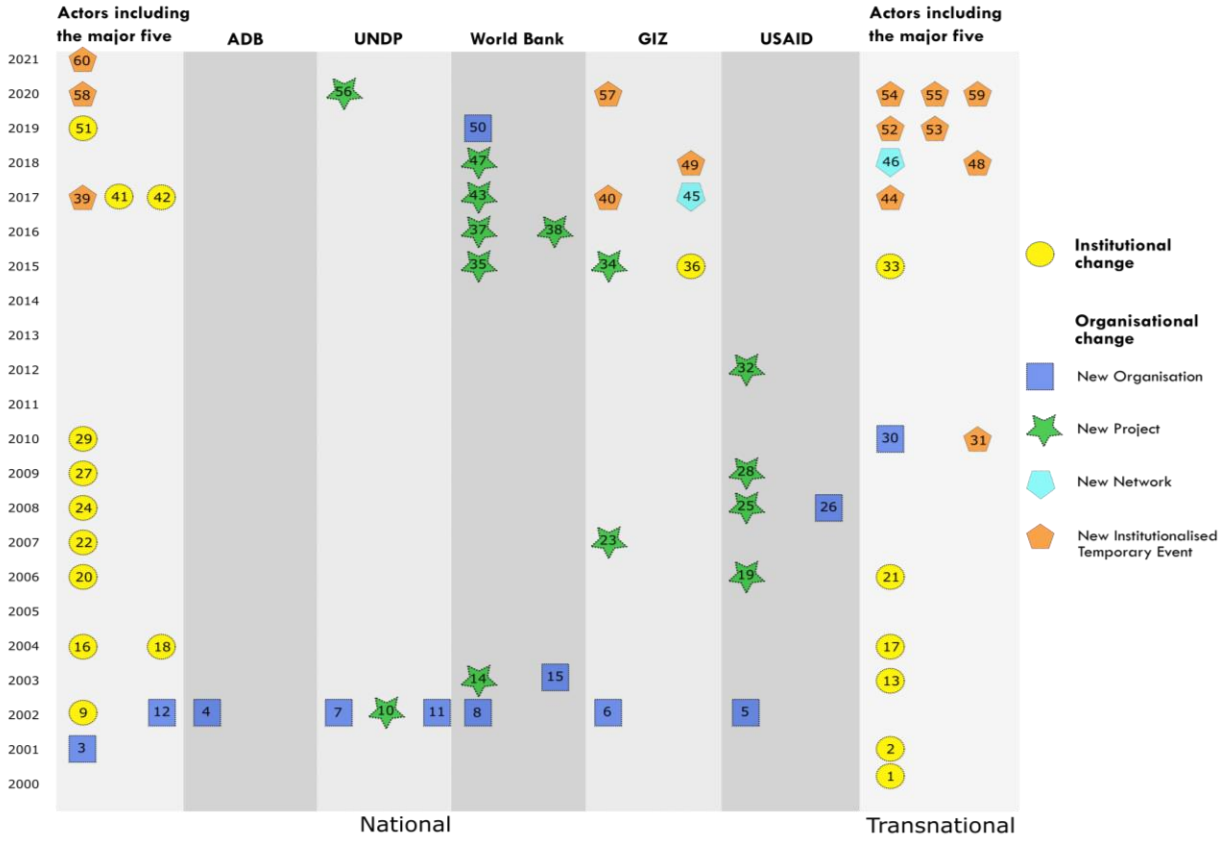

Figure 6. Map of organisational and institutional changes in terms of women empowerment in the energy sector of Afghanistan.

To illustrate how networks contribute to institutionalisation processes, in this case in relation to women's empowerment in in the energy sector of Afghanistan, we look at the launch of and accession to WePOWER. Figure 7 shows these processes. In 2018, the World Bank established WePOWER (see network 46 in figure 7), a network of women in power sector in South Asia. WePOWER defined 5 pillars for its activities: (a) Science, Technology, Engineering, and Mathematics STEM education, (b) Recruitment, (c) Development for female

engineer professionals, (d) Retention, and (e) Policy and institutional change. Afghanistan's energy utility, DABS, was supported to become an institutional partner. WePOWER organised several events since its launch including partnership forums (see events 48, 53 and 54 in figure 7), regional conferences (52), and steering committee meetings (55, 59) where Afghanistan was regularly represented by DABS. By becoming a partner of WePOWER, DABS made commitments in the network's conferences and events to improve conditions for women in Afghanistan's energy sector. For instance, for 2021 DABS committed to train 50 female interns, hire 100 female employees including 15 university graduates, provide kindergarten services in two provinces, provide separate praying rooms and toilets for women in all 34 provinces, and continue their 3-month maternity leave policy and flexible working hours for female staff.

Following the partnership with WePOWER, DABS signed a memorandum of understanding with Tetra Tech company (51) for an internship programme for the female employees of DABS. Another notable step in terms of women empowerment by DABS is the establishment of a gender department (50) within the utility. A World Bank blogpost (Shibuya, 2020) on DABS' partnership with WePOWER notes:

> DABS' impressive increase in female employees occurred alongside DABS' joining the South Asia WePOWER Network as an institutional partner. … In addition to aggressively recruiting female engineering students for paid internships, DABS scheduled more training sessions for female employees to develop professional skills and encourage internal promotions for successful women seeking new challenges. … At DABS, the transformative changes were spearheaded by two women employed in DABS' human resources department. Both are DABS' enthusiastic focal points of WePOWER. …. In 2019-20, the utility constructed kindergartens in two provinces, separate toilets for women in all provincial offices, and separate mosques for women in 6 provinces. DABS regularly publishes success stories about women employee role models and offers awards to its best employee.

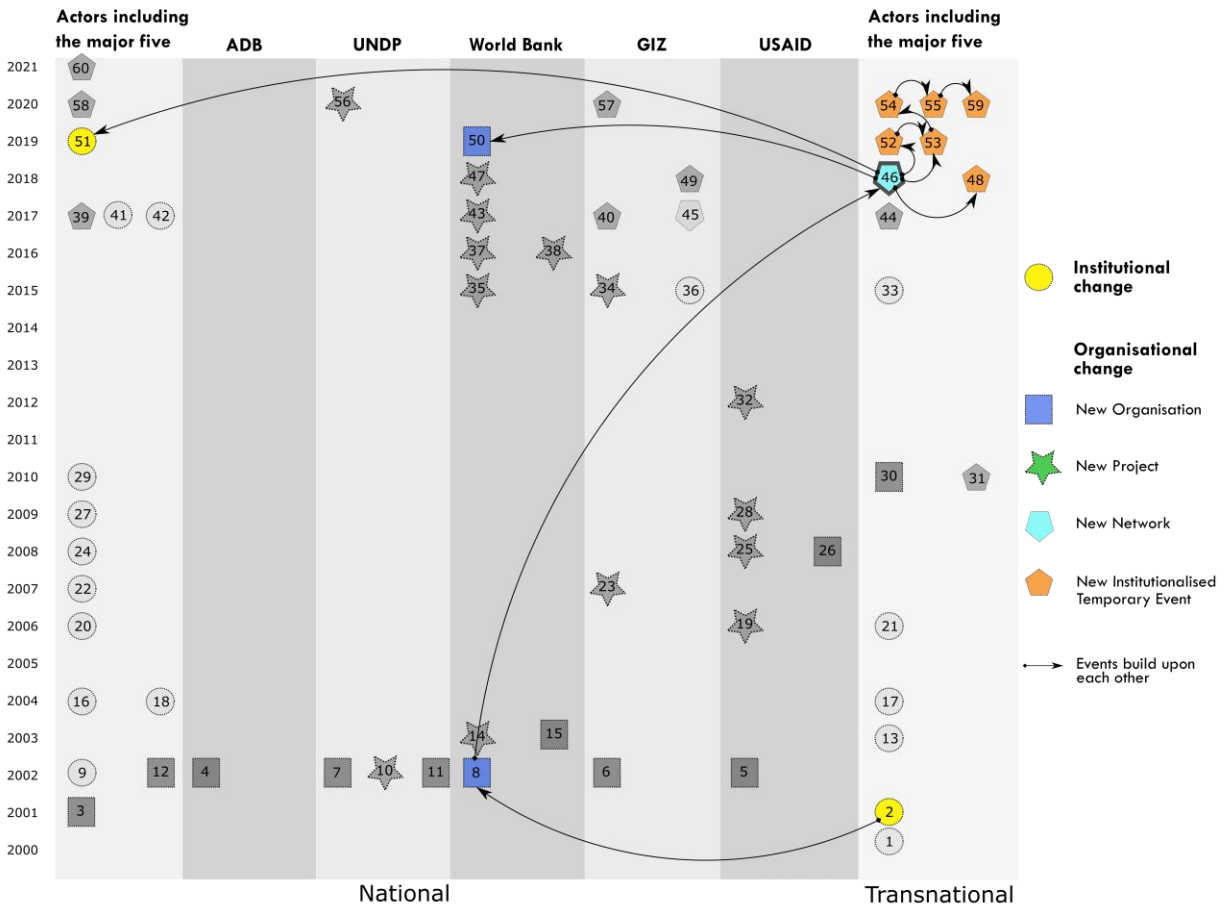

Figure 7. Map of organisational and institutional changes in terms of women empowerment in the energy sector of Afghanistan with a key event highlighted to show change processes and relations.

Lastly, women empowerment also received considerable attention in the majority of policy documents in the energy sector developed with the support of transnational actors. In the strategy documents of the government of Afghanistan developed with the assistance from transnational actors, issues around gender and women empowerment featured prominently either as cross-cutting or in dedicated sections such as in the Afghanistan National Development Strategy and Afghanistan National Peace and Development Framework. Developments such as the examples mentioned above contributed to the widening of female-friendly environment in various sectors including the energy sector. A list of organisational and institutional change events in women empowerment topology can be found in Appendix 4.

4.5. Discussion

Our research questions here have concerned (a) the types of change sought by organisations active in Afghanistan's energy transition; (b) the forms of organisational change that were initiated; and (c) the outcomes that emerged from this. We answered these in terms of the examples of the development of a regulatory framework for the energy sector, energy privatisation initiatives, and female empowerment in relation to energy. Using the transition topology approach, we trace the role of transnational actors in the institutional changes observed.

Our findings highlight the roles that development organisations play in the institutional change activities that both constitute and support transitions processes. These activities include creating formal organisations, setting up networks, initiating temporary events, and implementing projects which have been widely used in the context of Afghanistan. Over the 20 years between 2001 and 2021, with the cooperation of local players, transnational actors have developed a regulatory framework for the energy sector of Afghanistan, encouraged and strengthened the private sector including in the energy sector with public private initiatives and involvement of independent power producers, and empowered women.

A notable organisation-related finding is the widespread use of projects, a type of temporary organisation, by development organisations. From the topologies we see that on multiple occasions, origins of permanent organisations or institutional changes can be traced to projects. There have been attempts to study the link between projects and institutional change in e.g., Söderlund and Sydow (2019) and accompanying articles (e.g., Lieftink et al., 2019; Tonga Uriarte et al., 2019). However, studying projects designed usually by international development organisations for implementation in low-income countries and the linkage with institutional change raises questions that are not answered in studies on projects in firms or in Western countries. Further research is required to study the contexts and complexities of projects and their interactions with the wider environment in low-income countries, the usual recipients of projects designed by transnational actors. In Afghanistan's case, particularly projects to empower women or privatise energy systems can be valuable sites for such investigations.

Women's empowerment and privatisation efforts particularly were often initiated not by domestic players but by transnational, mostly Western, actors. These efforts to change institutions involved elements of cultures, values, and norms which are different in the context of the aid recipient and that of the aid provider. Frictions may occur as a result. Such challenges faced by development organisations were mentioned in interviews, the analysis of which is beyond the scope of the current study.

In a similar vein, interviewees commented on development organisations pursuing their 'agendas' and interests or those of their donor governments and not aligning their projects and activities with the needs of Afghanistan. Although beyond the scope of this study to investigate this in the context of Afghanistan, claims that for aid donors political, economic, or other strategic considerations are more important than the needs of recipient countries have been made in previous studies in other settings (e.g., Alesina and Dollar, 2000; Martens, 2005; Rahman and Giessen, 2017). The interests of donor governments and other actors are also evident in the various and differing energy imaginaries of Afghanistan (Fahimi et al., 2022). The extent to which the institutional and organisational changes induced by development organisations in Afghanistan's energy sector reflect their interests requires further data and analysis.

Making use of the topology approach's potential, we can compare the role of different actors, elicit various dynamics at work, and infer the different phases of development organisations activities or general trends. For example, in the first and second main topologies (i.e., figure 2 and 4) we observe the World Bank and GIZ have played a more important role in institutional changes than ADB and UNDP. Or looking at all the three main topologies (i.e., figure 2, 4, and 6) we see that the World Bank and the USAID have implemented more projects compared to others, especially for privatisation and women empowerment purposes. We have illustrated and discussed some of the dynamics in the key events we have described following the main topologies in each subsection.

Regarding cooperation of actors, earlier studies claimed poor coordination between actors (Fahimi and Upham, 2018). This was supported by data from our interviews and reviewed documents. The topology also shows that actors build mostly on their own previous works. However, we also find instances where one aid organisation builds on the work of another. This is evident, for instance, in the joint efforts of the World Bank and the USAID to commercialise the energy utility DABS. We also see that the major five development agencies contribute to institutional changes that were the result of the cooperation among a larger group of actors. The topology shows, however, that the preceding cooperation activities were not initiated by the major five.

In terms of general trends, we have observed a clear increase in the number of temporary events in the last five to seven years in all three main topologies. Looking at the details of these events, most of them are training and capacity-building related. From interviews we know that development organisations focused on such activities in the second decade of their involvement. This is in line with the findings of Betzold (2016) that aid donors have been investing more resources in 'software' including trainings, capacity building activities, and policymaking. We know from institutional theory that temporary events contribute to the institutionalisation of new practices or deinstitutionalisation of old ones by providing an

opportunity for the participants to be exposed to different institutional logics and de- and realign normative and cultural elements of institutions (Strambach and Pflitsch, 2020). One interesting observation is that these events mainly occur in later stages of the institutionalisation process, contrary to the case examined by Strambach and Pflitsch (2018). One explanation may be that temporary events fulfil a different function here than in the transformation process of the Augsburg region in Germany that the above authors studied. In Augsburg the sustainability process was rather initiated in a bottom-up way by civil society actors. In this context temporary events enabled sense-making processes and the joint development of new sustainable practices. In Afghanistan, it seems that the aid organizations are defining and diffusing sustainable practices in a more top-down fashion through these temporary events.

We also see how aid agencies make use of their transnational relations to create networks at an international scale which then again build the basis for changes in the country. The case of the WePower network illustrates for example how these actors use networks to enable translation and adaptation of institutional practices for the empowerment of women in the context of the energy transition between different countries in South Asia. This could also be an attempt to mitigate the above-mentioned frictions that have been caused by the transfer of the aid agencies' own mostly Western values.

4.6. Conclusion

Civil society organizations play a variety of critical roles in sociotechnical transitions for sustainability – both facilitating and forestalling change, depending on their normative commitments. As transnational actors, aid agencies are often involved in building the institutional capacity that both supports and constitutes sociotechnical change in a broad sense. The method that we have used here, transition topology, serves to abstract and highlight some of the causal connections, actors, and forms of organisation involved in this change.

In our case, we have shown how development organisations engage in activities that deliberately induce institutional change in aid-recipient countries. In Afghanistan, most of the direct institutional changes have been regulative, but our third finding, namely female empowerment, also contains more explicit elements of cultures, norms and values. Compared to privatisation and regulatory development, we find that less had been achieved in terms of permanent organisational change, up to the end of our period of study. Now with the return of the Taliban, these changes have also been rolled back. Whether achieving changes in informal institutions (in particular in a top-down way) than achieving change in formal institutions is open to discussion and an area for further research in transitions contexts.

Overall, our study offers empirical insights from an under-researched context that has been difficult for researchers to access and is now even more so following the Taliban's return to power. While the empirics are case-specific, we hope that our analysis can inform both aid donors and researchers interested in institutional change per se and by transnational actors. Finally, we might note some limitations of the study as arising from topological mapping: to understand change in depth, the approach arguably needs to be complemented by micro-level detail on the social processes involved. This requires in-depth interviews with participants and methods such as ethnography. In our case, security concerns made this impossible, but in more secure environments we would advocate this, alongside analytical perspectives that attend to structure-agency relationships and their causality. Topological nonetheless provides a high-level process map for this terrain.

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Chapter 5

Afghanistan's energy sociotechnical imaginaries: Alternative visions in a conflict zone[12]

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5. Afghanistan's energy sociotechnical imaginaries: Alternative visions in a conflict zone

Abstract

Imaginaries are understood to be both discursive and cognitive constructs that shape behaviour, policies, and institutions – but how do longstanding imaginaries evolve in new circumstances, and how do they interact with existing power structures in changed circumstances? Drawing on conceptions of discursive power, this paper investigates the interplay of power with both new and old imaginaries in the case of Afghanistan, specifically regarding alternative energy futures. Employing an interpretive approach, we draw on document analysis and semi-structured interviews with elite stakeholders and policy observers, to provide an account of the relations between alternative energy futures imaginaries and political power. We demonstrate, how certain discursive practices are made possible, authorised and articulated through imaginative geographies. Critically, the government-advocated imaginary of Afghanistan as an energy corridor and hence an energy importer both represents the views of several powerful interests and concurs with the long-held idea of Afghanistan as a buffer state. In this way, political path dependencies are reinforced through a supportive imaginary, just as the dominant imaginary is itself reinforced by the main stakeholders. While in line with our interpretive epistemology we do not make claims for the specific configuration of imaginaries being generalisable elsewhere, we do find the general theoretical approach useful for understanding discursive aspects of conflict zone politics, particularly vis-à-vis energy system trajectories.

Keywords: Sociotechnical Imaginaries; Energy; Afghanistan; Geopolitics; Power.

5.1. Introduction

High levels of uncertainty in Afghanistan make energy planning a challenging task. Afghanistan has experienced armed conflict throughout the 20th century and into the 21st, reflecting in part its strategic geopolitical location. With the international community's technical and financial assistance between 2001 and 2021, the country has sought to develop its energy supply and distribution system. This energy policymaking has taken place in the midst of Afghanistan's complex and often deadly geopolitics. Throughout the 20-year period of international community's presence and democratic governments backed by mainly western allies, several armed groups consistently posed challenges before the last Islamic Republic government fell to the strongest of these groups, the Taliban, in August 2021 and was replaced by an Islamic Emirate. In the latter years, more than twenty regional and international terrorist groups fought against government forces as per Afghan and American official sources (Cooper, 2018; Osman, 2019). Furthermore, several regional and international powers have for a long time been pursuing their interests in Afghanistan, compounding political instability (Woodward & Jenkings, 2012). External rivalries such as US-Russia, Saudi Arabia-Iran, India-Pakistan, US-China are also being played out in Afghanistan. The country has been acting as a buffer state between great powers since at least 1880s (McLachlan, 1997), namely between the Russian Empire and British India[13] and later between the Soviet Union and the United States. While it has in recent years experienced better relations with its northern neighbours, relations with Pakistan, its immediate southern neighbour, have largely been characterized by mistrust and animosity, further aggravated by Afghanistan's particularly close relations with India. This needs special attention because movement of goods (mostly from Pakistan to Afghanistan) and people (mostly from Afghanistan to Pakistan) – between the countries – takes place on a large scale (UNESCAP, 2015). Neighbouring Iran has experienced persistent political problems with Afghanistan's largely Western financial and military aid provider during the 2001-2021 period. This complicated cooperation with Iran due to US's sanctions on this neighbour. Regional projects involving Iran such as the Chabahar Agreement are particularly affected.

Internally, wide-ranging security challenges, political instability and slow economic growth have added to uncertainties and hampered reconstruction processes. They add to the costs, delay implementation, and raise questions regarding the feasibility of development projects. For instance, constructing a gas-fired power plant in Northern Afghanistan would cost 60% more than a comparable unit in Pakistan (Gencer et al., 2018). To put into perspective the violent conflict and institutional and social fragility in Afghanistan, it may be noted that the country has appeared on the World Bank's list of Fragile and Conflict-Affected Situations

[13] The political struggle between the two powers is also known as the Great Game (Ingram, 1980).

(FCS) every year since the list[14] was first compiled in 2006 (World Bank, 2021). Afghanistan has regularly scored around 2.6 – 2.8[15] from a possible high score of 6. The score for 2020 is 2.68[16].

Another index that captures the fragile security of the country is the number of attacks on infrastructure projects, which since 1989 stands at 319, of which 50 targeted facilities for generation and transmission of energy (Global Terrorism Database, n.d.). The current Islamic Emirate government and the then armed opposition group, the Taliban, have sought to increase their legitimacy by expressing support for infrastructure projects. Yet to exert pressure on and throw into question the power of the then Western-backed governments, they on numerous occasions targeted infrastructure projects such as schools, bridges, telecommunication towers, and electricity transmission lines (Sediqi & Birsel, 2019). This trend now continues against the Taliban by other armed opposition groups.

The current power supply arrangements in the country consist of a series of isolated grids fed by asynchronous sources mostly coming from Central Asian countries and Iran. Afghanistan imports around 80% of its electricity from Uzbekistan, Turkmenistan, Tajikistan and Iran (ADB, 2013). The domestic installed capacity is around 520 MW of which 51% is derived from imported diesel and furnace oil at a generation cost four times that of imported electricity and the other half is from large hydropower (ADB, 2017b). Around 5,000 small scale renewables-based projects have been implemented at off-grid scale under National Solidarity Program (NSP) (World Bank, 2018). The installed capacity from these renewable sources, however, remain small. The system is dominated by non-commercial issues such as violent conflict (ADB, 2013).

Economically, the country experienced a decade of growth as billions of aid money poured in upon the fall of the first Taliban regime in 2001. Bilateral donors and international aid agencies have been key actors in the reconstruction of Afghanistan, contributing both financially and technically. However, with the withdrawal of most international forces and a significant decrease in aid money, the GDP growth rate has plunged since 2014 (IMF, n.d.). Lack of guarantees against commercial risks and difficulty in accessing credit further discourage private investment. Politically, nearly all of the parliamentary and presidential elections since 2001, including the latest presidential elections in 2019, have been marred

[14] Formerly known as Low Income Countries Under Stress List, Fragile States List, and Harmonized List of Fragile Situations.

[15] The FCS list includes countries with a harmonized CPIA average of 3.2 or less (also accounting for Asian Development Bank (ADB) CPIA and African Development Bank CPIA) and presence of peacekeeping or political & peacebuilding missions. Lower CPIA scores indicate higher fragility.

[16] The Country Policy and Institutional Assessment index (CPIA) is chosen for its role in the FCS measures of the institutional and policy environment.

by fraud and violence (Rondeaux, 2019). The Taliban's takeover of the country for the second time, international community's reluctance in recognising the Taliban's government, and the freezing of almost 9.5 billion USD in assets belonging to the Central Bank of Afghanistan by the U.S. following the Taliban takeover create further uncertainties (Mohsin, 2021).

Uncertainties like these have been associated with imperfect knowledge regarding the probabilities of outcomes and the unpredictability of the future (Williams & Baláž, 2012). We argue that against this background, the study of collective visions of the future energy system become all the more important. For this purpose, we employ the concepts of sociotechnical imaginaries, rooted in Science and Technology Studies (STS), and discursive power, as used in Interpretive Policy Analysis, to study the collective and competing visions of the future Afghan energy system. Imaginaries – as "collectively imagined forms of social life and social order reflected in the design and fulfilment of nation-specific scientific and/or technological projects" (Jasanoff & Kim, 2009, p. 120) – consist of closely interconnected social and technological configurations, which often differ substantially between different interest groups. The purpose of this paper is thus to identify the currently competing, discursively selective energy imaginaries among domestic and foreign energy experts in Afghanistan, their political dynamics and their possibilities going forward, given both competing internal and external interests. Driven by interpretivism's attention to meaning and context, our research questions thus relate to the nature of those energy imaginaries in Afghanistan, their political correlates and the implications for the direction of energy system development in this specific national conflict setting.

The rest of the paper is structured as follows: in section two we review literatures on (i) sociotechnical imaginaries and (ii) discursive power with spatial relevance as our main heuristic. We then discuss our methods and empirical data generation in section three. In addition to reviewing policy documents, we conducted expert interviews between late 2016 and early 2019. Overall, in line with our interpretive approach, the research design is none of theory-testing, but unfolds in a recursive and iterative tacking back and forth between the theoretical and the empirical, the abstract, and the concrete (Kurowska & de Guevara, 2020, p. 1215). Section four discusses the identified imaginaries of energy importation (i.e., Afghanistan as an energy corridor), energy sources (i.e., affordable and least-cost energy supply) and the scale of energy technologies (i.e., off-grid for less populated rural areas and grid connection in urban areas). The alignment of actors' interests with the imaginaries is also discussed in this section. Section five concludes the paper.

5.2. Theoretical Concepts

5.2.1. Sociotechnical Imaginaries

The idea of imaginaries is used across sociology and other fields and can be traced at least back to a philosophical text by Jean-Paul Sartre in 1940, which argues for the importance of imagination for freedom from materiality (Sartre, 2004). Imagination is not a "mere fantasy" but an important cultural resource and a social practice (Appadurai, 1990, 1996, p. 31) that enables new forms of social life or social order (Taylor, 2004). As Griggs et al. (2017) have elaborated, it is through 'social imaginaries' that "people can envisage their social existence, organize their social relations, and endeavour to arrange the lives of subjects, as well as things and places." Imaginaries as collective imaginations have been the subject of scrutiny for a number of social science perspectives, including Science, Technology and Society Studies (STS), Interpretive Policy Analysis and branches of Human Geography. The proliferation of the concept over the past couple of decades in particular has added modifiers such as social, technoscientific, geographical or spatial, and sociotechnical (Anderson, 1983; Jasanoff & Kim, 2015; McNeil et al., 2017; Taylor, 2004). While earlier, seminal works in this field including that of Charles Taylor, Benedict Anderson, and Arjun Appadurai paid less attention to the role of science and technology in imaginaries, Jasanoff & Kim (2009) and Jasanoff (2015) proposed the concept of sociotechnical imaginaries.

Sociotechnical imaginaries refer to collectively held and publicly performed visions of desirable futures (Jasanoff, 2015, p. 4; Jasanoff & Kim, 2009) that often also reflect competing options. Imaginaries hold within themselves not only visions of how the future may be, but also how the future ought to be. In discursively connecting past and future events, imaginaries consist of familiar narratives. Narratives have their origin in social knowledge, which is carried as storyline into different discourses. Narratives are characterized by the way in which they provide fictional knowledge enriched with images and symbols; as part of discourses they create a story-world with a specific arrangement of time and space (Knaut, 2014, p. 100). Imaginaries as visions may influence behaviour, policies, and institutions. By justifying new investment in science and technology and the advances in these areas in return, sociotechnical imaginaries act both as ends of policy and as instruments of legitimation (Harvard STS Research Platform, 2012). An individual's vision can also be the origin of an imaginary. But only after such visions are communally adopted and made durable through exercises of power or acts of coalition building, do they become imaginaries in the sense of Jasanoff (2015). Some imaginaries are elevated above others often by the media, legislatures and other institutions (Jasanoff & Kim, 2009). Imaginaries can coexist in tension or in a productive dialectical relationship.

Imaginaries can be enacted, hence their performative dimension: for example, earlier imaginations of flying, space travel, or cloning were later enacted and materialized through science and technology (Jasanoff, 2015). In fact, processes of agenda setting or policy framing in which some 'problems' and solutions gain currency while others do not are examples of performing socio-technical imaginaries (Barbehön et al., 2015, p. 255). More broadly, future-oriented discourses, materialities, and anticipatory practices such as visions, expectations, and scenarios all can influence agenda setting and play a role in what may actually happen (Konrad et al., 2017).

Imaginaries are produced at different scales and in different spaces, as the contributions in Jasanoff & Kim (2015) and several other studies show. The national scale (i.e., national imaginaries) has attracted particularly more attention as scholars have focused on exploring nations' visions of their future. It is important here to recall Anderson's reference to nation itself as an imagined community (Anderson, 1983) which is continuously reimagined and reperformed (Jasanoff & Kim, 2009). This is exemplified in the work undertaken by Björkdahl (2018) who uses the concept of imaginaries[17] to study the state-making process of Republika Srpska, a para-state of the former Yugoslavia. Kuchler & Bridge (2018) examine Poland's historical sociotechnical imaginary of 'Poland stands on coal' and how this national imaginary is fused with the nation's fate to mobilize its rehabilitation. Hecht (1998, p. 18) in her analysis of France's nuclear politics notes that technological regimes and national identity are deeply entangled and further stresses the importance of rehearsing and articulating imaginations of nationhood. Felt (2015) analyses a national identity of "Austrianness" towards certain technology choices which she calls "an imaginary of the absent" referring to e.g., Austrians "naturally" opposing nuclear energy. She discusses how imaginaries are formed and stabilized in the process of national identity formation.

While work on the relationships between energy imaginaries and energy policy is longstanding (Hecht, 1998), its contemporary relevance persists. Genus et al. (2021) discuss the way in which techno-economic energy imaginaries dominate EU-funded research, marginalising the importance of energy practice and culture, as well as the disciplines that are used for their study. In many ways this reflects the governance of science and technology and concomitant allocation of resources. Levenda et al. (2019) illustrate how local and regional energy imaginaries can shape the sociotechnical configurations of energy innovations, reflecting local and regional specificities in history, geography, political identity and cultural beliefs (p. 181). The authors contrast the energy imaginaries of Portland and Phoenix, Portland's being oriented around a relatively consensual imaginary of public utility support for a mix of renewables, community-scale energy supply and reliable power grid

[17] Björkdahl's (2018) use of the concept is inspired by Taylor's (2004) social imaginaries and Anderson's (1983) imagined communities.

development; while the Phoenix imaginary of distributed solar power has been more contested by utility companies.

Returning to the cross-national scale, Bürkner (2018), drawing on theoretical concepts of intersectionality, imaginaries[18], and framing, identifies imaginaries on a bigger scale – the EU's imaginaries in policy areas such as gender policy, border and security policy, migration and asylum policy. Interviews from a network of experts, or techno-epistemic network in her conceptualization, formed the central part of analysis by Ballo (2015) regarding the sociotechnical imaginaries of smart grids in Norway. Factors such as institutional environment, economic and cultural dynamics, and other contextual elements such as portfolio of energy sources, degree of liberalisation, and interests are key to Norway's energy policy landscape (Ballo, 2015). Local communities in Phetchaburi, Thailand and Palawan, Philippines imagined different energy futures than their respective nationally dominant narrative (Marquardt & Delina, 2019).

The above notwithstanding, use of the imaginaries concept in the specific context of energy conflict zones is rather new and raises questions as to how such imaginaries are being mobilised, by whom and for what purposes, including vis a vis security, geopolitics and alternative understandings of development.

5.2.2. Discursive Power

The relevance of imaginaries and narratives lies in their embodiment of claims to power. Power has been conceptualized in innumerable ways. Terms such as *power over, power to, power with, power as domination,* and *power as empowerment* are often discussed when defining power, as power is thought to have several dimensions or "faces" (Digeser, 1992; Lukes, 2005). The concept has received increasing attention in the sustainability transitions literature (Avelino & Rotmans, 2011; Avelino & Wittmayer, 2016; Meadowcroft, 2011; Sovacool & Brisbois, 2019). Some have offered conceptual frameworks for the study of power relations in the transition to low-carbon energy systems (e.g., Avelino's (2017) *POINT Framework*, Brisbois's (2019) *Powershifts*, or Partzsch's (2017) *'power with'*, *'power to'*, and *'power over'*). Our work, in contrast, is informed by the literature on discursive power, following the importance of discourses for sociotechnical imaginaries (Jasanoff, 2015, pp. 25–26). Discursive power refers "to the degree to which the categories of thought, symbolizations and linguistic conventions, and meaningful models of and for the world determine the ability of some actors to control the actions of others, or to obtain new capacities" (Reed, 2013, p. 203). Imaginaries and the narratives that sustain them are "particularly effective in embattled political fields, where they have the task of coordinating

[18] Drawing on conceptualization of imaginaries by Jessop (2013) and Jessop & Oosterlynck (2008).

individual steps of interpretation in such a way that collective understanding and action of problems becomes possible even when the parties in dispute are constantly striving to existentialize their conflict" (own translation; Gadinger et al., 2014, p. 11).

Rather than drawing from a pluralistic concept of power, according to which power is seen as the ability to dominate the behaviour of others (Dahl, 1957), or to focus on non-decisions as power's 'second face', we can thus link to a Foucauldian understanding of power as a positive, productive force and as a question of "government" in a wider sense of the word: "To govern, in this sense, is to structure the possible field of action of others" (Foucault, 1982, p. 790). This foregrounds the power of overriding structures of knowledge and meaning that do not rest on the wishes, interests, and interpretation of acting subjects but are prior to them (Münch, 2016, p. 52). As policy scholars, we treat governmentality as epistemology (Ettlinger, 2011), but do not focus on the governance of the self by everyday citizen-subjects. The power of imaginaries rests in being taken-for-granted assumptions and stories about the problems in society and how and by whom they should be addressed in collectively binding decisions (Mulderrig et al., 2019, p. 17). Imaginaries are associated with particular interpretations and narratives of crisis and these particular problematizations favour certain solutions and preclude others (Fairclough, 2013, p. 183). Or to quote Schattschneider in Hajer (1995, p. 42): "some issues are organized into politics while others are organized out." Language not only describes our understanding of realities but has also the potential to shape our realities. The power of literary devices such as metaphors is harnessed to perform and operationalize sociotechnical imaginaries (Aspria et al., 2016).

There is a strong spatiality to the power of the discursive imaginaries that we identify. Reviewing political geographical themes relating to the analysis and conceptualisation of state sovereignty, (Mountz, 2013) describes how these have for some two decades (if not longer) been understood as extending beyond territorial boundaries. In the context of aid, development and multilateral agencies, there is also a complex and often opaque political economy involved that is not our purpose to analyse in depth, but which is nonetheless relevant (Michaelowa & Borrmann, 2006). For present purposes, we will show, how certain discursive practices are made possible, authorized and articulated through imaginative geographies (Gregory, 2004). This concept, Gregory (2004) asserted in his seminal work on Afghanistan, Palestine and Iraq, helps to understand how societies created an identity for their home area in opposition to others and how these images prevail. As we will demonstrate, interpretations of history and space also feed into socio-technological imaginaries.

5.3. Methodology

In reconstructing the discursively selective and geographically specific imaginaries on Afghanistan's energy transition, and how science and technology embed and are embedded in social practices, norms, and institutions (Jasanoff, 2004, pp. 2–3, 24), we position our research in an interpretive methodology. Interpretive research does not carry into the field the definitions and concepts of its own community or theories derived from the research literature in order to test their appropriateness, but aims to understand how a certain understanding, i.e., a certain interpretation 'out of the field' emerges at a certain time in a certain place (Schwartz-Shea & Yanow, 2012, p. 18). Interpretivism in the policy analysis literature focuses on "the struggle over ideas", embraces both hermeneutical as well as post-structuralist approaches to text analysis and is therefore open to treating the textual patterns that form imaginaries as social constructions, as consciously deployed strategies, or as expressions of a wider power/knowledge system (Münch, 2016, p. 48). In interpretive policy analysis, the three basic methods of generating data are "word-based" and make use of observations, interviews, and the close reading of policy documents (Yanow, 2007, p. 409). In this article, we draw on the latter two.

Visions of future energy systems in Afghanistan are not a topic of broad public or political debate, hence our focus on the policy discourse rather than public discourse. We therefore conducted our study based on interviews with experts professionally active in the field of energy in relation to Afghanistan – similar to Haas's (1992) epistemic community – complemented by document analysis as detailed below. The experts whom we interviewed had worked or were working in the energy sector inside the country with either the government of Afghanistan, aid agencies or academic institutions. We used the snowballing technique to identify interviewees, given the challenges of accessing such informants. Interviews lasted between 40 minutes and 130 minutes and were audio recorded, transcribed, and thematically coded as described below. Twelve interviews were conducted in 2017, one in December 2016, and one in November 2019. In line with interpretivisms' tendency to use conversational interviews (Yanow, 2007), interviewees were asked broad questions to allow them to share their own interpretations. These included challenges hindering the sector's progress, the role of politics, their views on what policies the government of Afghanistan might implement to overcome the challenges, the role of aid agencies, and of course their view of a future energy system for the country (*see* Appendix 5).

Table 1: Information on interview partners

Type of Organisation(s)	**Number of times represented**[19]
Governmental Agency	5
Academia	2
Development Organisation	7

Drawing from Jessop (2010) we treat 'imaginary' as a general concept for analysing the co-evolution of semiosis (social signalling) and structuration. Discourses become sedimented and institutionalized and interpretive policy analysis treats existing legislation and policy documents as artifacts that contain both diagnostic and prognostic problem descriptions. Policy documents can therefore offer insights into imaginaries. Document analysis in established democracies can draw easily from texts issued by the formal political-administrative system. In settings characterised by weak statehood, collecting documents needs to go beyond the nation-state's boundaries and take into consideration influential documents issued by other actors. We thus identified relevant policy documents (*see* table 2) through desk research, official webpages, and communication with informants. Data collection was carried out by the lead author, a national of Afghanistan and familiar with the context. This aided the process given the difficulty in accessing data in conflict settings.

Table 2: Reviewed policy documents on energy planning in Afghanistan

Title of document, year	**Timeframe when applicable**	**Organisation(s) and/or author(s)**	**Focus, in terms of issues of energy system scale, technology, and origin**
Afghanistan National Energy Supply Program (NESP), 2013	Short term: up to 2015 Long term: up to 2022	Government of Afghanistan, executed primarily by the MEW	All three; additionally, issues on institutional development and private sector participation
Afghanistan Power Sector Master Plan (PSMP), 2013	2012- 2032	Prepared by FICHTNER GmbH & Co. KG in Stuttgart, Germany;	All three; first comprehensive master plan in the sector

[19] There are instances of overlaps too where an interview partner had previously worked with a governmental agency for example but was working with a development organisation at the time of the interview. There were also instances where interview partners represented more than one type of organisation: for instance, one such partner represented both academia and private sector and another worked for two different development organisations.

		commissioned by Asian Development Bank (ADB)	
Afghanistan Renewable Energy Policy (AREP), 2015	Term 1: 2015-2020 Term 2: 2021-2032	MEW and GIZ	Renewables and their scales and technologies
Renewable Energy Roadmap for Afghanistan (RER2032), 2017	2017-2032	Prepared by IT Power Consulting Private Limited (ITP), India; commissioned by ADB	Renewables and their scales and technologies
Afghanistan Renewable Energy Development Issues and Options, 2018	NA	World Bank	Renewables and their scales and technologies
Energy Security Trade-Offs Under High Uncertainty: Resolving Afghanistan's Power Sector Development Dilemma, 2018	NA	World Bank; Defne Gencer, John Irving, Peter Meier, Richard Spencer, and Chris Wnuk	All three; additionally, a series of cases studies on hydropower planning, coal resources, natural gas, and transmission development

The interview data was coded using descriptive and in vivo coding methods (Saldaña, 2016) with the assistance of MAXQDA software. In terms of identifying what constitutes an imaginary for present purposes, such imaginaries are held to be rather specific depictions – usually explicit – of energy futures. They often consist of narratives in which causality, agency and temporality are implicit or explicit (Feldman et al., 2004). After the coding, narratives emerged around the three dimensions of energy importation, energy sources, and scale of energy technologies. These themes were then compared with the corresponding policy sections in the above six policy documents, in a technique that Schwartz-Shea & Yanow (2012) call "intertextuality". This allows searching for the ways in which different "texts" resonate with one another or fail to do so, similar to what positivist, variable-based research labels "triangulation". The dominant narratives across the six policy documents and the interview material form the basis of the identified imaginaries.

Finally, on a combined epistemological, methodological and ontological note, our use of others' statistics in the paper does not imply an uncritical perspective but rather delineates

the (discursive) context against which our analysis is set. Thus, we are mindful of how statistics embody values and imply category-making (Yanow, 2007), but when actors use numbers, we read these as sources of the meanings intended by those actors (Gusfield, 1981). Similarly, when reconstructing the imaginaries and narratives implied in interviews and policy documents, we treat these as data. Accessing any form of data in Afghanistan is (and already was prior to summer 2021) very challenging, primarily for security reasons. Menga (2020) has shown how researchers working in authoritarian contexts may self-police their work to avoid conflict. Here, although the lead author has longstanding, lived experience of Afghanistan, the research was conducted remotely and without immediate threat. Although we are committed to the decolonisation of knowledge, most statistical reports on the country have been produced by external development and international organisations, with fewer issued by the government of Afghanistan.

In what follows, we present the different sociotechnical imaginaries and discuss how they are embedded in wider hegemonic discourses. The patterns that we find resonate with dimensions often used in technical energy system analysis: issues of scale, technology and origin. In section 5 we discuss the results in relation to their spatial dimensions.

5.4. Results: Afghanistan's Energy Sociotechnical Imaginaries

Departing somewhat from our expectations, the imaginaries identified in the data do not fall neatly into alternative configurations (e.g., renewables vs fossil fuel), but are best considered in terms of alternative views of three, more specific dimensions: energy importation, energy sources and scale of energy technology. Document sources through to 2018 confirmed the persistence of the imaginaries through the interview period. For each, there are competing visions that reflect alternative imaginaries. We first describe and discuss our results on imaginaries concerning energy importation. Thereafter, two subsequent subsections focus on the imaginaries concerning energy sources and scales of energy technology respectively. Table 3 lists the dominant imaginaries in each dimension and summarises their drivers as attributed in advocate discourse. By 'dominant', we mean the imaginaries that are evident in the content analysed: we do not see other coherent imaginaries in the texts and transcripts examined.

Table 3: Afghanistan's energy imaginaries on energy importation, energy sources, and scale of energy technologies and their corresponding discursive drivers

Dimension	**Dominant Imaginary**	**Discursive drivers**
Energy Importation	Afghanistan as an energy corridor	• Stemming from the broader imaginary of Afghanistan as the land bridge between Central Asia and South Asia

		• Compensating for the domestic generation deficit
Energy Sources	Least-cost energy supply options	• Negligible CO2 emissions • An urgent need for economic development
Scale of Energy Technologies	Grid expansion to urban densely populated areas and off-grid solutions in sparsely populated rural areas	• Population density • Geographical considerations including distance to the grid and accessibility issues • Off-grid resilience in the face of conflict and natural hazards

5.4.1. Energy Importation

The dominant imaginary held by the majority of our interviewees and the government policy documents is *'Afghanistan as an energy corridor'*. It envisages Afghanistan as a route for energy importation, both for ongoing transit and for national consumption. This government-advocated imaginary represents the views of a combination of several powerful interests. The consensus among stakeholders, rehearsals, practices including discursive ones, and widespread prevalence in media detailed in the following paragraphs all point to the stabilisation of this imaginary (Felt, 2015). Several of the interviewed energy experts and policy documents produced by the Afghan government and aid agencies view Afghanistan as the future energy corridor between Central Asia and South Asia. In this imaginary, Afghanistan would consume imported energy and collect fees for the energy that passes through to South Asian countries. This imaginary finds support and its origins in the broader imaginary of Afghanistan being the (land) bridge between Central and South Asian countries in terms of trade and also Afghanistan's perceived, strategic geographical location.

As mentioned earlier, Afghanistan is perceived as a buffer state and hence a point of disconnect between its South and North for a significant part of its modern history. But as is the case with every point of disconnection, it can also be a point of connection. Geopolitical and socio-cultural developments with respect to Afghanistan have been influenced by this history. This history has also reinforced the perception among citizens of Afghanistan of their country's strategically important geographical location. One need only look at the media, historical accounts, and the government of Afghanistan's policy documents (Ahmadi, 2016; ANDS, 2006; RECCA, 2006; Sultani, 2012). This widely shared understanding of Afghanistan's geographical location is the source of our dominant imaginary. Reference to the importance of the country's location such as the following by an interview can be found regularly in policy documents: "Afghanistan has a good geographical location that it can

benefit from transit of power from Central Asia to populous South Asia". This imaginary can also be interpreted as coproduction of, in Jasanoff's (2004, 2015) terms, several factors including political (i.e., conflicts, buffering between different blocks, etc.), geographical (i.e., space), and historical through time. For instance, the country's history of buffering between competing blocks has become an element of its identity or nationhood, similar to how Hecht (1998) wrote of nuclear power for France. Against this background, we explain the production and performing of this imaginary.

'Afghanistan as an energy corridor' imaginary makes reference to various geopolitical drivers. The land-locked country sits between 'energy-rich' countries to its north and 'energy-poor' densely-populated countries to its south. Afghanistan has intensified its efforts towards regional integration and follows a foreign policy of seeking good relations with neighbours. Not only has the country joined regional projects such as Shanghai Cooperation Organization (SCO), Economic Cooperation Organization (ECO), South Asian Association for Regional Cooperation (SAARC), China's Belt and Road initiative (BRI), and Central Asia – South Asia Regional Electricity Market" (CASAREM) and Turkmenistan, Afghanistan Pakistan, India (TAPI) gas pipeline, it has initiated several arrangements which can be interpreted as performing the *land-bridge* and *energy corridor* imaginaries (see figure 1). The hegemonic imaginary materializes in the following briefly summarised initiatives.

Figure 1: Afghanistan and regional organisations and initiatives

Source: (RECCA, 2017)

Driven by the land bridge imaginary but also to overcome its landlocked situation, as well as due to increasing political problems with its largest trade partner Pakistan, the country has established several air corridors with regional countries to facilitate trade (Majidyar, 2018).

The first of these was established with India in 2017. Afghanistan has since expanded this program, establishing corridors with Turkey, Saudi Arabia, Kazakhstan, United Arab Emirates, and China. Furthermore, the Chabahar Agreement, was signed between Afghanistan, Iran and India in 2016. This agreement helps the contracting parties access international markets by way of land, sea, and air (RECCA, 2017). It is particularly important for the landlocked Afghanistan as it provides the country access to open waters through the Chabahar port in Iran. Similarly, in 2017 the Lapis Lazuli Transit, Trade and Transport Route Agreement was signed between Afghanistan, Afghanistan, Turkmenistan, Azerbaijan, Georgia, and Turkey to enhance regional economic integration and trade-based connectivity (RECCA, 2018). Here too the government of Afghanistan draws from a historical and cultural symbol: the name of this agreement comes from the historic route that Afghanistan's (semi) precious stones including lapis lazuli were exported over 2000 years ago.

The most prominent example of performing the *land-bridge* and *energy corridor* imaginaries by the government is initiating the Regional Economic Cooperation Conference on Afghanistan (RECCA) in 2005 which has turned into a series of conferences. The second RECCA conference recognised "that the strategically important location and centrality of Afghanistan to the surrounding regions plays an eminently vital role in providing a focal point for facilitating greater economic cooperation and integration" (RECCA, 2006, para 7). Coupled to the imaginary of Afghanistan as an energy corridor are other international transport infrastructures. The Development of a railway network in Afghanistan is at its infancy, but this is a sector that plays a key role in the broad imaginary of Afghanistan as a land bridge. Railway development is thought to promote trade, transit and transport and earn Afghanistan transit fees. This will significantly impact petroleum product and coal trade (Gencer et al., 2018).

Discursively too, the broader land-bridge and the more specific energy corridor imaginaries have been actively promoted. Terminologies stemming from these imaginaries such as "Afghanistan's strategic location", "Afghanistan as land bridge", "transit hub/corridor", or "energy corridor/conduit/bridge" can be found in several of the analysed policy documents developed for the government of Afghanistan (ADB, 2017b; ANDS, 2006; Gencer et al., 2018; Irving & Meier, 2012; NESP, 2013; Safi & Alizada, 2018). The government of Afghanistan and several other actors promote the concept. The first and most important strategy document of the new government since the fall of the Taliban regime in 2001 – Afghanistan National Development Strategy – stresses the country's potential in regional cooperation highlighting its "strategic position" and recalling its historic status of "land-bridge" (ANDS, 2006, p. 99).

Former Afghan President Ashraf Ghani's statement – "breakfast in Delhi, lunch in Peshawar, and dinner in Kabul – that's the world we seek!" – captures the position of different administrations on regional connectivity which promotes this imaginary (CNN NEWS18,

2015). In the past two decades, leaders of the country have, on numerous occasions, called attention to the importance of the country's geographical location using the land bridge terminology (Abdullah, 2018; Ghani, 2016, 2019; Islamic Republic of Afghanistan, 2016; Karzai, 2010, p. 35; Rabbani, 2019). In one of the most important regional conferences on Afghanistan, the country's foreign minister presents his government's vision as follows:

> Our vision, in this context, is to restore Afghanistan's historical role as a land-bridge and a convergence point between Central Asia, South Asia, China, the Middle East, and Europe, in order to achieve greater regional cooperation and integration for the benefit of peace and prosperity in the wider region (RECCA, 2018, p. 1).

United States, the biggest donor to Afghanistan, and other members of the donor community have accompanied the country's promotion of the concept of land bridge (Foster, 2008). The US, also driven by its own political interests, "support[s] the country's historic role as a land bridge connecting Central and South Asia" (US Department of State, 2005, p. 863). This has been reiterated on other occasions, including by the former assistant secretary of state as well as the former US ambassador to Afghanistan (Johnson, 2015; US Department of State, 2007).

This imaginary also converges with the US's version of the Silk Road which itself is a geopolitical imaginary similar to Russia's rival Eurasian narrative (Laruelle, 2015). US's New Silk Road promotes interconnectivity of the Central Asian, former Soviet Union states with South Asia, undermining Russia and China's influence in the region. Russia promotes a competing narrative – that of Central Asia as the southern part of Eurasia but disconnected from South Asia. This is particularly important in a critical geopolitics perspective (O'Tuathail, 1996), harnessing the power of discourses to 'make' new geographies. The US's version of the Silk Road specially helps the Afghan land-bridge and hence the country's energy corridor imaginary. While reading of the other two regional powers, China and India, of the Silk Road and overall regional connectivity might not be similar to that of the US, it aids Afghanistan's broad vision nonetheless. These powers are directly involved in some of the regional projects (e.g., TAPI for India and BRI for China). Central Asian countries, too, understandably want to secure an alternative southern outlet for their natural gas and surplus electricity and thereby increase their autonomy vis-à-vis Russia and China (Tadjbakhsh, 2012).

Turning to how the energy corridor imaginary has been performed, one can point to some materially concrete measures as well as discursive instances. Concrete measures have been in the form of executing projects such as TAPI, CASA-1000, and TAP-500. TAPI, first proposed in 1990s, is a gas pipeline project that is expected to transport natural gas from Turkmenistan to Afghanistan (5 million cubic meters), Pakistan and India (14 million cubic meters each) (ADB, 2016). It will generate between 200-250 million USD in transit fees for

Afghanistan (Bhatti, 2015). CASA-1000 is an electricity transmission project which will deliver up to 300 MW to Afghanistan and 1000 MW to Pakistan from clean hydropower surplus of Tajikistan and Kyrgyz Republic. This project, promoted mainly by the World Bank, is particularly beneficial for Pakistan as the country suffers from persistent power shortages in the summer. TAP500 is also an electricity transmission project between Turkmenistan, Afghanistan and Pakistan facilitated by the Asian Development Bank (ADB) (RECCA, 2018).

In connection with performing the energy corridor imaginary discursively, we can point to the government's national energy supply program. It states that "Afghanistan's vision is to retain its significance as an energy transit country linking energy rich Central Asian countries with energy starved South Asian economies" (NESP, 2013, p. 12). This imaginary is supported on economic and environmental grounds too. Imported electricity, produced in Central Asia and Iran mainly from gas and hydro, would meet unfulfilled demand and replace the costly diesel generated power in Afghanistan. It is recommended that import agreements be locked in with long term agreements to ensure some degree of stability and avoid price hike risks (ADB, 2013; NESP, 2013). According to experts, imported energy is cheaper than the cost of domestic generation. As one interviewee put it:

> … imports are not bad. Trade is good as long as you get cheap energy. The important thing is that people have power, and not that Afghanistan is independent for its energy use. There shouldn't be irrational strategy just to be independent of electricity import and at high cost.

An implication or extension of this imaginary which is to lead to improved regional connectivity as a result of fossil-fuel based energy trade would be that the renewable energy transition in Afghanistan may not take centre stage. On the contrary, this could lead to development of domestic fossil fuel resources. Some experts we interviewed think it is in the interest of Afghanistan to develop its domestic gas resources should the gas pipelines of Central Asia pass through Afghanistan to South Asia and even transfer the country's surplus energy via the expected pipelines (e.g., TAPI) to Pakistan and onwards.

Paradoxical combination of imaginaries can exist, as illustrated by Bürkner (2018). In this case study, while we found overwhelming support for imports, there were instances of support for self-sufficiency through high domestic generation citing mainly energy security concerns (ADB, 2013, 2017b; Gencer et al., 2018). Contesting the dominant practice an expert said that "the transmission line has been established to transfer energy from the northern neighbours to Pakistan and India, but the generation capacity has been neglected". Supply disruption, either originating from political disputes or the rise in domestic demand within the exporting countries, was the main driver of this alternative imaginary (Gencer et al., 2018). Concerns over the risks posed by price volatility were also raised. At the extreme

end of this continuum is the weak imaginary of Afghanistan as a net energy exporter (ADB, 2017b, p. 111). In the section that follows we discuss imaginaries on sources of energy.

5.4.2. Energy Sources

Regarding *energy sources*, the dominant imaginary is that an affordable and least-cost energy supply should be prioritized irrespective of the energy sources. It is argued that country circumstances must be the deciding factor in choosing the size of energy projects and type of technology. Experts alluded to Afghanistan's comparatively negligible per capita CO2 emissions which amounted to 0.2 metric tonnes in 2016 and still remains around this level in 2021 (South Asia averaged 1.5t CO2 and the EU 6.5t CO2) (World Bank, n.d.). Citing emissions figures, experts argued that development of energy projects should follow the least-cost supply model, advocating the use of both renewables and fossil fuels. As one interviewee said:

> I don't think that it is wise for Afghanistan to only focus on renewables. If it is proved that they are economically and environmentally the best option, then why not. If not, I don't see a reason to neglect other resources.

A common view amongst interviewees, also reflected in the policy documents, was that the country should use its fossil resources if they are the least-cost options. The policy documents anticipate that even by 2030 the emissions level would remain negligible in global terms even with the use of gas and coal (Gencer et al., 2018, p. 18). The PSMP advocates development of gas and coal fired power plants to compensate for shortages in the winter. It also recommends transporting gas from the north of the country to Kabul to replace imported diesel fuel. Because coal's quantity and quality needs further exploration, gas at the moment is slightly favoured, also for especially indoor but also outdoor air quality and CO2 emissions reasons (ADB, 2013; Gencer et al., 2018). Domestic power generation from gas is encouraged even if the costs are higher than equivalent imports, owing to the socioeconomic benefits associated with domestic generation. Gas projects are supported by at least two of Afghanistan's largest donors, the ADB and World Bank, for their contribution to "energy security" (ADB, 2020; World Bank, 2019b). While one cannot point to strong fossil fuels or specifically gas lobbies in the country today, it is possible that those companies that invested in this subsector (e.g., Bayat Power) will become locked-in technologically and/or economically.

Unsurprisingly, there is strong support for renewables in general, and solar and wind in particular. It is emphasized that these resources can play a key role in energy access and also importantly energy security (ADB, 2017b). Energy security issues raised by Afghan officials include access rate, disruption of electricity services due to weather-related events such as

avalanches, vulnerability due to lack of refinery inside Afghanistan (in instances of disruption of diesel imports), lack of import alternatives, and vulnerability of energy projects to insurgent attacks (Gencer et al., 2018, pp. 66–67). The above document argues that diversity in supply (i.e., not relying solely on imports) improves the system's resilience noting renewables-based small off-grid systems are important in the energy security discussion since "no small off-grid renewable energy facility in rural areas has been targeted" (Gencer et al., 2018, p. 67).

Use of hydro resources especially at large scale is supported by the majority of interviewed experts. There is a shared opinion that Afghanistan needs to rehabilitate the old dams which were built between 1920s and 1970s and construct new ones. This view is echoed by the Afghan government's policy documents (ADB, 2013; NESP, 2013). However, all of the country's river basins are transboundary and use of them therefore takes on regional dimensions; except with Iran, there are no agreements with the neighbouring countries on the use of water resources. Iran and Pakistan have on several occasions shown their disagreement with construction of dams in Afghanistan (Nagheeby & Warner, 2018; Ramachandran, 2018). There is a consensus on the need for negotiations and agreements on the use of transboundary rivers. One interviewee argued that "in regard to politics of hydro power projects, a lot of our rivers are transboundary. We have to solve our water issues with neighbouring countries like Pakistan and Iran. If this is solved, we can build large hydro dams. This issue has affected our hydro power development. We need to solve this issue with Central Asian countries, Iran, and Pakistan".

Envisaged use of biomass and geothermal sources is mixed. Some interviewees believe that biomass can be used especially in rural areas because agricultural and animal waste are available to feed such technologies. However, it is not encouraged by the PSMP because it is understood as competing with food production and the supply of basic energy for cooking and heating in rural areas. The PSMP too doesn't recommend biogas-to-electricity due to a lack of large farms for constant feedstock and waste collecting systems (ADB, 2013). A few experts believe geothermal resources can be exploited while acknowledging its complexity in the Afghanistan context (e.g., for greenhouse heating). However, at the moment, development of this resource does not garner considerable support, mainly due to lack of sufficient data on this source of energy.

As mentioned in the methodology section, in a weak state like Afghanistan it does not suffice to analyse imaginaries enacted by the government. With respect to alignment of actors' interests with competing imaginaries of energy sources, we make use of the classification of key actors in Fahimi & Upham (2018) and discuss only the interests of major aid agencies owing to their high level of engagement and technical and financial capacities. The German development organisations, Gesellschaft für Internationale Zusammenarbeit (GIZ) and

Kreditanstalt für Wiederaufbau (KfW) have predominantly implemented, using German technologies, and intend to implement, renewables-based projects in the northern provinces (BMZ, 2018). They have focused on the energy sector as one of their priority areas under Urban Development and Municipal Infrastructure section. The organisations have been active in electricity generation from renewables, electricity transmission and improving institutional frameworks and "will continue to offer Afghanistan specific support for the efforts to develop the country into a regional energy hub" (BMZ, 2018, p. 10).

For ADB, one of the largest development partners which itself is a multi-donor agency, energy has been[20] one of the three priority sectors in Afghanistan. In addition to electricity generation, distribution and transmission, it has said that it would "focus on domestic gas production…[and]… facilitate CAREC[21] Program's flagship TAPI gas pipeline" on the request of the government of Afghanistan (ADB, 2017a, p. 8). ADB has paid special attention to Afghanistan's role in regional cooperation "because of its location" and Afghanistan's potential to become a "cross-regional transit point for both transport and energy, with emphasis on the CAREC corridors and regional energy initiatives" (p. 7)[22].

The World Bank, another major donor, also intends to support renewables generally, as it acknowledges that "renewables are becoming least-cost choices to providing electricity to remote communities that cannot be connected to the electricity grid in the near future" (World Bank, 2016, p. 24). In the meantime, it has supported more than one gas development projects in the north and regional energy projects such as CASA-1000 (World Bank, 2019b, 2019a). Lastly, the United States Agency for International Development (USAID) has completed several renewables and fossil-fuel based projects including the largest diesel thermal power plant in Kabul and gas development projects while also investing in capital-intensive electricity transmission lines from Central Asian countries mostly for the south of the country. It appears, from their Country Development Cooperation Strategy FY 2019-2023, that USAID would have had a stronger focus on renewable energy and clean technologies in the future (USAID, 2019). They would also change their strategy of funding energy projects, to instead incentivising private sector investment in the sector (USAID, 2019, p. 34).

In summary, imaginaries on energy sources follow the least-cost supply model and are not as deeply rooted and widely shared as the one of energy importation. Performing of these imaginaries has been limited to the actors supporting them. Prominent examples include implementation of around 5,000 small renewable energy projects (World Bank, 2018),

[20] Writing during the fall of Afghanistan to the Taliban and the suspension of all but humanitarian aid flows for the time being, we have amended tenses in these paragraphs to the past and conditional.

[21] Central Asia Regional Economic Cooperation (CAREC).

[22] See also Danish et al. (2020) for the case for Afghanistan as a regional (gas) energy hub.

rehabilitation of old and construction of new hydro power plants, and the establishment of the first gas-fired power plant in northern Afghanistan. A competing but even weaker imaginary in this regard is a total transition to renewables. The following part of this paper moves on to describe in greater detail imaginaries on the scale of energy technologies (e.g., off-grid vs grid connection).

5.4.3. Scale of Technologies

Regarding the *scale of technologies*, the dominant imaginary for domestic production is that of off-grid projects, mostly from renewable sources for remote sparsely-populated rural areas, where energy is consumed mainly for lighting, cooking and to some extent heating/cooling purposes; complemented by grid expansion and grid-connected projects for urban and densely populated areas, in which energy is consumed also for commercial and industrial purposes. In the case of urban areas, renewable energy would play only a supporting role. This domestic production imaginary is shared by the experts interviewed as well as documents reviewed.

Interpretations of geopolitical factors that drive this imaginary include Afghanistan's geography, its harsh mountainous terrain and political chaos and security turbulence. According to this narrative, the Hindu Kush Mountains divide the country into three geographic regions: the northern plains, the central highlands, and the southwestern plateau. Extending the electricity grid to mountainous remote areas is both challenging and capital intensive compared to implementation of off-grid, smaller scale projects. On extending the grid an expert commented that:

> … it is not economical because power consumption in other smaller provinces is very low. And if we extend the high-cost transmission lines to those areas where consumption is low, it is not a good idea.

The PSMP recommends grid expansion in three phases but takes the view that some provinces cannot be connected to the grid for reasons of economic feasibility, specifically their distance to the network and population density. These are Nuristan, Faryab and Daykundi for which distributed generation from renewable sources is recommended (ADB, 2013, pp. 1–4; Ministry of Energy and Water, 2015). While the 2013 PSMP doesn't consider renewables (except large hydro) as priority options for grid-connected generation, more recent policy documents do recognize solar and wind potential in grid-connected electricity generation (ADB, 2017b). The PSMP prioritized large hydro, gas and coal-fired power plants for grid-connected electricity generation, due to the relatively high costs of renewables at the time of preparation of the master plan. In the PSMP large hydro will feature heavily, meeting 41% of expected demand followed by imports at 33% and domestic thermal at 26%.

However, the World Bank's 2018 report on Afghanistan renewable energy development and ADB's RER2032 roadmap suggest that some of the capacity projected in the PSMP based on gas-fired thermal plants and high-cost hydro-power plants could be replaced with utility-scale solar and wind farms (ADB, 2017b; World Bank, 2018).

Predictably, there is strong support for renewables at off-grid scale (i.e., mini-grid and stand-alone systems), especially for the needs of rural dispersed population. It is possible to provide electricity to between 55 and 73 percent of the Afghan population through off-grid solutions according to a World Bank study based on GIS analysis (Korkovelos et al., 2017). RER2032, in line with the ambitions of Afghanistan Renewable Energy Policy, projects a total addition of 5,000 MW from renewables by 2032 at all scales (ADB, 2017b). Introducing solar and wind adds to the resilience of the system as it is claimed that climate change has minimal impact on wind and solar energy output in Afghanistan (World Bank, 2018).

Two discrete reasons were given for supporting small scale renewables: first, they are viewed as economically better option than expanding the grid to remote areas characterised by dispersed population and low energy consumption. And secondly off-grid solutions are viewed as more resilient in the face of security challenges and natural hazards that has caused frequent power outages. This is of special importance given the number of attacks on infrastructure projects of mostly larger size, alluded to in the introduction to this paper, and the frequency that natural hazards including avalanches cut transmission lines. For instance, one of the policy documents' recommended measures against natural hazards is "transitioning toward more resilient power generation and transmission models, such as a decentralized power system, and the integration of distributed generation from renewable sources with intelligent grid systems" (World Bank, 2018, p. 8). For investors, too, smaller projects would mean lesser risks (Gencer et al., 2018). This is also reflected in an expert's comment:

> The difficult thing is the political situation. So, maybe one has to start with smaller technologies in order not to be a victim of explosion and attacks. If it is a big subject, probably they would attack. If it is smaller, they wouldn't probably harm it.

Community level initiatives are encouraged for their socioeconomic benefits too (Shoaib & Ariaratnam, 2016; World Bank, 2018). This is also captured in a comment by an interviewee:

> Where there is no grid and have local resources, funds should be made available for development of these decentralized solutions especially in mountainous and remote areas. Having a few KW or MW in villages have an immediate impact on the local area and can be developed relatively faster, maybe 2 years. In areas like Badakhshan, developing 1MW in Kishim, 4 MW in Faizabad, 2 MW in Baharak, few MW of wind in Ishkashim will electrify 300-400 people in quick time. This is a quick route and a

shortcut to electrification. It might be expensive to do so, but the socioeconomic benefits are convincing.

Energy produced from renewables inside the country, the capacity of which is currently negligible, is mainly consumed at production sites. Energy Security Trade-offs under High Uncertainty, a document produced by the World Bank for Afghanistan, encourages development of strategies to plan for interconnection of future small grids and their integration into the national grid so distribution can also serve transmission purposes (Gencer et al., 2018). Interconnection of domestic grids and synchronisation of the Afghan power network with the neighbouring countries were recurrent themes in the interviews and policy documents. The current power system in the country is made up of isolated grids that are fed by mainly imports from different countries with varying speeds and frequencies. It is argued that synchronisation of the networks can contribute to development of an integrated national grid, energy security by allowing integration of local generation into the grid and facilitating electricity transfer to Pakistan more efficiently. According to the PSMP, Afghanistan's national grid requires high-voltage direct current (HVDC) back-to-back converter stations to synchronize these systems.

Our interviewees acknowledge that politics play a role in the selection and implementation of energy projects and the scale of technologies which according to them negatively affect the sector. They assert that Afghanistan is a country divided along ethnic, linguistic, and religious lines. In 2016 re-routing of an electricity transmission project between Turkmenistan, Uzbekistan, Tajikistan, Afghanistan, and Pakistan (TUTAP) which was financially supported by ADB was met with mass protests by the Hazara ethnic group. Their protests, in turn, sparked reactions from other ethnic groups. The PSMP originally recommended that the power line pass through central Afghanistan (ADB, 2013), a predominantly Hazara populated region. However, authorities at the Ministry of Energy and Water later changed the route. Protests by ethnic Hazaras were attacked in which more than 80 protesters lost their lives and hundreds more were injured (Mashal & Nader, 2016).

In this subsection we have presented the dominant imaginary on the scale of energy technologies. It is worth mentioning that this imaginary resonates with the calculations in a recent study by Korkovelos et al. (2020). They study a geospatial conflict-adjusted least cost electrification approach for Afghanistan in which all of their three scenarios and the base scenario based on the cost of conflicts include a significant role for off-grid renewable-based projects in the less-populated rural areas and grid-connected projects in urban areas.

Broadly, one can find entanglements within and among all three imaginaries we have discussed above, similar to Delina's (2018) study of Thailand's energy imaginaries. On the other hand, the above discussion also reveals the diverse, divergent (and at times converging), contentious and complex reality with respect to energy visions in Afghanistan.

The implementation of the majority of projects designed by development organisations showcases whose knowledge matters, what role power and politics play, and who gets what (i.e., the issue of distribution of both incentives and risks) (Jasanoff, 2015; Meadowcroft, 2011). Contrary to Marquardt & Delina's (2019) assertions regarding the role of donor-driven interventions in Global South countries, in Afghanistan these initiatives have been key both in production and performing of energy imaginaries. However, it must be noted that Afghanistan is heavily aid-dependent and a conflict unstable context where policymaking is rarely bottom-up.

5.4.4. Spatiality and sovereignty

We argue that the politically dominant energy imaginary of Afghanistan is embedded in its 'imaginative geography' (Gregory, 2004) as a geostrategic buffer state, with ex-USSR states to the north, the Indian sub-continent to the south east and Gulf states to the south. This imaginary views the country as an energy corridor or hub, through which fossil gas would flow. The imaginary would perpetuate the geopolitical "in betweenness" of the country. Despite this, development agencies have nonetheless sought to promote and develop smaller-scale, renewable energy supply, not least because this is viewed as suitable for serving the needs of the largely off-grid, rural population (a view with which we concur). This imaginary of renewables is complemented by one of corresponding, small-scale deployment.

Overall, the set of imaginaries that we identify co-exist in a non-mutually exclusive and non-competitive way, but their direct beneficiaries and consequences nonetheless differ substantially: while Afghanistan as an energy corridor would (or should) bring tax revenue to the country, deployment of small-scale renewables benefits rural households directly. Arguably, in promoting a diverse set of imaginaries, the development organisations are reflecting the diversity of values held by the states that fund them. It has long been understood that states act at a variety of 'sites' (often institutionalised contexts), beyond their sovereign, territorial boundaries Mountz's (2013). Here the imaginaries are carried and promoted by international development organisations that both reflect and enact state values at a distance. As these values are heterogeneous, so there are multiple imaginaries that reflect these. The material circumstances of Afghanistan allow these to co-exist with limited competition, although some of the imaginaries are more aligned with elite interests in Afghanistan than others. Now that foreign states have suspended the activities of by international development organisations with the exception of some humanitarian aid, and now that information on energy development and policy in the country is even more difficult to obtain, we do not know the status of the imaginaries observed above.

5.5. Conclusion

We have sought to describe and explain how the production and maintenance of energy imaginaries in Afghanistan is bound up with longstanding and more recent political alignments and embedded in interpretations of history and space. The dominant imaginary, which garners support from several groups of actors, is Afghanistan as an energy corridor. We refer to this imaginary as dominant in the sense that it is both the most frequently referred to and is aligned with the most powerful actors. We consider them powerful because their access to resources and the collective decision-making powers of the state allows for imaginaries to become sedimented and institutionalized in policies and material artefacts. Performing this imaginary requires a great deal of regional cooperation and improved security conditions. Further research could usefully explore the potential of this imaginary and the energy projects involved in peacebuilding and regional cooperation. In comparison with the imaginary of Afghanistan as an energy corridor, imaginaries relating to diverse energy sources and alternative scales of energy technology are not widely debated in Afghanistan and are more restricted to the visions of energy experts. Even among the latter, expert discourse tends to largely follow least-cost reasoning, rather than the potential for energy system resilience or ideas of energy democracy.

Our findings suggest that these imaginaries do not readily fall into simple, alternative configurations, but are rather better considered in the more nuanced terms of alternative visions of key system dimensions. Imaginaries thus compete with others within their own dimension, but each dimension constitutes a complementary and necessary part of the energy system. Hence, for example, the dominant imaginary of energy importation competes with the imaginary of greater self-sufficiency through domestic energy supply from various sources. The dominant imaginary of fossil energy sources competes with imaginaries giving more priority to renewables. Finally, the imaginary of dispersed renewably supply competes for example with an imaginary that envisions a national unified grid for the country. The alternative imaginaries of each dimension reflect different interests and values and it remains to be seen how their physical expression will develop, as different political interests seek to shape the country in different ways. Overall, we find the theoretical, explanatory value of imaginaries to be useful in terms of the correlation of alternative imaginaries with alternative political alignments.

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Chapter 6

Conclusion

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6. Conclusion

> "Renewable energy systems are often the most reliable options for supplying consistent power in conflict and war zones due to the systems' decentralized nature. Onsite solar power systems — and mini-grids in particular — can save lives in many ways. They power health clinics and hospitals that care for the wounded. They quietly power security perimeter sensors and cameras as well as onsite security lighting. They reduce the need to truck in expensive fuel across dangerous roadways that are subject to attack. They can safely purify available water onsite. And they inform the local populace about relevant news, events and announcements." (Foster, 2022)

Long-standing conflict has cast its shadow on almost every aspect of life in Afghanistan. Whether it is access to education or health services, agricultural activities or commercial ones, transportation planning or energy provision, armed conflict has played a major role in how these and other societal functions have been fulfilled (or not) in at least the last forty years since 1980s. The above is a quote from a magazine entry by Robert Foster who carried out extensive fieldwork between 2008 and 2012 in Afghanistan studying and working in the energy sector. It captures several aspects of energy system development in a conflict setting including the challenges and ways to overcome them.

This chapter concludes this dissertation which studied the role of international development organizations in energy transitions in Afghanistan. It is structured as follows: first, I write about the contributions of the dissertation both conceptually (i.e., the role of international development organizations) and empirically (i.e., the energy sector of Afghanistan). Second, the main findings of the dissertation are summarized. Third, I briefly discuss the main findings in light of the transitions literature. Fourth, I contemplate about the policy implications of the dissertation's findings. Next, I write about the limitations faced during completion of this thesis. Lastly, avenues for future research are discussed.

6.1. Contributions of the dissertation

This dissertation has made both conceptual and empirical contributions in terms of investigating the role of international development organizations in sustainability and energy transitions, energy transitions in Global South, and dynamic of energy system development in a conflict setting. I answer the following three main research questions:

1. What is the potential of different renewable energy sources in Afghanistan and who were the main actors in the country's energy sector between 2001 and 2021?

2. What role did the international development organizations play in Afghanistan's energy sector in terms of institutional change?

6.2. What are alternative energy imaginaries in Afghanistan?

Conceptually, the core contribution is that this work adds to the small body of literature on the role of international organizations in sustainability transitions. In particular, this dissertation is one of few academic works that deal with investigating the institutional change role of international development organizations in aid-recipient countries. Chapter four contributes to an understanding of the types of institutional changes that international organizations seek to induce, how they do this, and what types of outcomes can be achieved. Based on this research, we know that in their attempts to induce institutional change, international organizations launch temporary events, create temporary and change permanent organizations, design and implement projects with components on institutional change, and contribute to development of policies, regulations, and laws. Echoing calls by other researchers, this underexplored topic could usefully be researched further, for example in terms of what specific institutional work international actors undertake to change institutions.

Another conceptual contribution of the dissertation is its investigation of the interplay of power with socio-technical imaginaries in conflict settings. In this way, it adds to the body of literature on discursive aspects of conflict zone politics vis-`a-vis energy system trajectories. Chapter five combines the concepts of sociotechnical imaginaries from rooted in Science and Technology Studies (STS) and discursive power as used in Interpretive Policy Analysis. Predictably, the findings suggest international development organizations also carry and promote certain imaginaries and oppose others. This further adds to our understanding of the role of international organizations (i.e., the core contribution discussed above).

Empirically, the dissertation generated insights on an under-researched conflict-affected context. This is of particular significance since accessibility to data in Afghanistan is limited and it has worsened after the return of the Taliban to power in August 2021. Chapter three, after conducting a literature review and several expert interviews, mapped the main governmental actors and international development organizations in the energy sector of Afghanistan. The chapter, exploratory in nature, also provided details on the renewable energy potential in the country. After the initial exploration into the make-up of different actors in the energy sector in chapter three, chapter four dove deeper and provided insights into the institutional change role of international development organizations in the energy sector of Afghanistan. This made gaining an understanding of the types of activities by international organizations and their outcomes possible. Their activities contributed to the

development of a regulatory framework for Afghanistan's energy sector, furthering privatization, and women empowerment.

Chapters three and four accompanied by chapter two, which is not published but reviews the country's energy sector, provided the necessary basis for a study on the visions of future energy system development in the country as shared by governmental actors and development organizations. These insights may be of value for researchers as well as energy planners in Afghanistan as it elicits expert opinions on energy imports, sources of energy, and scales of energy technology.

6.3. Central empirical findings

This section provides a summary of the central empirical findings generated following the aims set in section 1.1. They are organized based on the research articles included in chapters three (renewable energy potential and the make-up of actors), four (the role of international organizations in institutional change), and five (Afghanistan's energy imaginaries).

6.3.1. On renewable energy potential and actors

In addition to 73 million tons in coal reserves, 75 billion cubic meters gas reserves, and 1.6 billion barrels or 219 million metric tons of crude oil (Fichtner, 2013; Klett et al., 2006), the country can also produce substantial amount of energy from renewable sources. The energy potential of hydro (across all scales) is estimated at 23,000 MW, solar at 220,000 MW with annual average Global Horizontal Irradiance (GHI) of 1,935 kWh m^{-2} day^{-1}, wind at 67,000 MW with over 30,000 km^2 of windy land and 5 MW/km^2 generation capacity, and biomass at 4,000 MW from agricultural and animal waste. There are also some geothermal warm water wells in the country. However, there is scant information on the exact potential and possible uses of this energy source.

With regard to actors in the energy sector, a diverse set of international and domestic organizations were active over the 20-year period between 2001 and 2021. Key governmental ministries and their departments were: Ministry of Energy and Water (MEW) and its Renewable Energy Department (RED) established in 2009; Ministry of Rural Rehabilitation and Development (MRRD) and its Energy and Enterprise Development Directorate (REED) also created in 2009, Ministry of Mines and Petroleum (MoMP); Ministry of Economy (MoEc); and Ministry of Finance (MoF) and its Directorate General of Public Private Partnership (PPP) established in 2016. A national utility called Da Afghanistan

Breshna Sherkat (DABS) was responsible for operation and maintenance of power plants as well as for energy generation, transmission, and distribution.

Many international development organizations and bilateral donors contributed significantly to developments in the energy sector of Afghanistan between 2001 and 2021. The major international actors were: Asian Development Bank (ADB), the World Bank, the United States Agency for International Development (USAID), German development agencies (Gesellschaft für Internationale Zusammenarbeit (GIZ) and the German Development Bank or Kreditanstalt für Wiederaufbau (KfW)), United Nations Development Programme (UNDP); Japan International Cooperation Agency (JICA), and the government of India.

6.3.2. On of the role international organizations in institutional change

International development organizations were a key group of players, their combined capacity both financially and technically, far greater than that of the Afghanistan government and the non-existent private sector combined. After arriving in 2001, they found themselves in a dysfunctional institutional environment following years of wars and conflicts. Although their focus from 2001 to 2010 was primarily on increasing access to electricity by improving the available supply which mostly came in the form of imports from Central Asian republics, from 2010 onwards they paid increasing attention to the development of institutions in the energy sector. The findings of this dissertation in this regard reveal that international development organizations contributed to the development of a regulatory framework for the sector, promoted privatization, and pushed for empowerment of women in general and in energy-specific context.

As far as the energy sector's regulatory framework is concerned, international organizations contributed to the development of several key policy documents and establishment or restructuring of organizations. These included the development of a Power Sector Master Plan (2013, by ADB), the Renewable Energy Policy (2015, mainly GIZ), and Renewable Energy Roadmap for Afghanistan (RER2032) (2017, ADB). In terms of changing or creating organizations, they corporatized the energy utility; Da Afghanistan Breshna Moassessa (DABM) which was a state-owned enterprise was converted to Da Afghanistan Breshna Sherkat (DABS) which remains state-owned but runs on commercial basis. Furthermore, they helped establish the Afghan Energy Information Center (AEIC), the Inter-ministerial Commission for Energy (ICE) which was a vital coordination body for a long period of time, a Renewable Energy Department (RED) at the Ministry of Energy and Water, the Afghanistan Renewable Energy Union (AREU), the Forum for Coordination of Energy Stakeholders (FORCES), and the Energy Services Regulation Authority in the energy sector.

Championing privatization, the mostly Western development organizations promoted a major shift in the political economy of the country which had mostly followed a state-led development model thanks to a few decades of Soviet Union backed governments. In the new constitution of the country post-2001, Afghanistan declared to follow a market economy model. Subsequently, a wave of privatization efforts followed. International organizations encouraged and assisted the government of Afghanistan in privatizing or commercializing the 65 state-owned enterprises which delivered key services prior to 2001. One of these enterprises was the energy utility, then DABM. World Bank started the privatization of DABM early on in 2005. The utility was commercialized/corporatized into DABS in 2008 with the assistance of other donors including USAID and ADB. A further key privatization effort was the establishment of a union of private companies in 2013 called the Afghanistan Renewable Energy Union (AREU). International organizations also encouraged private actors to take part in energy generation activities and enter into agreements with the government of Afghanistan in public-private partnership (PPP) arrangements. They demonstrated this business model in Mazar-e-Sharif and Kandahar involving gas-to-power and solar projects.

Lastly, international organizations undertook many initiatives to empower women implementing a diversity of projects in the process. Afghanistan is considered a conservative society when it comes to what role women play, as is reflected in most gender equality indexes. Immediately after the fall of the first Taliban regime, a ministry dedicated to women's affairs was created. A 27% quota for women in the legislature was approved, lobbied for by international actors. Laws on elimination of discrimination against women were passed. In some projects, international development agencies systematically included a requirement to hire a certain number of women in a team. Capacity building measures such as trainings, workshops, and trips to foreign countries were organized for women. Favorable workplace conditions such as separate prayers rooms, toilets, and kindergarten were encouraged and, in some cases, provided by international organizations. The outcomes of the two-decade long women empowerment programs were tangible. However, the return of the Taliban has undone most advances in this regard.

6.3.3. On Afghanistan's energy imaginaries

Following two decades of progress in Afghanistan's energy sector, gaining insight into the visions of energy experts regarding future energy system development in the country was of interest both for researchers and policymakers. Our findings in chapter five, dedicated to Afghanistan's energy imaginaries based on document analysis and expert interviews, do not fall neatly into alternative configurations but are best considered in terms of alternative views of three, more specific dimensions of a system: energy importation, energy sources

and scales of energy technology. There are dominant imaginaries in each dimension as well as alternative ones which are elaborated in the following paragraphs.

With regard to energy importation, the dominant imaginary is 'Afghanistan as an energy corridor' between energy-rich Central Asia and energy-poor South Asia'. It is worth reminding that the country imported the bulk of its electricity needs from Central Asian republics during the 2001-2021 period (see chapter 2). In this imaginary which represents the views of several powerful actors and was advocated by the past governments, Afghanistan is envisaged as a route for energy importation both for ongoing transit to South Asia (e.g., Pakistan and India) and for national consumption. Large-scale regional projects such as the Turkmenistan–Afghanistan–Pakistan–India (TAPI) gas pipeline project and the Turkmenistan-Uzbekistan-Turkmenistan-Afghanistan-Pakistan (TUTAP) power interconnection project and measures taken by Afghanistan such as establishment of aid corridors, the signing of the Lapis Lazuli Transit, Trade and Transport Route Agreement, and initiation of a series of conferences on regional cooperation are steps towards realization of this imaginary. This imaginary finds its roots in the broader imaginary of Afghanistan being the (land) bridge between Central Asia and South Asia in terms of trade and other exchanges. A competing alternative imaginary here is self-sufficiency through domestic energy supply from various sources.

Afghanistan consistently followed the realization of the above broader imaginary through regional connectivity in not only the energy sector but also transport and other sectors. Domestic railway development and interlinking it with regional countries was kickstarted in the 2001-2021 era (Gencer et al., 2018). One example of this was a regional railway development initiative known as the Five Nations Railway Corridor (RECCA, 2017). This corridor when completed would connect China on one end and Iran on the other running a total distance of 2,100 kilometres through Kyrgyz Republic, Tajikistan, and Afghanistan in the process. Afghanistan was discussing this during the Western-backed administrations in the 2001-2021 period during the series of the Regional Economic Cooperation Conference on Afghanistan (RECCA). China for the first time sent goods to and received goods from Afghanistan by rail in 2016 and 2019 respectively. Since the return of Taliban to power, Iran has resumed talks on this initiative (Aljazeera, 2022).

As far as sources of energy are concerned, the dominant imaginary is an affordable and least-cost energy supply should be prioritized irrespective of the energy sources. Afghanistan's carbon dioxide (CO_2) emissions are negligible as the latest data by World Bank indicates. Compared to the South Asia average (1.5), the European Union average (6.1), and the World average (4.6), the per capita emissions in Afghanistan, 0.16 metric tonnes, are far lower. Furthermore, decades of wars and armed conflict have hindered development. For primarily these reasons, experts believe the country should follow a least-cost supply model

irrespective of the source of energy. Experts were of the view that even if fossil fuel projects proved to be the least-cost options, the country should consider them. A competing imaginary in this regard is a complete transition to renewables.

Finally, the dominant imaginary in terms of the scale of energy technologies for domestic production is that of off-grid projects mostly from renewable sources for remote sparsely populated rural areas where energy is consumed mainly for lighting, cooking and to some extent heating/cooling purposes complemented by grid expansion and grid-connected projects for urban and densely populated areas where energy is consumed also for commercial and industrial purposes. Factors driving this imaginary are Afghanistan's mountainous geography, political instability, and persistent conflict. Renewables-based off-grid projects at scales of mini-grid and stand-alone systems are recommended for remote hard-to-access areas as extending the national grid would be capital intensive, time-consuming, and challenging. Also, contrary to the high vulnerability of large-scale energy projects to terrorist attacks (which happened frequently during the 2001-2021 era) and natural hazards such as avalanches, small-scale decentralized projects are more resilient. The imaginary of decentralized renewables-based supply competes for example with an imaginary that envisions a national unified grid for the country. The alternative imaginaries in each dimension reflect different interests and values.

6.4. Discussion

Since the articles included in this dissertation contain discussion of their respective research findings, this section looks at the works of international development organizations in the energy sector of a conflict setting and analyzes the dissertation as a whole from the perspective of sustainability transitions research. I begin by discussing the situation in the country and the Taliban's return to power and its consequences for the energy sector. Next, I highlight the dependency on development aid from 2001 to 2021 and the negative consequences of this. I then turn to organizational and institutional changes induced by aid organizations in this period. The section also touches on Afghanistan's energy imaginaries and energy system development in a conflict setting. Lastly, I examine the developments in the energy sector of Afghanistan over the 20-year period between 2001 and 2021 from the lens of Multi-level perspective (MLP) framework (Geels, 2002).

Country Situation*:* Following the fall of the first Taliban regime in 2001, large-scale investments funded almost entirely by development aid transformed the energy sector of Afghanistan. In 2021 when the majority of international development organizations left the country, the energy sector was in a much better shape. Development organizations in cooperation with the governments of Afghanistan and other local actors worked on the development of domestic renewable energy sources, energy imports, electricity

transmission lines, and the energy sector's regulatory framework. The notable achievements since 2001 are a fivefold increase in the percentage of population connected to the country's power grid and the development of a significant part of the sector's regulatory framework.

After the Taliban took control of the country in August 2021 for a second time, many major aid organizations decided to either suspend their activities or leave the country. The subsequent drying up of foreign aid, international isolation of the de facto Taliban administration, natural disasters including severe droughts and floods, and the Taliban's policies have accelerated the country's slide into a multi-dimensional crisis and have slowed down the progress in the energy sector. The country's energy sector now receives only a fraction of the investments compared to the pre-Taliban levels. Around 32 projects on climate change risk mitigation and adaptation worth nearly 900 million USD were halted following the Taliban's return (Ruttig, 2022). This is catastrophic for a country that is claimed to be the sixth most affected by climate change (UNAMA, 2022). Currently, aid organizations deliver mostly humanitarian aid. The international community has declined to recognize the Taliban government. The Taliban, meanwhile, have resumed their 1990s-style government and continue to impose widespread bans on the activities of women.

Dependency on foreign aid: In the 2001-2021 period Afghanistan became extremely dependent on foreign aid as detailed in chapter two. Some believed the country had become 'an aid-dependent rentier state' (Bizhan, 2018; Clarke, 2020). Macroeconomic trends such as GDP growth and poverty rates directly depended on foreign aid and spending by international troops. It is claimed that the colossal amount of aid cultivated a clientelist rentier state (Clarke, 2020). This led to a patron-client relationship in which the Afghanistan governments were more accountable to aid donors than its citizens undermining the state legitimacy and democratization processes (Clarke, 2020). In such situations, citizens cannot hold officials to account since the state receives its revenue not from tax but from foreign aid. At the local level, government officials were patrons themselves; they ran their patronage politics, giving rewards - financial or government positions - in exchange for (political) support.

The strong aid dependency brought with it adverse consequences which are reviewed below. One of the most significant consequences of the astronomical foreign aid figures was the spread of corruption (Byrd, 2015; Strand et al., 2017). This has largely been attributed to the manner in which aid was delivered and handled (Bak and Kukutschka, 2019; SIGAR, 2016b). The US government's Special Inspector General for Afghanistan Reconstruction (SIGAR) concluded that the level of corruption post-2001 was higher than previous levels (SIGAR, 2016b). That there was systemic corruption in the government of Afghanistan was not entirely surprising; but the donors were not totally transparent either. A 2013 World Bank report stated that not every dollar spent on Afghanistan was spent in Afghanistan (Hogg et

al., 2013). According to this report, only 38 percent of every aid dollar reached the Afghanistan economy. Similarly, one of Waldman's (2008) findings was that "over half of aid is tied, requiring the procurement of donor-country goods and services." (p.5). These claims were echoed in other reports too pointing to huge sums of aid money returning back to donor countries in corporate profits and consultants' salaries – around 40 % between 2001-2008 (Waldman, 2008).

Other criticisms point to the form of off-budget aid delivery, fragmentation of aid and development efforts, and aid ending up in the hands of warlords and militias. For instance, in the period 2001-2008, more than two-thirds of development aid disbursed to Afghanistan bypassed the government of Afghanistan (Waldman, 2008). The decision to provide off-budget aid was driven by several factors. One of the main concerns of the aid agencies and a driver of off-budget aid delivery was the lack of capacity and the widespread corruption in the government of Afghanistan. The other main motive was the freedom that off-budget aid provided for donors, allowing them to implement projects that suited their own programme and appealed to their constituents back home (Ruttig and Bjelica, 2018). However, contrary to one of the key objectives of the international actors in Afghanistan - state-building - this method of aid provision not only failed to build the Afghanistan governments' capacity it undermined them and led to the fragmentation of development efforts.

Aid fragmentation, as a consequence of off-budget aid delivery which accounted for a large proportion of aid delivered to Afghanistan, compromised aid effectiveness (ATR Consulting, 2018). This also resulted in the duplication of efforts and a weaker government ownership. The sheer number of actors - dozens of aid agencies on the ground, backed by over 60 countries and institutions– made aid fragmentation unavoidable (ATR Consulting, 2018; Ruttig and Bjelica, 2018). This was further exacerbated by the fact that donors preferred to implement projects themselves or through their aid agencies and subcontractors.

Critics also questioned aid agencies pursuing their own agendas instead of aligning their programmes with the priorities and needs of local governments and citizens (Clarke, 2020; Waldman, 2008). It is alleged that aid agencies implemented projects that appealed to their taxpayers and what they considered as development and progress rather than what the local government and citizens wanted or needed. This issue is highlighted by the fact that only 4.4 billion USD of foreign aid during the 2012-2014 period were found to align with Afghanistan's national priority programs, while 8.4 billion USD did not align (ATR Consulting, 2018). Furthermore, conflicting programs among different aid agencies or with the efforts of the Afghanistan government were observed (Clarke, 2020). International aid organizations also created parallel structures, the size and capacity of which were, in some cases, greater than the state institutions they were meant to support (Bizhan, 2018).

Additionally, the attractive financial incentives offered by aid agencies to skilled workers contributed to a brain drain in the public sector.

Furthermore, weak coordination, favouritism, and uneven distribution of aid spurred an anti-government and in some cases anti aid agencies sentiment among the people (Donini, 2007; Fishstein and Wilder, 2012; Integrity Watch Afghanistan, 2021). This is of special importance considering the social fabric of the country. Afghanistan is a multi-ethnic country, deeply divided along ethnic, linguistic, and religious lines. These issues, along with corruption, also contributed to the conflict and strengthening of insurgency (Bak and Kukutschka, 2019). Furthermore, foreign aid, the 'unearned income', which paid for for nearly everything in public expenditure including employees' salaries and contracts, resulted in the neglect of revenue institutions and the promotion of "a lack of tax compliance culture leading to tax evasion and tax corruption" (Isar, 2020, p. 2).

The role of international development organizations in institutional change: In Afghanistan, international development organizations sought to induce institutional changes in the energy sector and the wider context. Noteworthy institutional changes in the energy sector included regulatory development of the energy sector involving creation of organizations and drafting of laws, privatization of the state-owned energy utility as well as promoting a free-market economy model, and empowerment of women. Given their financial and technical resources, international organizations and donor countries had unchallenged influence in creating, maintaining or disrupting institutions. Clarke (2020, p. 12) argues: "The scale of foreign influence, especially the US, on policy, institutions and appointments has been wide and deep. Foreign nations brought their own ideologies, ideas, prejudices and blind spots when shaping policy".

Examples include international actors, especially UN agencies, influencing the 2004 constitution in which they exerted pressure and lobbied for inclusion of gender quota to promote women's representation in the legislature (Bush, 2011). This was clearly the result of international actors' influence in a deeply conservative society in which even local rural women "were not aware of the quota and some even expressed displeasure with it" (Bush, 2011, p. 129). Another example is that "the international community, and specifically the United Nations Development Programme and UNIFEM, helped establish, fund, and provide technical expertise to the Ministry of Women's Affairs to facilitate gender mainstreaming in the government" (Bush, 2011, p. 129). Development programmes financed by foreign aid contributed to women empowerment in a mostly tribal society where social norms and cultural practices do not approve of women taking part in social, economic or political activities (Beath et al., 2013).

According to Scott (2013, p. 56), institutions "comprise regulative, normative, and cultural-cognitive elements that, together with associated activities and resources, provide stability

and meaning to social life". Institutions are understood to be resistant to change; nevertheless, they can undergo change, be maintained, or reproduced. Institutions and institutional change continue to receive increasing attention in sustainability transitions research. Prominent approaches such as the multilevel perspective on socio-technical transitions (MLP) (Geels, 2004) underscore the stabilizing nature of institutions, particularly at the regime and landscape levels. The landscape level encompasses values, cultural elements, and cognitive frameworks that are deeply ingrained and tend to change over extensive periods of time.

While institutions play an important role in stabilizing the regime and landscape, transformative change is expected to primarily occur in technological niches. Thus, the starting point of transitions is usually, not always, in technological change. From a socio-technical perspective, transitions researchers are also interested in how institutional and technological change co-determine each other (Fuenfschilling and Truffer, 2016; Markard et al., 2012). In recent years, an increasing number of studies have focused on institutional aspects of transitions (Loorbach et al., 2017). For example, Fuenfschilling and Truffer (2016) show institutional changes at the regime level can impact transition dynamics. Case studies from the geography of transition research show that transitions often start with institutional changes that motivate, legitimize and enable further changes in socio-technical regimes (Hodson et al., 2017; Rohracher and Späth, 2014; Späth and Rohracher, 2012). There is a long-standing debate on how actors exert agency over their institutional environments and vice versa (Giddens, 1984). The present research contributes to the above discussions and precisely on debates about how actors change institutions.

Energy system development in conflict settings: Afghanistan has experienced and continues to struggle with terrorism, religious extremism, ethnic tensions, consequences of foreign powers playing out their rivalries, and conflicts with neighbouring countries including disagreements on the use of its transboundary rivers. Energy system planners need to consider these conflicts when designing a generation system, a transmission line, or a power purchase agreement. The dissertation has alluded to these conflicts in various sections. The conflicts on transboundary rivers merit a brief discussion as it also provides important contextual insights relevant for energy system planning in Afghanistan.

Nearly all of Afghanistan's rivers are transboundary. Yet, except with Iran, the country has not concluded water sharing agreements with the riparian States. Iran and Pakistan both have shown their discontent with dam building in Afghanistan (Dehgan et al., 2014; Hayat and Elçi, 2017; Thomas et al., 2016). Iran is struggling with water shortages and droughts, and it has repeatedly warned Afghanistan to allow the flow of Helmand River water according to the water sharing agreement of 1973. Not only have the threats not subsided following the Taliban takeover of the country since Iran and Taliban maintained contacts

also during the latter's insurgency over the past two decades, they have continued and intensified (The Associated Press, 2023).

A similar situation, albeit a little milder, can be observed with relation to Pakistan. The country does not agree with Afghanistan's dam building ambitions over Kabul River. The governments of Afghanistan during the 2001-2021 era pursued their objectives regardless of the threats and requests for negotiations as it was perceived the country was in a weaker negotiating position. According to Thomas et al. (2016, p. 2), "transboundary water interactions [between Afghanistan and Iran and Afghanistan and Pakistan] take place within a context of acute power asymmetries." The country relies heavily on goods imported from Pakistan and Iran and several million refugees from Afghanistan are hosted in these two countries. The absence of transboundary dialogue and agreements is an obstacle hindering development of water resources (Ahlers et al., 2014).

Other conflicts including interferences by regional countries such as alleged provision of support to armed opposition groups, international military superpowers fighting for influence, and domestic insurgency all influence energy system development in Afghanistan. This unstable political and security situation deters private investors, increases project costs, does not offer stable revenues and returns on investments, involves civic-military competition over land which can delay projects and increase costs, and may entail disruptions such as obstacles for movement of goods and people (Fischhendler et al., 2022, 2016; Spyrou et al., 2019). Furthermore, attacks on energy infrastructure make energy planning more difficult. While the above is applicable to energy projects in general, small-scale decentralized systems may prove more resilient in the face of conflicts and hold certain advantages compared to conventional large-scale centralized systems.

First, decentralized energy systems based on renewable sources of energy such as solar, wind, and micro hydro, are less vulnerable to (cyber)attacks and disruptions caused by natural disasters. Afghanistan's capital Kabul experienced frequent and long power cuts during the 2001-2021 era because the transmissions lines coming from the north of the country carrying imported electricity were often attacked by the Taliban or were damaged due to avalanches. In the same way, Afghanistan's internally displaced people, either as a result of conflicts or natural disasters, who do not have access to electricity grid can make use of solar devices (Huber and Mach, 2019). Similarly, decentralized systems can contribute to alleviating energy poverty in Afghanistan as remote and difficult-to-access provinces such as Badakhshan, Bamyan, Daikundi, and Nuristan could utilize solar and other renewable energy sources by developing small scale off-grid solutions.

Second, renewables-based decentralized systems may reduce dependency of energy importers on energy exporters as most countries can produce sufficient energy from domestic renewable sources and do not need to rely fossil fuels imports (Vakulchuk et al.,

2020). For Afghanistan, a transition to renewables would improve its standing position vis-à-vis its neighbours who have supplied most of the country's energy needs over the past two decades and who have occasionally used energy as a foreign policy weapon. Furthermore, if the country concentrates specifically on solar and wind and reduce its dependence on large hydro power plants on which it has relied heavily, the conflicts on transboundary water with neighbouring Pakistan and Iran might potentially recede or not prove as damaging.

Third, decentralized systems also offer citizens the opportunity to participate in energy generation, hence improving energy justice and in turn reducing conflicts (Burke and Stephens, 2017; Jenkins et al., 2018). This is particularly relevant for countries with a diverse population such as Afghanistan. The country experienced one of its worst human tragedies post-2001 in 2016 which concerned energy projects and where decentralized solutions could have prevented it. A bomb explosion during a large demonstration by the Hazara ethnic community in 2016 protesting systemic discrimination in terms of energy provision and the rerouting of a transmission line from Central Asian republics killed and wounded hundreds (Mashal and Nader, 2016). On the basis of the argument that decentralized renewables-based energy systems enhance energy autonomy and democracy, conflicts along ethnic and religious lines involving practices of systemic discrimination and deprivation of a certain group on the basis of ethnicity or religion by the dominant community in power could be reduced (Kivimaa et al., 2022).

However, global energy transitions might also contribute to the onset of or an increase or intensification of conflicts in some countries especially those with rare earth materials crucial for energy transitions such as lithium (Kivimaa et al., 2022). It is claimed that Afghanistan sits on large deposits of lithium, worth around 1 trillion USD and the Chinese are already contemplating investments in the sector (Blumenthal et al., 2022). China has maintained relatively warmer relations with the Taliban and the country has shown readiness to invest 10 billion USD in Afghanistan's lithium deposits (KabulNow, 2023). The Taliban, on the other hand, struggle financially to deliver basic services and pay for their employees' salaries making them open to such investments. China's investment in lithium, if and when realized, may intensify conflicts or lead to new ones in Afghanistan as rival economic and military powers such as the US and Russia still maintain economic and military interests in the country having clashed with each other several times in the past. Such a conflict may also draw in new players and impact many inside and outside Afghanistan including regional countries.

For the above reasons, global energy transitions and domestic efforts in this direction in Afghanistan might contribute to increased inequality, marginalization of certain groups, worsening poverty, and strengthening of criminal and armed groups (Kivimaa et al., 2022). In this sense, a potential negative consequence of energy transitions might be the further

widening of gaps in the already fragmented communities in the country in the absence of strong state institutions, rule of law, and national values. It is therefore crucial to carefully consider these sensitive issues and design conflict-sensitive policies (Dabelko et al., 2013).

Looking at the energy developments in Afghanistan through the lens of the MLP framework: To begin with, this thesis does not claim that the developments in the energy sector of Afghanistan between 2001 and 2021 constitute an energy transition as is currently understood (i.e., the phase-out of fossil fuels and implementation of decentralized renewable energy systems). Here, I attempt to formulate the developments in the energy sector of Afghanistan according to the conceptual frameworks introduced in the introduction chapter, particularly the multi-level perspective (MLP). It is important to bear in mind that sociotechnical transitions frameworks in general and the elements of the MLP in particular cannot be applied to every context in a straightforward manner. I start with changes on the landscape level, followed by niche experiments, and concluded by a description of the multiple regimes.

Afghanistan's energy sector can be a suitable example to showcase how **landscape**-level shocks triggered system-wide changes. The events of September 11, 2001, and the subsequent military intervention led by the US were landscape shocks which set in motion large-scale economy-wide transitions in Afghanistan, including in its energy sector. The landscape changes included (a) a complete overhaul of the political system from an Islamic Emirate ruled by an Emir to a democratic elections-based system, (b) a shift to market economy model where private sector played a more prominent role, (c) a fundamental change in the make-up of actors which resulted in a significant increase in available technical capacity, and (d) a multi-fold increase in available financial capacity in the country through development aid. According to the socio-technical transition theory (Geels, 2002; Köhler et al., 2019), the events described here constitute landscape pressures which may trigger transitions. Additionally, climate change was a further landscape force influencing energy development in the country.

As far as **niches** in the energy sector of Afghanistan are concerned, renewable energy initiatives or start-ups were nonexistent prior to 2001. These niches or sustainability experiments (Berkhout et al., 2010; Sengers et al., 2019) were initiated mostly by and with the help of international development organizations post-2001. Distribution of solar panels and batteries to households in rural villages within the National Solidarity Programme (NSP) was one of the first projects that could be considered as a niche activity. This collective effort by the aid organizations and the government of Afghanistan was launched in the first half of 2000s. As part of the NSP, around 5,000 small scale-scale renewables-based energy projects were implemented. The installation of 100 kW wind energy system in Panjshir in 2008 can also be considered as a niche activity. Later, larger projects were developed such as the 1

MW solar PV and diesel hybrid system in Bamyan in 2013, 2 MW solar and wind hybrid system in Herat in 2017, and 10 MW solar farm in Kandahar in 2019.

It is, however, difficult to identify a **regime** as per the MLP in the energy sector of Afghanistan. It could be argued that multiple regimes existed: (1) a regime of large hydro power plants which were mostly built during the last century and rehabilitated between 2001 and 2021; (2) a regime of energy imports as the country imported around 80% of its electric energy needs for much of the 2001-2021 period; and (3) a regime based on traditional sources of energy as the majority of the population did not have access to modern forms of energy and still need to rely on animal and agricultural waste, charcoal, and fuelwood. Each of the above could be considered as a regime in their own right. For example, large hydro makes up around half of the domestic generation capacity and the country has relied on this source of energy for at least half a century. Similarly, during the 2001-2021 era extensive infrastructure and power purchase agreements were designed for energy imports from Central Asian countries which accounted for the bulk of supply. Lastly, much of the population still relies on traditional sources of energy and this could be a dominant regime similar to the other two. Identifying a uniform and coherent regime in utility sectors in low- and middle-income countries can in some cases be difficult and the existence of multiple regimes are unexceptional (Furlong, 2014; Oates, 2021).

Overall, the developments in the energy sector of Afghanistan did not involve complete replacement of a dominant regime by another one. Multiple complementary regimes coexisted such that individual regimes were not in direct competition with one another. Furthermore, contrary to Global North contexts where regime and niche actors are usually not the same, in the context of Afghanistan international organizations not only acted as on regime and niche levels by changing and developing laws and policies and undertaking sustainability experiments, but they were also part of the landscape forces who had resources and capacities to bring about wider changes in the broader environment.

6.5. Policy implications

Based on the findings of this dissertation, some policy implications can be drawn around the following themes:

In terms of energy planning in conflict-affected areas:

According to the International Energy Agency‘s World Energy Outlook 2022, around 775 million people still live without access to electricity (IEA, 2022). Unsurprisingly, more than half of those are in fragile and conflict-affected settings (IEA et al., 2023). If the total number of population living in conflict zones is 1 billion (World Bank, n.d.), almost half of them do

not have access to electricity; and if we take the 2 billion figure as per OECD's States of Fragility 2022 (OECD, 2022a), then around a quarter do not have access to electricity. IEA projects that the bulk of global electricity demand comes from emerging markets due to mainly their rapidly growing populations and economies as well as their currently unmet demand (IEA, 2022). Similarly, we know from Vanegas Cantarero (2020) that the share of modern renewable energy is lower in Global South countries than in their Global North counterparts. In light of the above-mentioned statistics and based on the findings of this dissertation in a conflict setting, policymakers need to take the factor of armed conflict into account when planning energy projects in these settings and implement small-scale off-grid projects.

One of the takeaways from this dissertation for energy policymakers in conflict-affected settings is to enhance the resilience of energy systems by implementing off-grid energy projects. The findings of this thesis show that large projects and units such as dams, transmission lines, and large-scale generation systems are often targeted by warring parties. While small-scale projects may also be targeted, they do not disrupt the supply as much as large-scale centralized units do when damaged or destroyed. Along the same lines, the shorter the distance between supply sites and consumption points the lesser is the risks of attacks and disruptions and the higher the resilience of the system. In terms of energy sources, solar PV is shown to be a practical option in conflict settings for uses such as lighting and charging electronic devices. A recent article confirms the usefulness of renewable energy especially solar in conflict settings as it constitutes 25 % of the total supply of the conflict-affected Gaza strip making at a regional RE leader (Fischhendler et al., 2022).

In terms of energy sector development in Afghanistan:

With regard to development of the energy sector in Afghanistan, this dissertation offers the following recommendations to policymakers. First, the role and mandates of the government agencies need to be made clear. As discussed in the thesis, there are uncertainties regarding the role of for example the national utility DABS vis-à-vis MEW in terms of energy planning or generation. At times during the 20-year period, DABS took over some of the functions the MEW was supposed to fulfill. Likewise, there were instances where three governmental entities – DABS, MEW, and MRRD – managed projects. The mandates of these entities and others active in the energy sector need to be clearly defined and the overlaps minimized. Similarly, the government should perhaps exclude some ministries and agencies from the energy sector such as the Ministry of Economy in planning energy projects. This way, existing overlaps are minimized and the roles are made clearer. Following this, a strong and independent regulatory body needs to be established. This can potentially attract the private sector as it promises accountability and transparency.

The government of Afghanistan needs to further develop the regulatory framework of the energy sector by filling in the gaps and removing existing contradictions in the current policy and legal documents. The leading agency in the sector, not clearly defined[23], could work on harmonizing the policy documents in a way that all the pieces steer the sector in one direction and are arranged to achieve one purpose. International development organizations shaped the structure of the regulatory framework in 2001-2021 period. Policy documents developed in this period reflect the influence of international organizations (e.g., extra emphasis on renewables, privatization, etc.). The government of Afghanistan and the country's legislature need to take a leading role in this regard. Future developments ought to address the needs and priorities of the country.

A well-functioning regulatory structure and bureaucracy is an important "pull" factor for private sector investment. The role of the private sector is vital, especially now that most international aid organizations have left the country or suspended their development projects worth hundreds of millions of dollars. In the 2001-2021 era, the private sector barely contributed to the development of the sector. While some factors were beyond the control of the government of Afghanistan, work could have been done to complete the regulatory framework, reduce taxes and duties, provide incentives and subsidies to investors, improve the security situation, eradicate corruption, ease administrative processes, and strengthen the State capacity.

Both international donors and domestic investors were unsatisfied with the low capacity in the government; donors frequently cited low capacity in the government as the key reason for implementing off-budget projects. While it was primarily the international donors who initiated capacity building programs for government employees between 2001 and 2021, the government of Afghanistan could take a leading and more active role in this regard now donors have left. This could be achieved by knowledge sharing, trainings, requiring prospective donors to train government employees and involve them from start to finish, enhancing collaboration with academic institutions, and creating opportunities for employees to learn from their counterparts in the region.

For international organizations working in Global South aid receiving countries such as Afghanistan:

Annually billions of development aid are delivered to dozens of countries worldwide. The need for development and humanitarian aid will continue to increase in tandem with the rise in the number of fragile and conflict-affected countries and multi-dimensional crises (OECD,

[23] There were instances in the past where both the Ministry of Finance and the utility DABS negotiated and signed energy investment or imports agreements even though the nodal ministry in the sector was Ministry of Energy and Water.

2022a). OECD reports that the total amount of official development assistance (ODA) in 2022 was an all-time high at 204 billion USD, a 20 billion increase from the 186 billion in 2021 (OECD, 2023). ODA is usually delivered through international development agencies, multilateral banks, international non-governmental, not-for-profit organizations, or in accordance with particular bilateral agreements. In the case of Afghanistan these organizations were, among others, USAID, GIZ, DFID, World Bank, ADB, UNDP and other UN agencies, and NGOs. The findings of this dissertation contain lessons for international development organizations.

One of the lessons learned from the case of Afghanistan is that international organizations need to better understand the local (institutional) context to enhance acceptance and the overall success of their projects. This may have been recommended in other studies and reports. The findings of this thesis endorse and underscore the significance of this lesson. Chapter four studies precisely the role of international organizations in changing institutions in an aid-recipient country such as Afghanistan. Understanding the local (institutional) environment becomes all the more important if international development organizations work in culturally and institutionally different contexts such as Afghanistan or countries for example in the Middle East or South Asia. Some of these aid agencies originate from Western countries. A viewpoint one regularly encounters in this regard and which was also raised by an interviewee is that Western donors did not understand the Afghanistan context well enough. In this viewpoint, changes involving cultural norms and practices such as those affecting women working and traveling (abroad) for work or education were enforced too quickly.

Understanding the local context well leads to another important conclusion which is that international organizations need to abandon the 'one-size-fits-all' approaches and practices. While there are project designs that have successfully been transferred from one context to another, many such attempts do not yield the results aid donors or receivers expect. The National Solidary Programme (NSP), inspired by the Kecamatan community-based development programme pioneered by Scott Guggenheim of the World Bank in the late 1990s in Indonesia, was a rare success story in the context of Afghanistan. A key explanation could be that the programme was adapted for the conditions in Afghanistan. Nevertheless, there are more examples of unsuccessful attempts.

Further policy recommendations include fostering a sense of ownership of development projects in the local population and the recipient government; this can be achieved primarily by ensuring that local actors are involved throughout the whole process of implementing a project. While this was not researched in detail in this dissertation, an interviewee pointed out that energy systems installed with financial or other contributions by locals lasted longer than those implemented entirely by aid money and with limited local participation.

Interviewees, mostly representing the Afghanistan government and academia, also argued against the creation of parallel structures by international development organizations. They advocated strengthening and working with the already existing governmental and local structures. Along the same lines, the group of experts representing Afghanistan side preferred the on-budget aid delivery (i.e., to the government) over off-budget delivery (bypassing the government of Afghanistan). The reasoning is that bypassing the government's structures undermines the local government. Off-budget projects are usually not aligned with the government's development plans and implementing development projects in this way can lead to duplication of efforts and difficulty in coordination.

6.6. Limitations

The most important limitation of this thesis lies in the fact that information about Afghanistan is scarce, inconsistent, and often conflicting. The return of the Taliban in August 2021, the thesis half-complete at the time, made the country and sources of information more inaccessible. More information and improved access to informants would have improved the thesis.

6.7. Perspectives for future research

This section concludes the dissertation with suggestions for future work. A natural progression of this work is to analyze (a) the role of international (development) organizations in sustainability transitions in aid-receiving countries of Global South, and (b) sustainability transitions and the role of actors in conflict-affected settings.

With regard to the role of international organizations in sustainability transitions in aid-receiving countries in Global South:

Considerably more work will need to be done for us to have a sound understanding of the role of international development organizations in sustainability transitions in Global South. Further research could explore the conflicts in ontological assumptions in the cultures of aid donors and aid receivers with regard to sustainability transitions. What conflicts and differences exist between (predominantly Western) aid donors and aid recipients with regard to values, cultures, and institutions and how these conflicts and differences impact sustainability transitions?

As per OECD's States of Fragility 2022 report, nearly 2 billion people live in fragile and conflict-affected settings. Similarly, OECD statistics show that in 2022 a record amount of 204 billion US dollars were provided as official development assistance (ODA) to mostly these countries. The development aid and in most cases also humanitarian aid are delivered

by international development organizations. Since these organizations have substantial financial and technical capacities and, in some cases, outweigh those of the recipient governments', they play a significant role in countries highly reliant on foreign aid as we have learned from the case of Afghanistan. In some cases, they tie their aid to certain conditions such as privatization of state-owned enterprises, inclusion of certain groups, democratization efforts, and implementation of certain governance principles. International organizations engage in for instance changing and creating organizations, defining policies and strategies, agenda setting, and institutional change.

In terms of institutional change, the following specific research questions could produce valuable insights into the work of international organizations: What specific practices and what types of institutional work activities (Lawrence and Suddaby, 2006) do international organizations undertake to induce institutional change in aid-recipient countries? Which institutional work activities by international organization produce the desired outcomes? Which institutional work activities by international organizations lead to conflicts with local cultures and institutions? What are the impacts of place-specific conditions on the institutional work activities by international organizations? Investigation of their role in a select number of countries around the world or in certain geographies may provide important theoretical insights. It can also produce policy recommendations for both these organizations and the aid-recipient countries. A contribution of such research is furthering conceptualizations on the role of actors in sustainability transitions, especially international organizations which have received scant attention in the literature (Kranke and Quitsch, 2021).

With regard to sustainability transitions and the role of actors in conflict settings:

Firstly, this thesis studied the role of international organizations in energy transitions in the conflict setting of Afghanistan. Chapter five studied energy imaginaries and found that the dominant energy imaginary supported by a host of actors is 'Afghanistan as an energy corridor between Central Asia and South Asia'. More work could explore the potential of this imaginary and the energy projects involved in peacebuilding and regional cooperation. Future research could usefully explore sustainability transitions in other sectors such as food or water in Afghanistan. The same could also be duplicated in other conflict settings with different socio-political and physical conditions. Then, a comparison between sustainability transitions in different sectors within a county as well as between countries might improve our understanding of sustainability transitions in conflict settings. There are notable differences between countries in South Asia and those in Africa or South America and Europe.

Secondly, agency and the role of actors in sustainability transitions still need further conceptualization despite important recent contributions. Much of the conceptual work on

actors in sustainability transitions has been based on experiences in Western particularly European countries. We know far less about the role of actors in Global South and even more so in conflict settings. These contexts can be very different, institutionally and otherwise, from those in Western Europe. One of the significant actors in sustainability transitions is the State on which there is insufficient conceptual work, particularly in Global South and conflict settings where they might play a more predominant role (Eckersley, 2021; Johnstone and Newell, 2018; Silvester and Fisker, 2023). Researching the interactions between international organizations, the state, and other local actors in Global South and conflict settings would be a fruitful area for further work.

Concrete themes that could be looked at are the role of State in sustainability transitions in conflict settings and Global South and how international organizations limit or facilitate the role of the State and other local actors. Similar to Avelino and Wittmayer (2016) who present a multi-actor perspective in sustainability transitions, further research could study and potentially conceptualize interactions and power relations between international organizations, the State, and other local actors in Global South and conflict settings. One could specifically investigate whether and when international organizations limit and/or facilitate sustainability transitions in Global South conflict settings. Similarly, a further avenue for research would be studying whether and when international organizations complement the agency of local actors and/or constrain their agency and what the impacts are on transitions outcomes. Such future studies can enhance our understanding of global-national- local relations in addition to furthering literature on the role of actors.

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8. Appendices

Appendix 1: Articles included in this cumulative dissertation and authors' contributions.

Overview of articles included in this cumulative doctoral dissertation (in accordance with the guideline for cumulative dissertations in the Faculty of Sustainability Science dated 23.01.2012, in the following termed "the guideline")

Thesis title: International Organizations and Energy Transitions in Afghanistan

The research articles included in this thesis have been or will be published as follows:

1. Title: The renewable energy sector in Afghanistan: Policy and potential
   Authors: Abdullah Fahimi and Paul Upham
   Journal: Wiley Interdisciplinary Reviews: Energy and Environment
   https://doi.org/10.1002/wene.280

2. Title: Building energy institutions in a conflict zone: the case of Afghanistan
   Authors: Abdullah Fahimi, Paul Upham, and Gesa Pflitsch
   Journal: *Submitted* to Energy Research and Social Science

3. Title: Afghanistan's energy sociotechnical imaginaries: Alternative visions in a conflict zone
   Authors: Abdullah Fahimi, Paul Upham, and Sybille Münch
   Journal: Political Geography
   https://doi.org/10.1016/j.polgeo.2022.102657

Authors' contributions to the above articles and the publication status of the articles (according to §16 of the guideline for cumulative dissertations):

Explanations:
AF – Abdullah Fahimi
PU – Paul Upham
SM – Sybille Münch
GP – Gesa Pflitsch

#	Title	Specific contributions of all authors	Author status	Weigh ting factor	Publication status	Presented in conference(s)
1	The renewable energy sector in Afghanistan: Policy and potential	AF undertook data collection and preliminary data analysis. AF contributed to execution of research. AF contributed to writing the first draft. PU contributed to interpretation of data. PU contributed to rewriting of the draft and preparation of a manuscript.	First author with predominant contribution	1.0	Published in: *Wiley Interdisciplinary Reviews: Energy and Environment, 7(2), e280.*	Renewable Energy Policy Network for the 21st Century (REN21) academy. Dates: 19-21.11.2018 Place: Berlin, Germany
2	Building energy institutions in a conflict zone: the case of Afghanistan	AF undertook data collection and preliminary data analysis. AF contributed to execution of research. AF contributed to writing the first draft. PU contributed to theory and methods	First author with predominant contribution	1.0	Submitted to (April 2023): *Energy Research and Social Science (ERSS)*	The 6th Geography of Innovation Conference (GeoInno2022). Dates: 4-6.07.2022 Place: Milan, Italy Link: https://geoinno2022.com/ 7th NEST Conference – "Global Sustainability Transitions: Towards Collaboration among Early Career Researchers"

		sections. PU contributed to editing and revision of the manuscript. GP contributed to theory and methods sections. GP contributed to editing and revision of the manuscript.				Dates: 5-6.05.2022 Place: Lyon, France Link: https://transitionsnetwork.org/7th-nest-conference-may-5-6/ Conference organized by the European Forum for Studies of Policies for Research and Innovation (Eu-SPRI)– Early Career Research Conference Dates: 21-23.10.2021 Place: Paris, France Link: https://ifris.org/en/agenda/eu-spri-2021-early-career-research-conference-ecc-paris-france/ European Consortium for Political Research (ECPR) general conference Dates: 30.08-03.09.2021 Place: Innsbruck, Austria/Virtual. Link: https://ecpr.eu/Events/151 12th International Sustainability Transitions (IST) Conference with the theme of Mainstreaming sustainability transitions - From research towards impact.

						Dates: 5-8.10.2021 Place: Karlsruhe, Germany /Virtual. Link: https://www.ist2021-karlsruhe.de/ist2021-en/index.php
3	Afghanistan's energy sociotechnical imaginaries: Alternative visions in a conflict zone	AF undertook data collection and preliminary data analysis. AF contributed to execution of research. AF contributed to writing the first draft. AF contributed to writing a revised version of the manuscript. PU contributed to theory and methods sections. PU contributed to editing and revision of the manuscript. SM contributed to theory and methods sections. SM contributed to editing and revision of the manuscript. SM	First author with predominant contribution	1.0	Published in: *Political geography, 98, 102657*	13th Interpretive Policy Analysis (IPA) conference Dates: 28.06-02.07-2021 Place: Virtual Link: https://ipa.science/events/events/ Energy Futures - Emerging Pathways in an Uncertain World Dates: 22-26.01.2021 Place: Berlin, Germany/Virtual Link: https://www.leibniz-energiewende.de/konferenzen/2021-energy-futures-emerging-pathways-in-an-uncertain-world 11th International Sustainability Transitions (IST) Conference with the theme of Governance in an Era of Change – Making Sustainability Transitions Happen. Dates: 18-21.08.2020 Place: Vienna, Austrial/Virtual Link: http://ist2020.at/

		contributed to writing a revised version of the manuscript.				International conference on Energy Geopolitics and Renewable Electrification Dates: 18-19.12.2019 Place: Jerusalem, Israel

Author status:

According to §12b of the guideline:

- "Single authorship, if the PhD student's own contribution is 100%.
- Predominant contribution, if the PhD student's own contribution is greater than the individual share of all other co-authors and is at least 35%.
- Equal contribution, if (1) the PhD student's own contribution is as high as the share of other co-authors, (2) no other co-author has a contribution higher than the PhD student's own contribution, and (3) the PhD student's own contribution is at least 25%.
- Important contribution, if the PhD student's own contribution is at least 25%, but is insufficient to qualify as single authorship, predominant or equal contribution.
- Small contribution, if the PhD student's own contribution is less than 20%."

Weighting factor

According to §14 of the guideline:

Single author	1.0
Co-author with predominant contribution	1.0
Co-author with equal contribution	1.0
Co-author with important contribution	0.5
Co-author with small contribution	0

Declaration (according to §16 of the guideline):

I avouch that all information given in this appendix is true in each instance and overall.

Appendix 2. Scheme of questions for semi-structured interviews for the article in chapter four.

1. How do you assess the role of transnational actors and development aid organisations in the energy sector of Afghanistan?
2. What were some of their most important achievements or milestones in the sector?
3. How did they achieve these? Can you remember the process or steps and discuss how one thing led to the other? Can you connect these achievements and milestones with their preceding programs or projects that might have helped?
4. Do you think transnational actors and development aid organisations have created new organisations or structures or changed existing organisations and structures in Afghanistan? If yes, could you please give examples with the name of the actor, the year in which they created or changed, and the name of the organisation/structure in question?
5. Were Afghan actors involved in the designing or implementation of projects? How much and in what capacities?
6. What reforms in the energy sector do you think were implemented by transnational actors and development aid organisations or because of their involvement?
7. What do you think were or are the challenges for transnational actors and development aid organisations working in the energy sector of Afghanistan?
8. Do you have any other comments or remarks on the role of transnational actors and development aid organisations in the energy sector that we might have missed in this conversation?

Appendix 3. List of documents reviewed for the article in chapter four.

Document	Author(s)/Organisation	Year
Findings, Conclusions & Recommendations from the Independent Evaluation of National Area-Based Development Programme	Elizabeth Winter, Kerry Abbott for UNDP	2004
Proposed Technical Assistance to the Islamic Republic of Afghanistan for Support to the Inter-Ministerial Commission for Energy	ADB	2006
Capacity Assessment in the Subsector of Rural Electricity Supply through Renewable Energy Technologies	GTZ (predecessor to GIZ)	2009
National Area Based Development Programme (NABDP) III Afghanistan: Independent Management Review Final Report	Basil Comnas and Kalimuddin Ghawri for UNDP	2010
Kabul Electricity Support Improvement Project Fact Sheet	USAID	2010
Afghan Energy Capacity Building Program Fact Sheet	USAID	2011
Afghanistan National Energy Supply Program (NESP)	Ministry of Energy and Water	2013
Afghanistan Power Sector Master Plan (PSMP)	Prepared by FICHTNER GmbH & Co. KG in Stuttgart, Germany; commissioned by ADB	2013
Supporting the Inter-Ministerial Commission for Energy	ADB	2013
DABS Planning and Capacity Support (P131228)	World Bank	2013
Afghanistan Renewable Energy Policy	Ministry of Energy and Water and GIZ	2015
Afghanistan Sustainable Energy for Rural Development project document	UNDP	2015
Renewable Energy Summit and Exhibition – "Access to Finance"	USAID	2015
Afghanistan: Extractives for Development Project (P159402)	World Bank	2016
Citizens' Charter Elements Project (P160567)	World Bank	2016
Enabling PV in Afghanistan	GIZ	2017
Renewable Energy Roadmap for Afghanistan (RER2032)	Prepared by IT Power Consulting Private	2017

	Limited (ITP), India; commissioned by ADB	
Afghanistan Renewable Energy Development Issues and Options	World Bank	2018
Afghanistan: Second Sustainable Development of Natural Resources Project (P118925)	World Bank	2018
Energy Security Trade-Offs Under High Uncertainty: Resolving Afghanistan's Power Sector Development Dilemma	Defne Gencer, John Irving, Peter Meier, Richard Spencer, and Chris Wnuk for the World Bank	2018
A Conference on Private Investments for Development of Sustainable Energy in Afghanistan	Bibi Yada Seddiqi, Women's Initiatives for Sustainable Energy Association	2018
Capacity Building support to the Energy Directorates in the Energy Division of the MEW and the Provincial Energy Committees of MEW: Final Report	Mittal Processors Private Limited for GIZ's IDEA project	2018
Islamic Republic of Afghanistan: Energy Supply Improvement Investment Program (Tranche 5)	ADB	2018
Sector Overview	ADB	2019
Energy Sector Improvement Program (ESIP) Mid-term Review Workshop	GIZ	2019
Completion Report: Supporting the Inter-Ministerial Commission for Energy	ADB	2019
Energy Supply Improvement Investment Program (Tranche 7) (PFRR AFG 47282-009): Gender Action Plan	ADB	2020
Afghanistan rural energy market transformation initiative - Strengthening resilience of livelihoods through sustainable energy access	UNDP	2020
Afghanistan Sustainable Energy for Rural Development: Mid-term Evaluation	UNDP	2021

Appendix 4. **Legend of institutional and organisational changes in the three transition topologies in the case of Afghanistan's energy landscape.** Institutional changes = *I*; New formal organisational entities = *O*; Projects = *P*; Temporary events = *E*; Network forms of organisation = *N.*

(1) Development of a regulatory framework for Afghanistan's energy sector

#	Year	Institutional and organisational changes including new formal organisational entities or temporary organisations such as temporary events, projects, and network forms of organisation
1	**2000**	Adoption of the Millennium Development Goals (MDGs) by international community, *(I)*
2	**2001**	Bonn Agreement, *(I)*
3	**2002**	Launch of Tokyo Conference held on January 21-22, 2002 – the first of several donors-government conferences in the period 2001-2021 in which the donors have pledged assistance and the government of Afghanistan discussed progress and plans, *(E)*
4		Opening of the ADB office in Afghanistan, *(O)*
5		Reopening of the USAID office in Afghanistan, *(O)*
6		Resumption of activities and opening of the then GTZ office in Kabul, *(O)*
7		Re-establishment of the UNDP office in Afghanistan [24], *(O)*
8		Reopening of the World Bank office in Afghanistan, *(O)*
9		Adoption of the National Development Framework (NDF), *(I)*
10		Launch of the project National Area-Based Development Programme (NABDP), *(P)*
11		Establishment of District Development Assemblies (DDAs), *(O)*
12	**2003**	Completion of an Assessment project - Afghanistan: Post-Conflict Environmental Assessment, *(P)*
13		Launch of the project National Solidarity Programme (NSP), *(P)*
14		Establishment of Community Development Councils (CDCs), *(O)*
15	**2004**	Adoption of the Millennium Development Goals (MDGs) by Afghanistan, *(I)*

[24] UNDP has provided assistance for Afghanistan also during 2000 and 2001, mainly through their office in neighbouring Pakistan.

16		Adoption of the New Afghanistan Constitution, *(I)*
17		Establishment of the U.S. – Afghanistan Energy Partnership Program, *(N)*
18		Launch of the project Afghanistan Energy Assistance Project (AEAP), *(P)*
19		Adoption of the first Power Sector Master Plan in post-2001 era, *(I)*
20		Adoption of Securing Afghanistan's Future, *(I)*
21	**2005**	Establishment of the Afghanistan Environmental Protection Agency (NEPA), *(O)*
22		Approval of the Mineral Law, *(I)*
23		Approval of the Hydrocarbons Law, *(I)*
24		Signing of agreement between USAID Afghanistan and USAID India through the South Asia Regional Initiative for Energy Cooperation and Development (SARI) to provide assistance to the energy sector of Afghanistan, *(N)*
25		Accession to the Central Asia Regional Economic Cooperation Program (CAREC), *(N)*
26		Establishment of the Afghan Energy Information Center (AEIC) at the Ministry of Energy and Water, *(O)*
27		Launch of the project Restructuring and commercialization of Da Afghanistan Breshna Moassessa (DABM), *(P)*
28	**2006**	Launch of the project Sustainable Development of Natural Resources Project (SDNRP I), *(P)*
29		Establishment of the Inter-ministerial Commission for Energy (ICE), *(O)*
30		Adoption of the Interim Afghanistan National Development Strategy (I-ANDS), *(I)*
31	**2007**	Adoption of the Environmental Law, *(I)*
32		Establishment of the Afghanistan National Standard Authority (ANSA), *(O)*
33		Launch of the project Improving the Capacity Of Da Afghanistan Breshna Moussassa (DABM), *(P)*
34		Launch of the project Afghanistan Energy Programme Renewable Energy Supply for Rural Areas (ESRA), *(P)*
35	**2008**	Adoption of the Afghanistan National Development Strategy (ANDS), *(I)*
36		Adoption of The Energy Sector Strategy – as Part of ANDS, *(I)*

37		Corporatisation/commercialisation of Da Afghanistan Breshna Moassessa (DABM) and its conversion to Da Afghanistan Breshna Sherkat (DABS), *(I)*
38		Launch of the project Human and Institutional Capacity Building for Afghanistan Energy and Natural Resources (HICB), *(P)*
39		Launch of two-year post-graduate diploma programs at the Kabul University and Kabul Polytechnic University for training on Operation & Maintenance activities for transmission and distribution systems and in hydropower plant operations, *(O)*
40		Launch of the project Energy for Rural Development in Afghanistan (ERDA), *(P)*
41		Establishment of the Rural Energy and Enterprise Department (REED), *(O)*
42	**2009**	Establishment of the Program Management Office (PMO) at DABS, *(O)*
43		Launch of the project Kabul Electricity Service Improvement Project (KESIP), *(P)*
44		Launch of the project Kabul Electricity Directorate (KED) Commercialization, *(P)*
45		Launch of the project Afghanistan Power System Development Project, *(P)*
46		Government of Afghanistan endorses implementation of Extractive Industries Transparency Initiative (EITI) principles, *(I)*
47		Revision and Adoption of the new Hydrocarbons Law, *(I)*
48		Establishment of the Renewable Energy Department (RED) at the Ministry of Energy and Water, *(O)*
49		Launch of the project Afghan Clean Energy Project (ACEP), *(P)*
50		Launch of the project Technical Support to Afghan Energy Information Center (AEIC), *(P)*
51		Launch of the project Support for Interministerial Commission for Energy (ICE), *(P)*
52	**2010**	Admission of Afghanistan as a candidate to Extractive Industries Transparency Initiative (EITI), *(I)*
53		Establishment of the Extractive Industries Transparency Initiative (EITI) Multi-Stakeholder Group (MSG), *(N)*

54		Adoption of the National Priority Programmes at the 2010 Kabul Conference, *(I)*
55		Rehabilitation of the Vocational Training Center at Ministry of Energy and Water with 334 new technical reference books and English dictionaries, *(E)*
56		Establishment of the Afghanistan Infrastructure Trust Fund (AITF), *(O)*
57	**2011**	Launch of the project Sustainable Development of Natural Resources Project (SDNRP II), *(P)*
58		Establishment of the Secretariat for the Inter-Ministerial Council, *(O)*
59		Establishment of the Kabul University Renewable Energy Laboratory, *(O)*
60		Establishment of the Tarakhil Training Center, *(O)*
61	**2013**	Adoption of the Power Sector Master Plan (PSMP), *(I)*
62		Launch of the project Afghanistan: Supporting the Inter-Ministerial Commission for Energy, *(P)*
63		Adoption of the Afghanistan Rural Renewable Energy Policy, *(I)*
64		Establishment of the Afghanistan Petroleum Authority (APA), *(O)*
65		Adoption of the National Energy Supply Programme (NESP), *(I)*
66		Establishment of the Energy Engineering Department at Kabul University, *(O)*
67		Establishment of the Afghanistan Renewable Energy Union (AREU), *(O)*
68		Th government of Afghanistan approves issuance of electricity generation license by MEW to Independent Power Producers (IPPs), *(I)*
69		Transfer of the Afghan Energy Information Center (AEIC) from the Ministry of Energy and Water to DABS, *(I)*
70		Launch of the project Afghanistan: Gas Development Master Plan, *(P)*
71	**2014**	Establishment of the Solar House Technicians Association (SHTA), *(O)*
72		Launch of the project Modernising university education in Afghanistan's mining sector, *(P)*
73	**2015**	Adoption of the Afghanistan Renewable Energy Policy, *(I)*
74		Launch of the project Afghanistan: Renewable Energy Development, *(P)*
75		Launch of the project Institutional Development for Energy in Afghanistan (IDEA), *(P)*

76		Adoption of the Afghanistan Energy Efficiency Code for Building, *(I)*
77		Launch of the project Afghanistan Sustainable Energy for Rural Development (ASERD), *(P)*
78		Establishment of the Renewable Energy Coordination Committee (RECC), *(N)*
79		Establishment of the Provincial Energy Committees (PECs), *(N)*
80		Launch of the project Consultancy services for improving the business environment –Reform of the Afghanistan State Gas Enterprise ("Afghan Gas") with the production of a corporatisation report, *(P)*
81		Endorsement of the Sustainable Development Goals (SDGs) by the government of Afghanistan, *(I)*
82		Launch of the project Afghanistan Energy Study, *(P)*
83		Establishment of the SDG Secretariat at the Ministry of Economy, *(O)*
84	**2016**	Adoption of the Power Services Regulation Act, *(I)*
85		Adoption of the Afghanistan Energy Efficiency Policy, *(I)*
86		Afghanistan signs Paris Agreement, *(I)*
87		Launch of the national programme Citizen's Charter, *(P)*
88		Establishment of the National Energy Regulatory Authority (NERA) at the Ministry of Energy and Water, *(O)*
89		Launch of the project Consultancy Services for Improving the Business Environment: Reform of Northern Coal Enterprise (NCE) with the production of a corporatisation report, *(P)*
90		Launch of the project DABS Planning and Capacity Support, *(P)*
91		Adoption of the Afghanistan National Integrated Energy Policy (ANEP), *(I)*
92		Adoption of the Public Private Partnership (PPP) Law, *(I)*
93		AREU signs a Memorandum of Understanding with the Ministry of Energy and Water (MEW), *(I)*
94		AREU signs Memorandum of Understanding with the German Solar Industry Association (BSW), *(I)*
95	**2017**	Adoption of the Renewable Energy Roadmap for Afghanistan (RER2032), *(I)*
96		Establishment of the Afghanistan Energy Information Portal (AEIP), *(O)*

97		Launch of the event Youth Entrepreneurship Support (YES), *(E)*
98		Adoption of the Afghanistan National Peace and Development Framework (ANPDF) 2017-2021, *(I)*
99		Adoption of the National Priority Programmes (NPPs) to operationalize the goals set in ANPDF, *(I)*
100		Establishment of the Executive Committee on Sustainable Development Goals, *(N)*
101		Launch of knowledge exchange events: Solar Off-grid Electrification Workshop (Bangladesh, Jan 2017), *(E)*
102		Launch of Geo-spatial workshop I (New Delhi, Feb 2017), *(E)*
103		Launch of Geo-spatial workshop II (Dubai, Jul 2017), *(E)*
104		Accession to the International Renewable Energy Agency (IRENA), *(N)*
105		Adoption of the Energy Efficiency Guidebook for Buildings (Farsi), *(I)*
106		Adoption of the Renewable Energy Strategy for rural Afghanistan (Farsi), *(I)*
107		Launch of the first Afghanistan Sustainable Energy Week (ASEW), *(E)*
108		AREU signs a Memorandum of Understanding with Mercy Corps, *(I)*
109	**2018**	Adoption of the State-owned Corporations Law, *(I)*
110		Enactment of the reviewed and revised Public Private Partnership Law, *(I)*
111		Establishment of a Training Center for Renewable Energy in Afghanistan (TCRENAF) at Kabul University, *(O)*
112		Launch of the project Energy Sector Improvement Programme (ESIP), *(P)*
113		Legal processes for Corporatization of Afghan Gas Enterprise (AGE) undertaken by the government of Afghanistan, *(I)*
114		Adoption of the revised Minerals Law, *(I)*
115		Adoption of the revised Hydrocarbons Law, *(I)*
116		Establishment of the Afghan Oil and Gas Regulatory Agency (AOGRA), *(O)*
117		AREU signs Memorandum of Understanding with the Afghanistan National Standard Authority (ANSA), *(I)*
118		AREU signs Memorandum of Understanding with the International Organization for Standardization (ISO), *(I)*

119	**2019**	Adoption of the Environmental and Social Management Framework (ESMF) for the Citizens' Charter Afghanistan Project (CCAP), *(I)*
120		Establishment of the Forum for Coordination of Energy Stakeholders (FORCES), *(O)*
121		Launch of the project Establishment of DABS Training Center, *(P)*
122	**2020**	Establishment of the Energy Services Regulation Authority (ESRA), *(O)*
123		Adoption of the second Afghanistan National Peace and Development Framework (ANPDF II) 2021-2025: Forging our Transformation, *(I)*
124		Establishment of the Energy Efficient Houses Promoters Association (EEHPA), *(O)*
125		Launch of the event Second Youth Entrepreneurship Support (YES II), *(E)*
126		Launch of the project Development of a Renewable Energies and Energy Efficiency (RE/EE) master's degree programme at the Engineering Faculty of Kabul University, *(P)*
127		Launch of the conference AFGSolar1: Afghan Conference on Solar Technologies, *(E)*
128		Launch of the project Afghanistan: Energy Supply Improvement Investment Program (Tranche 7), *(P)*
129		Launch of the Second Afghanistan Sustainable Energy Week (ASEW II), *(E)*
130	**2021**	Launch of the project Afghanistan Rural Energy Market Transformation Initiative, *(P)*
131		Continuation of the second Afghanistan Sustainable Energy Week (ASEW II) - Women and Energy Campaigns, *(E)*

(2) Privatisation of energy systems

#	Year	**Institutional and organisational changes including new formal organisational entities or temporary organisations such as temporary events, projects, and network forms of organisation**
1	**2000**	Adoption of the Millennium Development Goals (MDGs) by international community, *(I)*
2	**2001**	Bonn Agreement, *(I)*
3	**2002**	Opening of ADB office in Afghanistan, *(O)*

4		Reopening of USAID office in Afghanistan, *(O)*
5		Resumption of activities and opening of the then GTZ office in Kabul, *(O)*
6		Re-establishment of the UNDP office in Afghanistan, *(O)*
7		Reopening of the World Bank office in Afghanistan, *(O)*
8		Adoption of the National Development Framework (NDF), *(I)*
9		Establishment of the Afghanistan Reconstruction Trust Fund (ARTF), *(O)*
10	**2003**	Establishment of the Afghanistan Investment Supporting Agency (AISA), *(O)*
11		Regularisation of relationship with International Financial Institutions such as World Bank, Asian Development Bank, and International Monetary Fund, *(I)*
12	**2004**	Adoption of the Millennium Development Goals (MDGs) by Afghanistan, *(I)*
13		Adoption of the Securing Afghanistan's Future, *(I)*
14		Establishment of the U.S. – Afghanistan Energy Partnership Program, *(N)*
15		Adoption of the New Afghanistan Constitution, *(I)*
16		Establishment of the Afghanistan National Standard Authority (ANSA) within the framework of the Ministry of Commerce and Industries, *(O)*
17	**2005**	Adoption of the Law on Domestic and Foreign Private Investment in Afghanistan, *(I)*
18		Accession to the Central Asia Regional Economic Cooperation Program (CAREC), *(N)*
19		Launch of the project Credit Guarantee Facility for Afghanistan (CGFA), *(P)*
20		Launch of the project Restructuring and commercialization of Da Afghanistan Breshna Moassessa (DABM), *(P)*
21		Establishment of the Afghan Energy Information Center (AEIC) at the Ministry of Energy and Water, *(O)*

22	**2006**	Launch of the project Sustainable Development of Natural Resources Project (SDNRP I), *(P)*
23		Adoption of the Interim Afghanistan National Development Strategy (I-ANDS), *(I)*
24		Endorsement of the Afghanistan Compact, *(I)*
25	**2007**	Establishment of the Afghanistan National Standard Authority (ANSA) as an independent authority, *(O)*
26		Launch of the project Improving the Capacity Of Da Afghanistan Breshna Moussassa (DABM), *(P)*
27	**2008**	Corporatisation/commercialisation of Da Afghanistan Breshna Moassessa (DABM) and its conversion to Da Afghanistan Breshna Sherkat (DABS), *(I)*
28		Adoption of the Afghanistan National Development Strategy (ANDS), *(I)*
29		Adoption of the Energy Sector Strategy – as Part of ANDS, *(I)*
30		Establishment and accession to the Central Asia - South Asia Regional Electricity Market (CASAREM), *(N)*
31	**2009**	Establishment of the Program Management Office (PMO) at DABS, *(O)*
32		Launch of the project Kabul Electricity Service Improvement Project (KESIP), *(P)*
33		Launch of the project Kabul Electricity Directorate (KED) Commercialization, *(P)*
34	**2010**	Adoption of the National Priority Programmes (NPPs) at the 2010 Kabul Conference, *(I)*
35		Establishment of the Afghanistan Infrastructure Trust Fund (AITF), *(O)*
36	**2011**	Launch of the project Financial Access for Investing in the Development of Afghanistan Activity (FAIDA), *(P)*
37		Launch of the project Sustainable Development of Natural Resources Project (SDNRP II), *(P)*

38		Launch of the project Sheberghan Gas Development Project (SGDP), *(P)*
39	**2013**	Establishment of the Afghanistan Renewable Energy Union (AREU), *(O)*
40		Adoption of the Afghanistan Rural Renewable Energy Policy, *(I)*
41		Th government of Afghanistan approves issuance of electricity generation license by MEW to Independent Power Producers (IPPs), *(I)*
42		Transfer of the Afghan Energy Information Center (AEIC) from the Ministry of Energy and Water to DABS, *(I)*
43	**2014**	Establishment of the Public Private Partnership Unit at the Ministry of Finance, *(O)*
44	**2015**	Establishment of Afghan Credit Guarantee Foundation (ACGF), *(O)*
45		Launch of a Technical Assistance (TA) project financed by Public-Private Infrastructure Advisory Facility (PPIAF) to support Public-Private Partnerships in Afghanistan, *(P)*
46		Launch of the event Renewable Energy Summit and Exhibition, *(E)*
47		Launch of the event Afghanistan-India Renewable Energy Summit, *(E)*
48		Launch of the project Renewable Energy Promotion in Afghanistan, *(P)*
49		Launch of events on Access to Finance Renewable Energy summits and exhibitions in Kabul and Kandahar, *(E)*
50		Launch of the project Consultancy Services for Improving the Business Environment –Reform of the Afghanistan State Gas Enterprise ("Afghan Gas") with the production of a corporatisation report, *(P)*
51		Adoption of the Afghanistan Renewable Energy Policy, *(I)*
52		Ghazanfar Group signs a Memorandum of Understanding with the government of Afghanistan to enter into a partnership to produce electricity from gas in Mazar-e-Sharif province (Mazar IPP), *(I)*

53	**2016**	Afghanistan's formal accession to the World Trade Organization (WTO), *(N)*
54		Adoption of the Power Services Regulation Act, *(I)*
55		Launch of the project Consultancy Services for Improving the Business Environment: Reform of Northern Coal Enterprise (NCE) with the production of a corporatisation report, *(P)*
56		Adoption of the Public Private Partnership Law, *(I)*
57		Establishment of the Directorate General of Public Private Partnership (PPP) at the Ministry of Finance, *(O)*
58		Bayat Power signs a Memorandum of Understanding with the government of Afghanistan to enter into a partnership based on Independent Power Producer model to produce electricity from gas in Sheberghan province, *(I)*
59		AREU signs a Memorandum of Understanding with the Ministry of Energy and Water (MEW), *(I)*
60		AREU signs Memorandum of Understanding with the German Solar Industry Association (BSW), *(I)*
61		Launch of the project DABS Planning and Capacity Support, *(P)*
62	**2017**	Adoption of the National Policy on Public Private Partnerships (PPPs), *(I)*
63		Launch of the research project Enabling PV Afghanistan to study the legal and administrative framework of Afghanistan's PV market and conditions of import, trade, and investments, *(P)*
64		AREU signs a Memorandum of Understanding with Mercy Corps, *(I)*
65		Adoption of the Renewable Energy Roadmap for Afghanistan (RER2032), *(I)*
66		Launch of the event Passage to Prosperity: India-Afghanistan Trade and Investment Show, *(E)*
67		Launch of the project to prepare Proposal to establish Investment Promotion Desk (IPD) at the Ministry of Energy and Water, *(P)*

68		Launch of the Youth Entrepreneurship Support (YES) programme, *(E)*
69	**2018**	Launch of a Conference on Private Investments for Development of Sustainable Energy in Afghanistan: Orientation of Emerging Entrepreneurs to the Energy Sector, *(E)*
70		Launch of the 50-megawatt gas-fired power plant project, known as the Mazar Independent Power Project (IPP): Mazar IPP, *(P)*
71		Bayat Energy receives final approval from the Government of The Islamic Republic of Afghanistan (GIRoA) for the construction of the first phase of the gas-fired power plant in April 2018, *(I)*
72		Bayat Energy enters into a power purchase agreement (PPA) with the Government of Afghanistan in April 2018 for off-taking 40MW from the Bayat power plant phase one, *(I)*
73		Adoption of the State-owned Corporations (SOC) Law, *(I)*
74		AREU signs Memorandum of Understanding with the Afghanistan National Standard Authority (ANSA), *(I)*
75		AREU signs Memorandum of Understanding with the International Organization for Standardization (ISO), *(I)*
76		Enactment of the reviewed and revised Public Private Partnership Law, *(I)*
77		Launch of the event Passage to Prosperity: India-Afghanistan International Trade and Investment Show (second in the series), *(E)*
78		Launch of the project Corporatisation of the Afghan Gas Enterprise (AGE), *(P)*
79		Adoption of the Private Sector Development National Priority Programme (PSD-NPP) (2018-2023), *(I)*
80		DABS signs a Memorandum of Understanding with India's TATA Power, *(I)*
81	**2019**	Launch of a Kick Off Meeting in Dubai for Reviewing Afghanistan's Net Metering Concept, *(E)*
82		Launch of the event Renewable Energy: From Green Dream to Economic Driver, *(E)*

83		Launch of the event Passage to Prosperity: India – Afghanistan International Trade and Investment Show (third in the series), *(E)*
84		Conclusion of the first Public Private Partnership Agreement between an energy producer, Badakhshan Energy (BE) and the government of Afghanistan represented by DABS, *(I)*
85		Launch of the project Establishment of DABS Training Center, *(P)*
86		Establishment of the Forum for Coordination of Energy Stakeholders (FORCES), *(O)*
87	**2020**	Transfer of the PPP General Directorate from the Ministry of Finance to the Investment Facilitation Unit of the Administrative Office of the President, *(I)*
88		Launch of the event Second Youth Entrepreneurship Support (YES II), *(E)*
89		DABS signs a Memorandum of Understanding with United Arab Emirates-Based PAL 4 Solar Energy LLC, *(I)*
90	**2021**	Launch of a virtual tour to Germany at SelfChill Solar Cooling Innovation Center organised for 75 AREU members and stakeholders, *(E)*

(3) Women's empowerment

#	Year	**Institutional and organisational changes including new formal organisational entities or temporary organisations such as temporary events, projects, and network forms of organisation**
1	**2000**	Adoption of the Millennium Development Goals (MDGs) by international community, *(I)*
2	**2001**	Bonn Agreement, *(I)*
3		Establishment of Ministry of Women's Affairs, *(O)*
4	**2002**	Opening of ADB office in Afghanistan, *(O)*
5		Reopening of USAID office in Afghanistan, *(O)*
6		Resumption of activities and opening of the then GTZ office in Kabul, *(O)*
7		Re-establishment of UNDP office in Afghanistan, *(O)*
8		Reopening of World Bank office in Afghanistan, *(O)*
9		Adoption of the National Development Framework (NDF), *(I)*

10		Launch of National Area-Based Development Programme (NABDP), *(P)*
11		Establishment of District Development Assemblies (DDAs), *(O)*
12		Establishment of the Afghanistan Independent Human Rights Commission (AIHRC), *(O)*
13	**2003**	Ratification of the UN Convention on the Elimination of All Forms of Discrimination against Women, *(I)*
14		Launch of National Solidarity Programme (NSP), *(P)*
15		Establishment of Community Development Councils (CDCs), *(O)*
16	**2004**	Adoption of the New Afghanistan Constitution, *(I)*
17		Adoption of the Millennium Development Goals (MDGs) by Afghanistan, *(I)*
18		Adoption of Securing Afghanistan's Future, *(I)*
19	**2006**	Launch of the project: The Ministry of Women's Affairs Initiative to Support Policy and Advocacy (MISPA), *(P)*
20		Finalisation of the Interim Afghanistan National Development Strategy (I-ANDS), *(I)*
21		Endorsement of the Afghanistan Compact, *(I)*
22	**2007**	Adoption of National Action Plan for the Women of Afghanistan (NAPWA), *(I)*
23		Launch of the project Afghanistan Energy Programme Renewable Energy Supply for Rural Areas (ESRA), *(P)*
24	**2008**	Adoption of Afghanistan National Development Strategy (ANDS), *(I)*
25		Launch of the project Human and Institutional Capacity Building for Afghanistan Energy and Natural Resources (HICB), *(P)*
26		Launch of two-year post-graduate diploma programmes at the Kabul University and Kabul Polytechnic University for training on Operation & Maintenance activities for transmission and distribution systems and in hydropower plant operations, *(O)*
27	**2009**	Adoption of Elimination of Violence Against Women Law, *(I)*
28		Launch of the project Ambassador's Small Grants Program to Support Gender Equality in Afghanistan (ASGP), *(P)*
29	**2010**	Adoption of the National Priority Programmes at the 2010 Kabul Conference, *(I)*

30		Establishment of the South Asia Women's Institute for Sustainable Energy Research (WISER), *(O)*
31		Launch of capacity building programme event for women from Afghanistan in renewable energy and energy efficiency technologies, financing mechanisms for clean energy, and gender considerations in energy policy development, *(E)*
32	**2012**	Launch of the project Ministry of Women's Affairs Restructuring and Empowerment, *(P)*
33	**2015**	Endorsement of Sustainable Development Goals (SDGs) by the government of Afghanistan, *(I)*
34		Launch of the project Institutional Development for Energy in Afghanistan (IDEA), *(P)*
35		Launch of the project Afghanistan Energy Study, *(P)*
36		Adoption of the Afghanistan Renewable Energy Policy, *(I)*
37	**2016**	Launch of the project DABS Planning and Capacity Support, *(P)*
38		Launch of the national programme Citizen's Charter, *(P)*
39	**2017**	Launch of the first Afghanistan Sustainable Energy Week (ASEW), *(E)*
40		Launch of the event Youth Entrepreneurship Support (YES), *(E)*
41		Adoption of the Afghanistan National Peace and Development Framework (ANPDF) 2017-2021, *(I)*
42		Adoption of the Women Economic Empowerment National Priority Programme (NPP) to operationalize the goals set in ANPDF, *(I)*
43		Launch of the project Women's Economic Empowerment National Priority Program, *(P)*
44		Launch of the Entrepreneurship Development Training, *(E)*
45		Launch of the Women's Initiatives for Sustainable Energy (WISE), *(N)*
46	**2018**	Launch of and accession to Women in Power Sector Network in South Asia (WePOWER), *(N)*
47		Launch of the project Energy Sector Improvement Programme (ESIP), *(P)*
48		Launch of the First WePOWER Partnership Forum, *(E)*

49		Launch of a Conference on Private Investments for Development of Sustainable Energy in Afghanistan: Orientation of Emerging Entrepreneurs to the Energy Sector, *(E)*
50	**2019**	Establishment of a gender department at DABS, *(O)*
51		DABS signs a Memorandum of Understanding (MOU) with Tetra Tech supported by USAID on a women internship program, *(I)*
52		Launch of the First WePOWER Regional Conference, *(E)*
53		Launch of the Second WePOWER Partnership Forum, *(E)*
54	**2020**	Launch of the Third WePOWER Partnership Forum, *(E)*
55		Launch of the Fourth WePOWER Steering Committee Meeting, *(E)*
56		Launch of the project: Afghanistan Rural Energy Market Transformation Initiative – Strengthening Resilience of Livelihoods Through Sustainable Energy Access, *(P)*
57		Launch of the event second Youth Entrepreneurship Support (YES II), *(E)*
58		Launch of the Second Afghanistan Sustainable Energy Week (ASEW II), *(E)*
59		Launch of the Fifth WePOWER Steering Committee Meeting, *(E)*
60	**2021**	Continuation of the second Afghanistan Sustainable Energy Week (ASEW II) - Women and Energy Campaigns, *(E)*

Appendix 5: Guide for semi-structured interviews for the article in chapter five.

Topic	Questions, (follow-up questions in parentheses)
Challenges	What would you say are the major challenges facing Afghanistan's energy sector?
Visions for the future of the sector	• What measures might the government take to improve the situation? What policies, specifically? • Do you think I'm right to think that the aid agencies and bilateral donors have the potential to support exploitation of the energy potential in Afghanistan? (Could you say more about why?) • If yes: what types and scales of technology do you think the aid agencies and bilateral donors should focus on? (Why is that? What might the government do to support this?)
Technology transfer and the energy sector	• What role do you think trade can play in supporting energy technology transfer into Afghanistan? • What role might foreign aid play in this? (Through which mechanisms?) (Do you think the Kyoto mechanisms have a role to play in this? What about the Paris Agreement?)
Politics and the energy sector	What role is politics playing in the energy sector both in terms of internal and external supply? (What about domestic politics and the role of regional and international powers?)