A FRAMEWORK FOR UNIVERSAL ENERGY INCLUSION; DEFINITION, REALISATION BY SOCIAL INNOVATION, AND STAKEHOLDER IMPLEMENTATION GUIDELINES

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Dedication

To the planet and people, in the hope that thoughtful business and scholarship, joined with determined practice, help secure a more just and habitable future for coming generations.

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To my family, especially my beloved wife, whose patience, practical support, and admiration sustained me through long periods of writing, contemplating and revision. May my dedication encourage my daughters as they begin their own journeys.

Thank you.

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Statement on the Use of AI Tools

In preparing this doctoral thesis, the AI-driven language support tool of Copilot was used to assist with structuring of selected text, and with a preliminary literature search on hard to find and outdated topics. All text and literature suggestions generated by this tool was critically reviewed, validated, and integrated under the author's direction. The underlying research design, theoretical frameworks, data analysis, and conclusions are the author's original work, no AI tool was used, and any remaining errors or oversights are the sole responsibility of the author.

ABSTRACT

A FRAMEWORK FOR UNIVERSAL ENERGY INCLUSION; DEFINITION, REALISATION BY SOCIAL INNOVATION, AND STAKEHOLDER IMPLEMENTATION GUIDELINES

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This thesis addresses the urgent need to reconcile the technical and social dimensions of the global Energy Transition (ET) by introducing a universally applicable definition and benchmarking methodology for Energy Inclusion (EI) and by demonstrating how Social Innovation (SI) can operationalise EI in diverse regional contexts. Three core research questions guide the work. Firstly, how can EI be defined and benchmarked globally across varied socioeconomic settings? Secondly, how can SI principles anchor EI objectives within capital-intensive energy transition development projects (ETDPs)? And thirdly, how can EI targets be planned, implemented and monitored throughout an ETDP lifecycle? Drawing on a three-pillar literature research framework, i.e. Technical Innovation, SI and EI, this study fuses EI theory into a two-factor, nine-level evaluating model and develops a Blueprint non-financial business framework to integrate SI supported by performance indicators. The public–private–community collaboration Blueprint moves beyond Corporate Social Responsibility and embeds EI goals from ET project inception through delivery. Novel contributions are a global EI definition, benchmark tool and SI project implementation guidelines. The framework offers practitioners and policymakers a pathway to inclusive, measurable and social sustainable energy investments.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER I

INTRODUCTION

1.1 Introduction

It is globally recognised that greenhouse gas emissions from fossil-based fuels drive global warming, causing adverse climate impacts worldwide. In response, nations across the globe are pursuing an Energy Transition (ET) to build a more sustainable, reliable and environmentally friendly energy system. Energy Transition involves shifting away from fossil-based energy sources, but beyond mitigating climate change, this transition offers multiple societal benefits, including reduced pollution, ecosystem preservation, improved air quality and economic gains through technological innovation and job creation. Fundamentally, the effectiveness of this shift depends on fulfilling ethical and social responsibilities, ensuring that all communities share in the transition's benefits. Within this context, Energy Inclusion (EI) has emerged as a vital concept to guarantee equitable access, participation, and benefits for all people with an emphasis on marginalised and underserved populations. This research defines and benchmarks EI, examines how to anchor EI in Energy Transition Development Projects (ETDPs) through Social Innovation (SI), and identifies stakeholder strategies to achieve both environmental goals and social justice.

1.2 Research Problem & Purpose

The Energy Transition (ET) and the importance to reduce significantly fossil fuels, represents a pressing concern that transcends national borders and economic boundaries. It demands urgent technical and social innovations incorporated into comprehensive strategies for sustainable energy solutions with the need to benefit all stakeholders in the energy value chain. The term Energy Inclusion (EI) is often used in the context of ET development projects and is often interpreted differently. The common meaning of EI, i.e.

energy for all, shifts firstly to renewable energy for all, which is certainly not evident for all. Other definitions come upon are Just Transition and Energy Justice, suggesting the definition of EI is more than having access to energy for all. A universally definition of Energy Inclusion, along with a detailed description of its scope and dimensions, is currently absent from both academic literature and practical discourse. To advance EI globally, it is essential to establish a universally applicable definition that accommodates diverse socioeconomic contexts, alongside a methodology for evaluation and international benchmarking. Subsequent, Social Innovation (SI) can drive improving on EI in all its defined aspects amidst the worldwide transition to adopt renewable energy sources. Therefore, an profound understanding of SI and how it integrates with the novel definition of EI is of the essence. This leads to a Blueprint of universal guidelines for businesses in the energy transition to move beyond common Corporate Social Responsibility and pursue EI through SI initiatives.

1.3 Significance of the Study

The novelty of this research is twofold. The first research novelty relates to defining Energy Inclusion (EI). While a priority for policymakers in Europe and the United States, EI lacks broad coverage in the existing literature. An analogous EI inclusion definition is non-existing and hence it cannot be uniformly measured and taken as a benchmark for comparison and improvement. This research departs form analysing and aggregating the numerous EI definitions in the literature to recommend an EI framework which makes benchmarking EI on a global level achievable. By globalising the EI through a benchmark able framework, this research departs from previous research trends where scholars primarily examined Social Innovation (SI) in the ET within developed regions like Europe and the United States, laying the groundwork for understanding its impact on affected communities. Although some researchers have expanded the SI-ET focus to include

developing countries such as those in Africa and the BRICS nations, a limited emphasis on SI in policy recommendations is noted. By establishing a globalised framework for defining EI, this research lays the groundwork for advancing SI-ET focused research particularly in regions beyond the economically developed world. Existing literature on SI, ET, and EI primarily revolves around policy making. This focus is logical, given that until recently, the ET has primarily been driven by public sector initiatives. As of 2020, private enterprises are increasingly engaging in commercially ET projects. Literature reveals that the broader dimensions of SI and community impact, including EI, are not considered in the larger (private) ET developments. Hence the second research novelty is the development of a collaborative public-private-community partnership Blueprint, to serve as a strategic instrument for operationalising SI in the ET arena. This Blueprint progresses from abstract policy recommendations to actionable guidelines for implementing EI across all regions in the world, economically developed, underdeveloped, or emerging. The overall research objective is to recommend on a model/framework that incorporates both SI and EI into a socioeconomic business framework. The non-financial model intends to provide private and public stakeholders with insights into leveraging SI to advance EI within the framework of industrial development. It seeks to demonstrate how benefits can be distributed among stakeholders and how this integration may impact a ET Development Project (ETDP). The proposed framework can serve as a guiding framework for further research endeavours, both academic and applied.

1.4 Research Questions

Q1: The first main research question is how to define Energy Inclusion and design a benchmarking model which is globally applicable in different regional contexts. Energy Inclusion (EI) holds diverse meanings by different groups. Throughout the literature a single or all-encompassing definition of EI was not encountered. Without a clear, shared

understanding of EI, realising, monitoring, and comparing EI across regions becomes extremely challenging, if not impossible.

Q2: The second research question is how to anchor EI through SI in a capital intensive Energy Transition Development Project (ETDP). Here a thorough understanding of Social Innovation design and processes is required. Diverse stakeholders in SI projects must engage in intensive collaboration, raising the sub-question of how a collaboration is structured, what role the ETDP developer plays in this and how to align the various Stakeholder's distinct objectives and goals.

Q3: The third and basically an applied research question, is how to plan, implement, and monitor EI objectives of the SI project throughout the life cycle of an Energy Transition Development Project, i.e. the Blueprint.

The objective is applying business management theory by integrate existing business management models into the SI design process to recommend on novel business and funding models for a ETDP and SI project.

1.5 Research Scope, limitations & Assumptions

Energy Inclusion is firstly related to society's access to energy and most importantly for underprivileged communities in both developed and underdeveloped regions. This study adopts a global scope for benchmark indicators, encompassing virtually all countries. However, the study's guidelines and best practices for integrating Social Innovation into Energy Transition Development Projects (ETDP) are more tailored to underdeveloped and emerging regions, because new ETDP are predominantly planned in the Global South regions of Latin America, Africa and South East Asia. There is also a disparity in the geographical focus in the literature. The majority of studies are centred on countries in the Global North, particularly Europe, whereas a small proportion investigate Latin America and Africa. This necessitates the translation of knowledge gleaned from

European regions and the broader literature into the context of the selected research regions Southern Africa and Northern Brazil. My study presumes that theoretical insights derived from research in developed regions are equally applicable to SI projects in underdeveloped and emerging regions. To address this presumption, this research dedicates substantial focus to the social, political and economic contexts of a ETDP region. Global benchmarking data are drawn from reputable international organisations and although each indicator is selected with care, discrepancies in the reference periods of certain data may occur. These temporal inconsistencies are not considered detrimental to the objectives of the global benchmark.

1.6 Definition of Terms

EI	Energy Inclusion	**LeiM**	Levelized Energy Inclusion Model
EIC	Energy Inclusion Committee	**SCR**	Social Corporate Responsibility
ET	Energy Transition	**SE**	Social Entrepreneurship
ETDP	Energy Transition Development Project	**SI**	Social Innovation

1.7 Background

An ET Development Project is in principle a cluster of industrial activities directly involved in the production, distribution, transportation, and utilisation of renewable energy products. Examples include producing Green Hydrogen from renewable sources, i.e. wind and solar, or decentralised production of renewable energy for local industrial use. An important characteristics is the project being capital intensive and therefore having a larger impact on the socioeconomic development of the region in which it is planned. This does not mean that the findings and recommendations of this study cannot be applied to smaller ETDPs, although, as we see later, may signify reduced financial resources for a SI project.

CHAPTER II

REVIEW OF LITERATURE

2.1 Introduction

The ET is predominantly driven by different technical innovations and will have a significant impact on the society in the countries with a high energy demand and in the countries that have the favourable conditions to produce renewable energy. Hekkert & Negro (2009, as cited in Greenacre, P. et al., 2012, pg.3) observed that influencing innovation towards sustainable directions is high on political agendas and crucial to deal with the negative side effects of the carbon based energy economy. Society and communities will be affected by technology innovation and the innovation ecosystems give opportunities in the field of Social Innovation (SI), aiming for Economic Development in the communities in the vicinity of ET Development Projects.

2.2 The literature framework

This literature framework is built on three core pillars, Technical Innovation, Social Innovation (SI) and Energy Inclusion (EI). Social Innovation (SI) focuses on Social Value creation and Social Impact generation, which together with Technical Innovation drives (socio) Economic Development. A good understanding of the literature on the types and processes around technical innovation is important to be able to recognise how Social Innovation (SI) fits in the innovation ecosystem, understand the parallels between social and technical innovation and how both can result in Energy Inclusion (EI). The literature review starts in paragraph 2.3 with exploring on the various types of Innovation and Technology Innovation Systems (TIS). This is followed in paragraph 2.4 with Transition Dynamics, while Paragraph 2.5 expands on Social Innovation (SI), with its definition, processes, value creation and impact measurement. Paragraph 2.6 investigates Energy

Inclusion (EI), the various definitions surrounding the term and the association with social psychology, exploring an all-encompassing definition of Energy Inclusion. Such an all-encompassing definition of EI can, together with integrated SI and Business Management principles, be applied within an ET Development Project and, more broadly, can serve as a benchmark for regions around the world with each their own socioeconomic and political contexts.

2.3 Innovation

Technological innovation is essential to the energy transition, as it drives the development of cleaner, more efficient energy solutions that reduce reliance on fossil fuels. Through advancements in renewable energy technologies, energy storage and smart grid systems, technological innovation enables the shift to a sustainable energy future, addressing climate change while fostering economic growth, energy security and Energy Inclusion. Social Innovation intersects with various innovation models in two key ways. First, by generating products and services that often fall within the technical domain and second, by serving as the foundational driver of Social Entrepreneurship.

In the first half of the 20th century the innovation was seen as a **linear one-directional linear model**, driven by a supply-push process whereby the velocity and course of innovation are proceeding through technological inventions. Increased resources into Research and Development (R&D) would generate more marketable products or services. **Evolutionary innovation** takes place as incremental innovations on existing products and services, commonly observed in consumer markets and is sluggish because of the interlinked economic, social, institutional and technological variables. Evolutionary innovation is inherently subject to uncertainty at technological, competitive, supplier, resource, consumer and political levels. (Stenzel, 2007, as cited in Greenacre, P. et al.,

2012, pg.7). Arthur (1994, as cited in Greenacre, P. et al., 2012, pg.8) observed four phases of increasing returns to adoption being, economies of scale, learning effects, adaptive expectations and network economies, all applicable to both technologies and institutions. **Radical disruptive innovation** does not necessarily lead to a radical change, or be discontinuously, but disruptive innovations may overturn dominant technologies, products or processes and result in radical change. Large firms with R&D budgets rely on incremental innovations, where smaller companies that invested in existing systems and often focussing on a technology or market niche take more radical approaches to innovation (Greenacre, P. et al., 2012). The **Path-Dependent innovation** model is based on the concept of with a growing number of users adopting the technology, the more likely it is improved upon through innovation (Greenacre, P. et al., 2012). The growth of both the users and the sophistication of electronic devices, like laptops, smart phones, is an example of path-depended innovation. Gross (2008, as cited in Greenacre, P. et al., 2012, pg.11) states that a technology which achieved market dominance, albeit the incremental innovations, can lock-out more disruptive innovations with a potential improved alternative. The enormous entry barrier of new innovative renewable energy sources is both at system and technology level. This because current carbon based energy systems have path-depended innovation which is creating a lock-in through capital intensive fossil based energy technologies and analogous compatible energy offtake markets of e.g. mobility, aviation and energy intensive industry (Greenacre, P. et al., 2012). **Technology Innovation Systems** (TIS) emphasis on information flows between the wide range of multiple agents and distributed learning mechanisms in technology change (Kline, 1986, as cited in Greenacre, P. et al., 2012, pg.12). Foxon (2003, as cited in Greenacre, P. et al., 2012, pg.18) highlights the importance of the role of institutions at all levels to optimise innovation paths and reduce barriers to radical change. Technology Innovation Systems evolved as a model

to better map the innovation processes as the number of agents and networks are smaller and therefore less complex then when studying a national innovation system, although an overlap does exist (Greenacre, P. et al., 2012). Jacobsen and Bergek (2004, as cited in Greenacre, P. et al., 2012, pg.20) define the three elements of a technology innovation system as: Actors, Networks and Institutions. Additional to a structural focus, a process focus needs to be considered to identify the policy issues in a system (Bergek et al., 2008a, as cited in Greenacre, P. et al., 2012, pg.20). As the thesis progresses, it becomes evident that enhancing Energy Inclusion scores depends heavily on governmental policies that shape a region's Technological Innovation System (TIS). Notably, there is a clear overlap between TIS dynamics and the core components of Social Innovation, namely, actors, networks, and institutions, highlighting that SI functions within the framework of regional TIS. The ET particularly driven by technological innovation is more than simply incremental and includes economic, social and environmental aspects. In the literature three main **Transition theory** themes can be observed, a multi-level perspective, transition management and socio-technical scenarios. The transition process of technological change has according to Geels (2002, as cited in Greenacre, P. et al., 2012, pg.25) a multi-level perspective with changes in user practises, regulation, networks, infrastructure and culture. Geels defines three levels, technological niches at a micro-level, social-technical niches at the meso-level and landscapes at the macro-level. Social Innovation operates within a socio-technical regime characterised by the dynamic interaction among various actors and institutions and these three levels are applicable to the SI environment. The various actors and institutions shape the social structures and establish the rules governing them, all within the broader context of the political, social, and cultural values that define the structural trends of society. Landscapes, representing the macro-level, are particularly resistant to change due to their entanglement with diverse and complex factors such as

energy costs, economic growth, and political coalitions (Greenacre et al., 2012, p.25). Kotler, P. and de Bes, F. (2015), advocate that in general innovation is delegated to R&D departments, but that the competitiveness of companies require innovation across various levels of the organisation. They assert that innovation is imperative for a company's success, yet it doesn't naturally occur within organisations. Many companies have subsequently implemented the hygiene concept of **Continues Innovation** to continually introduce new, or gradually enhance, concepts, techniques, goods, or services within their organisation to sustain competitiveness and foster expansion. Baregheh, A. et al. (2009), agree and defines a Technology Innovation Systems as "Innovation is the multi-stage process whereby organisations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace". The multi-stage process can be associated to the chain-linked model of Kline (1986, as cited in Greenacre, P. et al., 2012, pg.12). Jain, N. (2023) describes Continuous Innovation as a permanent organisational effort to continuously pursue and execute enhancements, advancements and changes by introducing new ideas, methods, products, or services to maintain a competitive edge in a dynamic business environment. The iterative R&D approach where new ideas or concepts are tested, refined and implemented in multiple cycles, he introduces the critical marketing criteria of Customer-Centric Focus. The Energy Transition (ET) is external driven by governmental policies and regulations and asks for technological innovation to realise the needed transition from carbon based fuels to renewable alternatives. Despite this external driver for compulsory innovation and adopting of the markets to new technologies, many companies in the ET service related market segments are internally motivated and pursue Continues Innovation by the prospect of the commercial opportunities these governmental regulations bring. Diáz-Gárcia et al. (2015, as cited in Hermundsdottir, F., and Aspelund, A., 2021, pg. 2) agree and identified

internal motivational drivers, i.e. changing the external market environment and external pressure drivers, from the changing environment through governments or shareholders. Iterative Development and Learning and knowledge Sharing corresponds with the learning and evaluating transition experiments of the Strategic Niche Management theory of Foxon et al. (2010, as cited in Greenacre, P. et al., 2012, pg.26). This theory aims to mobilise change through a shared vision and goals. Tushman, M. and O'Reilly, C., (2002), underscore how leadership, culture and organisational structures influence innovation. They stress the significance of effective Change Management in tackling managerial challenges, leveraging culture for innovation and adapting to evolving organisational demands. The Oxford Reference (2024), defines innovation as "The process through which new products, concepts, services, methods, or techniques are developed". Across the literature, a diverse array of innovation definitions emerges, each with distinct characteristics. An understanding of the variations give insight in application associated with Social Innovation (SI) and Social Entrepreneurship to be reviewed later. **Technical Innovation**, the economic function that introduces new technologies into production and consumption involves identifying new technological possibilities, organising the necessary human and financial resources to develop them into useful products and processes, and maintaining these activities (Scherer, F.M., 2001). **Eco-innovation** defined by Europeia (cited in Hazarika, N. and Zhang, X., 2019 page 2), states "any form of innovation aiming at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment or achieving a more efficient and responsible use of natural resources, including energy". In this definition Eco-innovation encompasses the many different definitions of innovation, be it with the requirement of stressing the environmental output as a main goal, which may for instance include reduction of food waste (Hojnik, J. et al., 2024) or circular-economy elements (Phonthanukitithaworn, C. et

al., 2024). Bartlett, D. (2013) noted that Environmental Innovation, which aims to significantly reduce negative environmental impacts, is a key component of eco-innovation. The second major component of eco-innovation is product or service innovation. **Sustainable Innovation** involves developing and implementing new products, services, technologies, or business models that positively impact the environment, society, and economy. It seeks creative and efficient solutions to address urgent challenges like climate change, resource depletion, pollution, inequality and poverty. Companies intentionally change their products, services or processes with the goal to generate long-term social and environmental benefits while creating economic profits. It contributes to sustainable business, described as meeting the needs of present society without compromising the needs of future generations and it requires system thinking. The term is interchangeable with Eco-innovation (Jain, N. 2022). **Digital innovation** is defined by Jain, N. (2023a) as "the process of utilisation of digital technologies and strategies to create new or improved products, services, processes and business models. It involves leveraging digital tools and platforms to drive transformation, enhance customer experiences and generate value." The digital innovation plays an important role in the Energy Transition through, for example, balancing renewable energy production and demand in the grid. Smart home technologies and collaborative software platforms facilitate the sharing and optimal distribution of energy from solar panels and (car) battery systems through the existing energy grid (Strzelecki, A. et al., 2024). Fintech solutions disrupted traditional banking services by introducing faster, more accessible financial services for payment of energy at vehicle loading points. With establishing Energy Inclusion in a region previous deprived of adequate levels of access to energy, micro and small businesses may benefit from digital innovation developments. **Commercial Innovation** encompasses all forms of innovation designed to enhance customer value, including new business or market entry

models, entirely new service offerings, redesigned processes, improved customer experiences, transformed customer relationships and new distribution channels (Delvaux C., 2016). **Economic Innovation** is a relatively new branch of economics that concentrates on innovation, technology, knowledge and entrepreneurship and seeks to understand the origins of new ideas and to formulate policies that promote the development of innovative thinking (Georgina T., 2021). Marten L. (2016), explains that neoclassical economics examines how societies produce valuable goods using limited resources and distribute them among individuals, whereas Innovation Economics explores how individuals create new products, business models and production methods to enhance quality of life and generate wealth. Innovation Economics fosters innovation and productivity among economic actors, whether they are organisations, individuals, industries, or nations. To create the conditions for SI, Murray, R. et al. (2010), outlines as an economic innovation, the rise of a hybrid social economy rooted in ethical values and collaboration, rather than transactional exchange. It spans distributed networks and blurs traditional roles between producers and consumers. Drawing from the market, state, grant economy and household sectors, it integrates diverse logics and resources to pursue social goals. This economy fuels social innovation and includes a broad spectrum of actors, from domestic caregivers to socially driven enterprises.

2.4 Transition Dynamics

Processes and transition dynamics significantly influence the success of applied projects, especially in sectors undergoing transformation, such as energy or sustainability. When policymakers become involved, they must carefully balance the specific objectives of the project with broader societal transition goals. This requires a nuanced approach to impact assessment, ensuring that project outcomes not only meet immediate goals but also align with long-term societal needs, such as social equity, environmental sustainability and

economic resilience. Policy makers need to consider integrating these considerations to contribute meaningfully to both local and systemic transitions.

2.4.1 Transitional Framework

Innovation systems and transitions thinking go beyond traditional linear models of innovation and it is recognised that innovation is a complex, interconnected process involving various actors, institutions and technologies (Verpoort, P.C. et al., 2024). Transition Dynamics in innovation refers to the processes and changes that occur during the shift from existing systems or practices to new, more sustainable ones. Transitions are large scale changes, i.e. system innovations, where sustainability transitions are system-broad long-term changes in the different societal domains of economy and social processes with the objective of a more sustainable future (Adamides, E.D., 2024). Aagaard, et al. (2021), states that sustainability transitions involve shifting from unsustainable practices to more environmentally friendly, socially just and economically viable alternatives, occurring at levels ranging from individual behaviours to entire socio-technical systems. Adamides, E.D. (2024), states that transition dynamics involve interactions between micro-level factors (individual firms, products, services) and macro-level factors (entire sectors, societal norms). Businesses at the micro-level drive innovation through new products, services and business models, while macro-level forces, such as societal change, policy reform and cultural attitudes, shape how these innovations are adopted and spread. The interaction between these layers ultimately defines the trajectory of the broader transition process.

2.4.2 Motors of Innovation

Transition dynamics in innovation involve understanding how different factors interact and drive change within innovation systems. Several scholars have studied the dynamics of Technological Innovation Systems (TIS) focusing on system functions and

their interactions (Bergek, 2002; Jacobsson and Bergek, 2004; Negro, 2007, cited in Suurs R., 2009, page 60). They relate the interactions not only to particular drivers, but also to internal and external barriers. Suurs R. (2009), observes that within the ET there is not just one TIS and a multilevel approach to drivers and barriers across a variety of systems needs to be considered when formatting a (technological) innovation ecosystem. Suurs, R. (2009), introduced the concept of "Motors of Innovation" which integrates with the dynamics of technological innovation systems and identifies key drivers that propel innovation forward. These "motors" include factors like technological breakthroughs, policy changes, market demand, and shifts in societal values. Suurs R. (2009), generalised the definition into four motors and proposes that all change processes within a system can be understood through one or a combination of these four motors. The Life-cycle motor advances through a fixed sequence of stages determined by an institutional, natural, or logical blueprint set at the outset, creating a predictable progression. With the Teleological Motor Change unfolds via a continuous loop of goal formulation, implementation, evaluation and modification. The pathway emerges from purposeful actions and the shared construction of an envisioned "end state" by participants. By the Dialectical motor transformation is driven by conflict between opposing views. Through debate, negotiation, and synthesis, the system evolves as competing perspectives clash and resolve. With the Evolutionary motor, stakeholders compete for limited resources, experimenting with survival strategies. Over time, the selection environment favours the most effective approaches, leading to gradual shifts in population composition and innovation. The key takeaway from Suurs R. (2009) theory is to adopt a multilevel driver/barrier approach during the formative stages of a SI project with the principal ETDP stakeholders and to monitor these factors throughout the subsequent phases. In a collaborative Social Innovation (SI) project, it is essential to identify the diverse Motors of Innovation

contributed by stakeholders through a thorough stakeholder analysis, see also Chapter V. Recognising and valuing these drivers is crucial to ensuring the project's success. Walrave, B., & Raven, R. P. J. M. (2016), introduced in their dynamic model for transitions, additional to the four motors of Suurs R. (2009), five feedback loops. The first is the Science and technology-push loop relating to technological knowledge developed and diffused. The second, the Entrepreneurial motor stipulates that the perceived legitimacy of the Technological Innovation Systems (TIS) dependents on both technological and market legitimacy and increases with the institutionalisation of the TIS structures, like the development of formal market rules and regulations, the establishment of intermediary networks and the buildup of infrastructure. Stronger TIS legitimacy motivates entrepreneurs to launch ventures, boosting entrepreneurial activity. That activity then activates the fourth system-building loop, which further reinforces TIS legitimacy. The fifth loop in the model is the regime resistance loop, whereby feedback in the innovation system may lead to increase of efforts to improve performance through innovation, especially when there is a spill over into the existing regime. Where Suurs's Motors of Innovation assists in understanding Stakeholders drivers and barriers when conducting a Stakeholder analysis, the five feedback loops from Walrave, B., & Raven, R., give insights in the government's Technological Innovation Systems (TIS) policy approach fostering social or technical entrepreneurship. **Entrepreneurship** involves discovering, creating, and exploiting opportunities to generate or appropriate value through products, services, production processes and innovative business models. Recently, this process has increasingly focused on sustainability, aiming to benefit both the natural and communal environments, leading to the concept of sustainable entrepreneurship, while techno-entrepreneurship is closely related to technological innovation (Adamides, E.D., 2024). Scherer, F.M. (2001), notes that sustainable or eco-innovation, driven by innovative

business models and collaborative efforts to explore new products or processes, demonstrates the merging of sustainability and techno-entrepreneurship. Within the scope of this research entrepreneurship needs to lead the community utilising the Energy Inclusion opportunities and move beyond access to affordable energy to improve life and search for economic and business opportunities. Where entrepreneurship focuses on creating profitable businesses prioritising financial returns social entrepreneurship aim to solve social or environmental problems and measure success by their impact on society. **Open Innovation** in to the contrary of traditional closed innovation models accepts external inputs and partnerships and involves collaborative efforts seeking external ideas, technologies and expertise aiming to accelerate innovative progress by leveraging a diverse network to driving development through collective intelligence (Jain, N., 2023b). Four types of open innovation are identified, i.e. outside-in, inside-out, coupled and collaborative innovation. With outside-in Innovation organisations look externally for ideas, technologies, and knowledge to meet innovation needs through customer insights, emerging technologies and innovation challenges. Bogers, M. et al. (2018), process approach to outside-in open innovation and describes it as a company opening up its innovation processes to external inputs and contributions. Inside-out (open) Innovation leverages and commercialises internal ideas and technologies externally through licensing, spin-offs, start-up incubation and joint commercialisation. Coupled Innovation is some collaborative partnerships between organisations to jointly develop and commercialise innovations through research collaborations, joint ventures and co-creation with customers. By Collaborative Innovation Networks individuals or organisations collaborate and share knowledge to drive innovation through online platforms, knowledge-sharing communities and innovation ecosystems. Knowledge transfer across a firm's boundaries can occur in various forms, such as acquiring knowledge through outsourcing, licensing, consulting,

crowdsourcing challenges, corporate start-up incubators and accelerators, mergers and acquisitions, and partnerships with external stakeholders (Wu, 2022, as cited in Chistov, V. et al., 2023, page 4). Close cooperation with government helps ensure compliance with environmental laws and reduce the risk of financial penalties (Oliver, 1991, as cited in Chistov, V. et al., 2023, page 4). Collaboration with the public and interest groups enhances firms' legitimacy and credibility (Bansal and Roth, 2000, as cited in Chistov, V. et al., 2023, page 4), while engaging with stakeholders improves understanding of sustainability concerns and prevents future conflicts (Gold et al., 2009, as cited in Chistov, V. et al., 2023, page 4). Open innovation is widely applied in Social Innovation (SI) and involves collaboration among diverse stakeholders, such as citizens, non-profits, governments and businesses, to co-create solutions for complex social and environmental challenges. By sharing ideas, resources and expertise across sectors, open innovation helps social initiatives become more inclusive, effective and scalable. This approach encourages transparency, community engagement and faster development of impactful solutions (ROSI, 2025). Chesbrough (2006, as cited in Logue D., 2019, p. 14, chapter 3), also observes that co-creation emerged from technology and business innovation, especially with the shift from closed to open innovation. Chesbrough emphasises that stakeholder participation fosters the development of innovation ecosystems, similar to open innovation, where organisations can connect, collaborate and share resources.

2.5 Social Innovation

Technological and related innovation processes play a critical role in driving Social Innovation within communities by fostering collaboration among key stakeholders, private companies, government and the community. Private companies contribute by developing innovative solutions and investing in technologies that address societal challenges. Governments provide regulatory frameworks, funding and policy support to ensure these

innovations are inclusive and aligned with public needs. Meanwhile, community involvement ensures that innovation efforts are grounded in local realities, empowering citizens to actively participate in shaping solutions that improve their quality of life. Together, these stakeholders create a synergistic ecosystem that promotes sustainable economic and social development through innovation. A **definition of Social Innovation** of Social Innovation (SI) is necessary to understand that the wording is a composition of two nouns with each at times a debatable definition and when used together leads to linguistic and philosophical debates on the meaning of the compositional semantics. The combined definition of social and innovation create complex semantic complexity in meaning (reference) and sense (associated concepts) (Logue, D, 2019). The polysemous concept forms different meanings across different groups in cross-sector and cross-discipline settings of Social Innovation (Fillmore and Atkins, 2000, as cited in Logue, D, 2019, page 3, chapter 3, 2019). It may highlight different views on particular definitions and perceived social problems, and subsequent on their perceived solutions. The plurality may bring different groups together in defining their common definition of SI and be generative in maintaining inclusion of different actors within the network. Logue, D. (2019), states SI is a "contemporary manifestation of historical tensions in the relation between economy and society" and focusses on a set of issues which concerns a shared future. SI is pursuing both economic and social progress and is fundamentally related to values and morality. It ranges from motivation to be socially "good" to participation to the outcome of SI processes and contribution to distributing benefits beyond a single individual or entity, i.e. shared value and social impact. Nicholls and Murdock, (2012, as cited in Logue, D. 2019, page 1, introduction), state that SI does enter the later spectrum by it seeking to address social problems and producing shared value that would otherwise not have been created. They state that this goes beyond economic performance and efficiency,

of employment, productivity and economic growth. Phillips et al. (2008, as cited in Logue, D. 2019, page 2, introduction), also state SI to be a novel solution to a social problem which is more effective, efficient or sustainable than existing solutions, whereby the created value is predominantly to society as a whole. Kanter (1999, as cited in Logue, D. 2019, pg. 2, Chapter 1), recognises the importance of cross-sector partnerships between business, government and non-profit organisations. In defining Energy Inclusion, paragraph 2.6, it becomes clear that community participation in inclusion processes is essential. This involvement may extend beyond the three main actors mentioned by Kanter and is more accurately reflected in Kanter's six characteristics of successful private-public partnerships (PPP), namely shared purpose, committed leadership, trust and open communication, clear roles and governance, aligned incentives and resources and performance measurement with adaptive learning. Confirmed by Selsky and Parker's (2010, as cited in Logue, D. 2019, p. 2, Chapter 1), who emphasised the need for a clear business agenda, strong partner commitment to or business goals, shared investments, deep roots in the user community, connections with community organisations and a long-term focus on achieving sustainable and reproducible results. The European Union, compare social innovations to mainstream innovations and state that SI are critically driven by an extra motive: a social mission, and the value they create is necessarily shared value, at once economic and social. Soule, S. et al. (2024), observes that SI is not the prerogative or privilege of any organisational form or legal structure. Solutions often require the active collaboration of constituents across government, business and the non-profit world.” Caulier-grice, J. et al. (2012, page 18), in their literature study defined Social Innovations (SI) being “new solutions (products, services, models, markets, processes etc.) that simultaneously meet a social need (more effectively than existing solutions) and lead to new or improved capabilities and relationships and better use of assets and resources. A notable aspect of their definition is

adding “improved relationships” and concerns changes in social relations, particularly governance. Logue, D (2019), identified three consistent properties across various definitions in the literature. Collectiveness, which involves understanding social movements and collective actions, the importance of multi-disciplinary and cross-sector interactions and relationality, which focuses on creating new relational channels to generate social value. In conclusion, the key elements of SI include a broad and inclusive scope of participatory actors, the novelty of the innovation, a focus on addressing social challenges, often with an economic component, and the creation of value that primarily benefits society as a whole. From a policy makers′ viewpoint, improved relationships, enhanced (socio-political) capabilities and improved access to resources, all lead the way to social change, resulting in SI. Two observations, when defining SI for a regional project, the value created may not necessarily benefit society as a whole and when the innovation is scaled up or replicated, it may no longer be defined novel, but it increases the benefits for a larger part of society. **Social design** is used as a term to describe particular approaches to social innovation. It applies design methodologies to address complex human issues whereby social issues are priority. Social design empowers local communities to collaboratively develop solutions to economic and social challenges. It also helps guide public administrations through collaborative working, experimentation and prototyping. Unlike traditional public sector service planning, social innovation practices are more flexible, interdisciplinary and participatory, involving more stakeholders, using animation techniques and encouraging out-of-the-box thinking. There is also an increasing focus on co-production and co-creation, where users are directly involved in the design and delivery of services. In the context of cohesion policy, these approaches nearly always involve widening the range of stakeholders and deepening their engagement in deliberative planning (Caulier-grice, J. et al., 2010). **Social Capacity** involve service users, end-users

or citizens raises the question of equality of participation as not all citizens have the resources, social capacity and willingness to participate and contribute in an innovation ecosystem. Social capacity refers to the capacity of individuals to obtain advantages and develop solutions to challenges through their involvement in social networks. It encompasses three key dimensions, the interconnected relationships between individuals and groups (social ties or participation), the degree of trust embedded within these connections, and the resources or benefits that are accessed and exchanged as a result of these social relationships and participation (Britannica, 2024). The various definitions in the literature on SI can also be categorised in types of **process approaches to SI**. In a pragmatic approach Mulgan, G. et al. (2008), finds SI to involve innovative activities and services motivated by the goal of meeting a social need. These innovations are predominantly developed and spread through organisations whose primary purpose is social impact. Westley, F. and Antadze, N. (2018), describe SI in their Systemic approach as a complex process through which new products, processes, or programs are introduced. These innovations lead to significant changes in daily routines, resource flows, power dynamics, or values within the system affected by the innovation. The Managerial stance of Phills, J., et al. (2008), defines social innovation as a new solution to a social problem that is more effective, efficient, sustainable, or equitable than existing solutions. The value generated by such innovations primarily benefits society rather than individuals or organisations. MacCallum, D. et al. (2016), see social innovation as a Process of empowerment and political mobilisation, focusing on bottom-up transformation as the Critical approach. It aims to change the functioning of social systems by involving stakeholders and redistributing material and immaterial resources. The OECD (2010a), takes an Economic approach and defines social innovation as encompassing conceptual, process, or product changes, as well as organizational shifts, changes in financing, and new

relationships with stakeholders and territories. The Comparative approach of Caulier-grice, J. et al. (2010), highlights the distinctive nature of social innovation, both in its outcomes and its emphasis on new forms of cooperation and collaboration. They note that the metrics and methods used in commercial or technological innovation are not always applicable to the social economy. Caulier-grice, J. et al. (2012), refers to a Universal approach whereby social innovations is defined as new solutions, whether products, services, models, or processes, that simultaneously meet social needs more effectively than existing solutions and lead to improved capabilities, relationships, and the use of resources enhancing society's capacity. In their Guide to Social Innovation the European Commission (2013), defines three key approaches to SI. First, Social demand innovations address unmet social needs, typically overlooked by markets or institutions and focus on vulnerable groups. Second, the Societal challenge approach targets innovations that benefit society as a whole by integrating social, economic and environmental dimensions. Lastly, Systemic change involves organisational development and shifts in relationships between institutions and stakeholders, aiming to alter power dynamics and encompass aspects of the other two approaches. Definitions of SI vary widely which arises because SI is a practice-led field, shaped by actions rather than academic theories. As SI differs across fields, sectors and regions, it's natural that definitions vary, what qualifies as SI in rural Africa may look very different from urban areas in Europe due to differing social needs and contexts. In investigating **process and outcome** of SI, Moulaert, F. et al. (2005), a range of disciplinary approaches, e.g. focusing on its significance in organisational science, its use as a tool for local development, its impact on political governance and its links across economic, social, and environmental spheres. Three key aspects intersect across these dimensions, content/product dimension, process dimension and empowerment dimension. The first, content/product dimension is the fulfilment of unmet human needs, whether due to being

previously overlooked or no longer deemed important by the market or the state and corresponds with the Social Demand Innovation approach (European Commission, 2013). The emphasises is on addressing neglected basic needs, though these may differ across societies and communities. The second aspect, process dimension, involves changes in social relations, particularly in governance, which not only enable the fulfilment of unmet needs but also enhance participation, especially for marginalised groups. The third is empowerment dimension and focuses on boosting socio-political capabilities and improving access to resources, ensuring the right to meet basic needs and to participate fully in society. Logue, D (2019), approaches SI through the lens of social value and relates this to a set of ethics and morals, and a measure of both economic and social benefits. Mulgan (2010, as cited in Logue, D, 2019, pg. 2, chapter 2), observes that although metrics assume that value is objective and discoverable through analysis, it is not. Economist agree that value emerges from the interaction of supply and demand, and reflects what people are willing to pay, inevitably misaligning the organisation's strategic and operational priorities. This leads to the difficulty of quantification of social value, which is the relative importance that people place on the experienced changes (Social Value UK, as cited in Logue, D, 2019, pg. 2, chapter 2). This parallels Distributive Justice which is defined as the perceived fairness of how rewards and costs are shared (Forsyth, D.R., 2006). In defining Energy Inclusion this concept of perceived social value distribution plays a worthy role and Distributive Justice is discussed in more detail. SI needs to result in the **creation, capture and distribution** of **social value**. Social value refers to the broader impact of activities on the well-being of individuals and communities, beyond just financial or economic metrics. It encompasses the importance people place on changes to their well-being and uses these insights to make better decisions (Social Value International, 2024). It encompasses the broader benefits to well-being, quality of life, community development and environmental

sustainability. Social value considers factors like improved health, social inclusion, environmental protection, education and overall community resilience, aiming to enhance the collective welfare and address societal challenges (Barman, 2016, as cited in Logue D., 2019, p. 9, chapter 2). Amit and Zott (2011, as cited in Logue, 2019, p. 7, chap. 2), argue that business models act as mechanisms for creating and capturing social value through novel activities. Dimitrakopoulos G. et al. (2020), observes that a business model is an economic model with the goal to make money. Bapuji et al. (2018, as cited in Logue, 2019, p. 21, chap. 2), further observe that these models enhance the sharing of Social Value, yielding positive secondary effects such as employment generation or the development of specific products. Meanwhile, Teixeira et al. (2017, as cited in Logue, 2019, p. 7, chapter 2), note that the literature has increasingly focused on multi-stakeholder perspectives of value creation and business ecosystems. From the business organisational and management literature three mainly for-profit concepts can be drawn (Logue, D. 2019). Social Entrepreneurship with Social Value or Social Returns being the business driver, Shared Value where Social Value is shared between business and society in the operations and outputs of a business, and Bottom of the Pyramid markets. The BoP markets approach is not firms to be charitable, but for them to pursuing market growth by introducing the right products, or services, at the right price and alleviate poverty with a profitable activity (Prahalad & Hammond, 2002, as cited in Logue, 2019, p. 17, chapter 2). Common across all definitions of Social Entrepreneurship (SE) is the double and triple bottom line (Austin et al., 2006, as cited in Logue, 2019, p. 11, chapter 2). The double bottom line refers to both financial and social outcomes of an enterprise, where the triple bottom line adds environmental impact and evaluates an organisation's performance on three criteria; Profit, People, Planet. Thornton (2012, as cited in Logue, D., 2019, p. 28, chapter 3), states that the logic of the market is focussed on transactions and competition in the pursuit of profit

and value with the organisation's legitimacy deriving from price competition, supply and demand and driven by self-interest, status and reproduction of capital. This logic entered the domains of health, education, professional services, wind energy and Social Innovation. (Logue, D., 2019, page 28 Chapter 3). Value distribution, traditionally being retained earnings to shareholders is according to Bapuji et al. (2018, as cited in Logue, 2019, p. 21, chapter 2), skewed therefore towards firms which are the primary source of wealth creation and distribution which results in an economic inequality. They argue, that as many stakeholders contribute to it, the value produced should be more equally distributed among actors that provided direct and indirect resources. The business strategists Porter and Kramer (2011, as cited in Logue, 2019, p. 15, chapter 2), advocate companies to pursue shared value through policies and operating practises that enhance the competitiveness of the firm while simultaneously advance the economic and social environment in which it operates. The infusion of SI in business sector emerges from a history of Corporate Social Responsibility (CSR) and the entrepreneurship viewpoint of applying market mechanisms to addressing social problems. Chapter IV, research question 2, elaborates a CSR/SI strategy for a ETDP developer. The institutionalised belief system (logic) of the **Not For Profit (NFP)** sector draws legitimacy from equality of participation, authority from collectiveness and advocacy through social justice for all (Marquis et al., 2011, as cited in Logue, 2019, p. 22, chapter 3). Tensions within the not-for-profit sector arise from the challenge of balancing the social mission with the goals of funders, leading to conflicting assumptions about the roles and responsibilities of recipient organisations. The reduced availability of public funds and the emergence of social enterprises and venture philanthropy generates greater competition within the sector, requiring innovation to develop alternative streams of funding. Market-based innovation meets resistance as it challenges the fundamental logic of the NFP form (Logue D., 2019). Zimmerman & Dart

(1998, as cited in Logue, D., 2019, p. 26, chapter 3), argue further that marketization has put management at the centre of organisations, corporate business at the centre of society and defined government and non-profit organisations as non-productive. This notion leads to competition of social enterprises with the NFP sector in terms of funding. Commercial innovation and SI processes share many similarities and social enterprises are often seen as for-profit businesses. While they aim to achieve financial returns and at least maintain financial sustainability, they also focus on delivering social benefits that extend beyond the organisation itself (Garud et al., 2013, as cited in Logue, D., 2019, p. 28, chapter 3). Others view social enterprises to have a broader more societal objective by seeking a larger system change (Bhatt and Ahmed ,2006, as cited in Logue, 2019, p. 31, chapter 3). **Social Entrepreneurship** (SE) focusses on market-based business models to address social problems. They drive change in both developed and developing economies where in the later BoP strategies are applied to foster economic advancement through trade among the poorest members of society (Mair et al., 2012, as cited in Logue, D., 2019, p. 32, chapter 3). Tracey and Stott (2017, as cited in Logue, D., 2019, p. 32, chapter 3), argue that social entrepreneurship occur in different organisations, in new organisations, within existing organisations or between interorganisational collaborations. With the different "locations" of entrepreneurship, the funding of social innovations or social enterprises are also taking various forms and are described as social finance, venture philanthropy or impact investing (Hinings et al., 2017, as cited in Logue, D., 2019, p. 32, chapter 3). Impact investments relates to investments in organisations, companies and funds with the aim of generating measurable social and environmental impacts together with financial returns. It emerges at the intersection of philanthropy, investment and finance, CSR and SE (Logue D., 2019). Social enterprises are labelled as hybrid organisational forms that generate both social innovative solutions and services, and pursue financial goals, thereby attempting to

combine organisational elements of the divergent institutional logics (Jäger and Schröer, 2014, as cited in Logue, D., 2019, p. 7, chapter 4). Dees and Anderson (2003, as cited in Logue, D., 2019, p. 7, chapter 4) refer to hybrid organisations as "sector-bending organisations." Complexity of integration increases with combining three or more logic interacts or elements as can be observed in education sectors seeking both social and financial returns and biotechnical companies that seek to combine academic elements with commercial sectors (Powell and Sandholtz, 2012, as cited in Logue, D., 2019, p. 8, chapter 4). Santos et al. (2015, as cited in Logue, 2019, p. 10, chapter 6) propose four types of blended or integrated hybrids, arguing that the identification make organisational forms less prone to mission drift, more financially sustainable and better secure legitimacy. The first type, the Market Hybrid (integrated), combines social and commercial impacts without separating them. The second, the Blended Hybrid (integrated), serves customers and beneficiaries who are the same but each require additional services. The Bridging Hybrid (differentiated) has separate customers and beneficiaries and when price differences arise for similar services, there is a risk of mission drift. Lastly, the Coupling Hybrid (differentiated) also separates customers and beneficiaries but introduces additional support services distinct from the commercial side, which can create resource allocation challenges when financial sustainability is strained. Clarifying the logics of societal domains involved in social innovations helps identify the barriers to collaboration and achieving social innovation impact. However, it also offers valuable insights into potential opportunities and strategies for organising, financing and managing organisations or projects that address social issues, such as Energy Inclusion. In this literature review, I do not explore the area of public-private partnerships, which also offers valuable insights into cross-sector collaboration challenges, but the focus is on entrepreneurial, social enterprise models as a means to achieve social innovation, in relation to Energy Inclusion. **Measuring**

Impact is reflected in the shift in the literature from "value" to "impact" suggesting a transition from contributing to the collective good within existing systems to transforming those systems for the benefit of both individuals and society as a whole (Logue, 2019). The growing movement to develop impact investing markets (Tett, 2019, as cited in Logue, 2019, p. 21, chapter 6), along with the evolving role of corporations from simply being responsible to actively doing good and using the corporate model to foster inclusive growth and enhance social good (Logue, 2019), calls for establishing a clear and consistent definition and standard for impact measurement. Kroeger and Weber (2014, as cited in Logue, D., 2019, p. 24, chapter 6) indicate two compelling issues for non-profit organisations to measure social value creation. Firstly, the desire to know if real progress is being made and second if the potential positive social impact is maximised. Emerson (2003, as cited in Logue, 2019, p. 29, chapter 6) advocates for improved social management information and the development of a common set of metrics or a shared language for measuring value creation. Since all investments operate across economic, social and environmental domains, it is important to understand in which of these areas value is being generated. Measuring blended value and quantifying blended return on investment needs a new approach to accounting and capital allocation. Social Return on Investment (SROI) is an example within a broader category of blended value accounting where stakeholders are involved in defining outputs, outcomes and monetary proxies for a measurement of impact (Manetti, 2014, as cited in Logue, D., 2019, p. 31, chapter 6). Ebrahim and Rangan (2014, as cited in Logue, 2019, p. 33, chapter 6), distinguish between outcomes, defined as "lasting changes in the lives of individuals" and impact, which refers to "enduring results achieved at the community or societal level." Benchmarking metrics is important and may be compiled from multiple sources and aggregated at a national level. A number of indices and banks of measure are developed like the Impact Reporting and Investment Standards

(IRIS), the UN Sustainable Development Goals and The Global Value Exchange. The Global Impact Investing Network (GIIN) in a study found the most commonly measured impacts to be number of program beneficiaries, number of people employed, reduction of GHG emissions due to products or services sold, household cost savings deriving from shifts in fuel usage and increased income-generating opportunities (Logue D., 2019). Other program logic models show the relationship between inputs, outputs and program outcomes. Results-based approaches providing financial assistance when specific outcomes are achieved, commonly applied in the health and education sectors, are increasingly being used in the environmental sector as well. Cost-Benefit Analysis (CBA) assigns a financial value to the costs and benefits associated with a program to monetise its impact. SROI quantifies social impact in monetary terms, comparing the value of benefits to the cost of achieving them. It involves identifying stakeholders, mapping outcomes and assigning monetary values to those outcomes. As with CBA, monetisation is the most complicated part of SROI and three non-market methods are used. The cost-saving method, stated preference (how much are people willing to pay) and revealed preference, using evidence of the behaviour of people to infer their willingness to pay (Logue D., 2019). The EU has introduced several key regulations aimed at improving corporate sustainability and Environmental, **Social and Governance (ESG) reporting**. In the year 2024. Corporate Sustainability Reporting Directive (CSRD) requires a wider range of companies, including listed small and medium-sized enterprises (SMEs) and large firms, to disclose detailed ESG-related data. The CSRD introduces the European Sustainability Reporting Standards (ESRS), ensuring consistency in sustainability disclosures across companies (EU, 2024). These regulations reflect the EU's increasing focus on transparency, accountability and sustainability in corporate governance, aligning businesses with global ESG goals.

2.6 Energy Inclusion

Energy Inclusion (EI) holds diverse meanings for different groups and without a clear, shared understanding, realising, monitoring and comparing EI across regions becomes extremely challenging, if not impossible. Additionally, it is essential for citizens to understand how EI impacts their lives and communities, as their engagement and comprehension are crucial for its successful implementation and long-term sustainability.

2.6.1 Introducing to Energy Inclusion

Similar to the earlier discussion, Energy Inclusion is, like Social Innovation, a polysemous concept (Logue D, 2019) where the words Energy and Inclusion have on their own various interpretations. Used together the combined definition create semantic complexity in both meaning (reference) and sense (associated concepts). "Inclusion" refers to the practice or policy of including and accommodating individuals who might otherwise be excluded or marginalised, such as those who have disabilities or belong to minority groups. In a broader sense, inclusion aims to embrace diversity and create environments that are welcoming and supportive for all individuals, regardless of their differences (Oxford Languages, 2024). Inclusion can be applied in various contexts, including education, workplaces and communities. The goal is to ensure that everyone has equal access to opportunities, resources, and experiences, fostering a sense of belonging and participation. In the context of "Energy Inclusion," the term can be used to describe efforts to ensure that access to energy resources, technologies and benefits is inclusive and equitable. This could involve addressing energy poverty, promoting access to clean and sustainable energy for underserved communities and considering the diverse needs of different populations in energy planning and policy. The meaning or reference of Inclusion define the subjects to be marginalised or excluded individuals/groups, but in the context of Energy Inclusion (EI) may also apply to underserved communities having access to fossil

based-energy, but not to renewable energy, due to price or availability. This suggest that in a certain policy or project context the “target” group needs to defined and may not be easily generalised. The term Energy Inclusion in the context of the global Energy Transition (ET) is at present being associated to renewable energy. Also here the definition of both the type of renewable energy and its impact on a group needs to be placed in context. Is it access to energy, access to renewable energy or to financial benefits through social entrepreneurship/innovation or other financial or social benefits. To be able to understand how Energy Inclusion can be achieved within ET projects and what impact it can have on a community, it firstly needs to be properly defined. The term EI is rarely mentioned in the literature, although many derivative associated terms are encountered. The World Economic Forum (WEF) outlines an Inclusive ET into a framework of 5 policy dimensions creating an inclusive approach to the ET (Musaab A. & Tatsuya T., 2023). Geo-inclusivity refers to the multiple transition pathways of the different regions in the world as each is starting at different points within the so called energy triangle of equity, security and sustainability. Society and people inclusivity highlights energy affordability being crucial for the lower-income population on a country level, especially in the Global South, where job creation, reskilling and regional development are imperative. The needs and contributions of communities at a local level are essential. Technological inclusivity acknowledges the requirement of an all-technologies approach to promote research and development in an innovative collaborative model as diversity in options across geographies, space, time and sectors to achieve technical breakthroughs. Industrial inclusivity is about the ET demanding significant resources, necessitating industry involvement to develop these resources and establish new value chains for manufacturing lower-emission energy technologies. This involvement is essential for expediting investments and ensuring efficient progress and momentum. Regulatory inclusivity guards

against isolated policy-making, which can leave gaps affecting the world's economically disadvantaged regions. Furthermore, the World Economic Forum (WEF, 2024) developed the energy triangle system performance and transition readiness model which identifies the 5 strategic areas where across simultaneous progress is needed to balance and achieve the three imperatives of the energy triangle (figure 2.1). An equilibrium in the energy triangle needs to be found between Energy Security, Energy Equity and Sustainability.

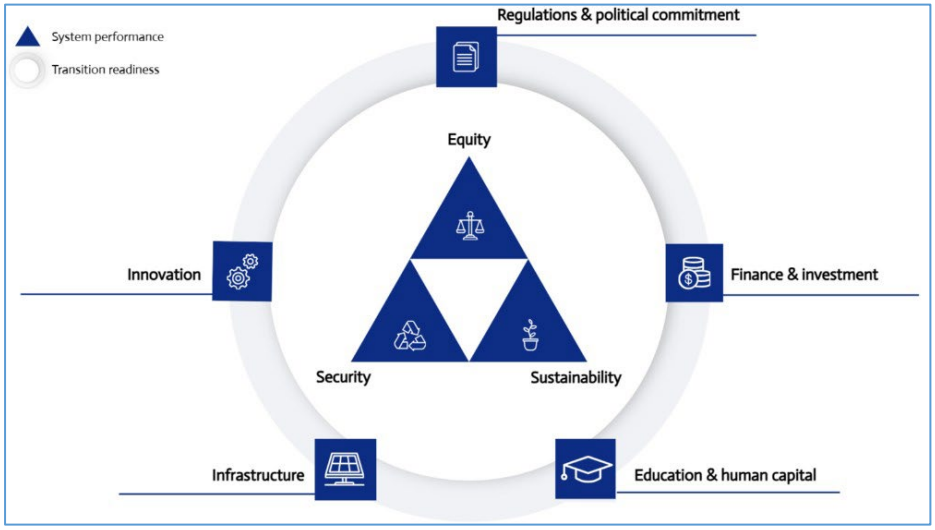


Figure 2.1: The 5 strategic areas balancing the progress within the three imperatives of the energy triangle (WEF, 2024).

2.6.2 Society and People Inclusivity dimension

Baker, S. et al. (2019), noted in their research the absence of consistent terminology in relation to Energy Equity and Energy Justice. Energy Justice is defined as achieving equity in both social and economic participation in the energy system, "while remediating social, economic and health burdens on marginalised communities". They assert that Energy Justice is closely linked to Environmental and Climate Justice. Particularly, frontline (of pollution & climate change) marginalised communities are often the first to experience potential adverse environmental impacts from ET projects in their regions, as

well as possible negative effects such as increased energy costs and limited employment opportunities. Baker, S. et al. (2019), argue that Energy Justice explicitly centres around the concerns of frontline communities and frame it together with Energy Equity and Energy Democracy in the broader Just Transition to a low-carbon regenerative economy. The broader "Just Transition" philosophy advocates remedying the injustices of the fossil-fuel energy system and the related extractive economy (Baker, S. et al. (2019). Although frontline communities are the first to encounter the negative impact of climate change or environmental pollution, I need to observe that lately the top and the middle of the society pyramid in both Europe and the U.S., cannot escape the devastating impact of the climate change such as wild fires and floods, or the environmental pollution of heavy industry. Another inclusivity term. Energy Democracy, is about the engaging of the community in energy generation, distribution and transition activities. Supporters of Energy Democracy feel it can only be reached if decision making power and control over the energy system is with the community affected by it (Baker, S. et al. (2019). With this Energy Democracy aligns with community participation earlier discussed in Social Design. Fairchild, D. et al. (2017), introduce the term "deep democracy" and argue that the energy participation of frontline communities, often poor people, people of colour or indigenous communities, need to go beyond the fundamentals and need a deeper structural transformation of the economic and social structures. The extent of energy democratisation hinges on a region's political context, and policymakers must also address groups not currently on the frontline who will become vulnerable to shifting employment, restricted access to education, and rising energy costs during the ET. At the onset, policymakers need to encompass a wider range of frontline communities, taking into account ethnic, gender and socioeconomic segmentation. To effectively incorporate and monitor Energy Inclusion (EI) initiatives at the implementation level of commercial initiated energy projects, clear definitions of

selected community segments are necessary. At both the policy and project levels, it is essential to maintain an economic perspective that serves the diverse groups within society, ensuring alignment with the regional economic development goals. Baker, S. et al. (2019), observe several other concepts used within Energy Democracy groups, which require some elucidation as they may be interpreted differently in an economical perspective of an ET project. Community Ownership refers to owning and controlling the sources of energy by a (defined) community. Community Decision-making refers to a democratic say in the means of energy production and distribution. Community Decision-making does not necessarily mean ownership of sources of energy, while this ownership can also be shared with private or public agents. The relevant sources and distribution of energy require to be defined at project level. Is it the infrastructure like solar panels and windmills, or is it the energy product, i.e. electricity, the molecules, that is generated by the infrastructure? Power Decentralisation is the empowerment of those closest to the means of production, geographically, socially and economically (Baker, S. et al., 2019). In the economic context, decentralisation of power is not synonymous with empowerment, but rather about bringing energy generation within a region closer to the various demand locations spread across different geographical areas or communities. In social sciences and legal literature on Energy Democracy, key concerns and their impact on the energy system include economic benefits, Equitable Distribution of benefits and harms, Pollution Reduction and prioritising the voices and control of frontline communities (equity through empowerment). Next to Energy Democracy, other definitions within the frame work of Energy Justice as stated by Baker, S. et al. (2019), are Energy Burden, the cost of energy in relation to household income, Energy Poverty referring to a lack of energy itself and Energy Insecurity. Energy Insecurity is best described by Hernández D. (2016), who defines Energy Insecurity as a multi-dimensional construct consisting of three themes. Economic Energy Insecurity

according to Hernández is the disproportionate financial burden of energy costs imposed on low-income households, the difference with Energy Burden being the specific segmentation into low-income groups. Physical Energy Insecurity which refers to the deficiencies in the physical infrastructure of the home environment impacting thermal comfort, inducing harmful exposures and increased energy costs. In frontline communities within underdeveloped and emerging economy countries, such as those in Africa and Southeast Asia, challenges might include exposure to smoke (air quality) from cooking in small shacks or huts. Conversely, in Europe, issues often revolve around the inadequate insulation of older houses and the direct impact of higher energy usage for heating additional to higher (renewable) energy prices. Poor communities lack the financial means to invest in energy-saving measures and those in social housing have little influence over such improvements. Hernández D. (2016) third theme, Behavioural Energy Insecurity, is defined by strategies used to cope, improvise and counteract the impacts of Economic and Physical Energy Insecurity. The level of Economic Energy Insecurity differs according to the earlier suggested frontline community segmentation groups and will have a differentiated approach of addressing the complexity. Hernández's research demonstrates that Behavioural Energy Insecurity has a detrimental impact on people's health. Another important topic Baker, S. et al. (2019) touches upon, is the question which communities in society should be centred when developing energy policy. This aligns with my earlier observation if the focus needs to be on current frontline marginalised communities or also on future vulnerable communities in the Just Transition philosophy. They refer to analytic frameworks in social science literature that include restorative justice, requiring acknowledgement of prior harms to frontline communities and that these by the current energy system most harmed communities are to be the focus. This may be a justifiable conclusion, but Energy Inclusion (EI) is, or needs, to be broader then restorative Justice

and EI is allied to Just Transition within the global society. Distributive Justice refers, according the Oxford Review (2025) “to the equitable allocation of resources, opportunities, and benefits within a society or organisation”, and principally focusses on ensuring fairness not only in benefits, but also burdens. Distributive Justice ultimately require stakeholders to be involved in policy effectiveness along racial and social-economic dimensions (Baker, S. et al., 2019). It differentiates with Equitable Distribution, as it relates to the perceived fairness by people. Fairness is not just embedded in a structural system, like involvement in policy effectiveness, but is also social relational and anchored in Social Psychology.

2.6.3 Social Psychology

The term Distributive Justice is related with the fairness of resource allocation decisions (Hu, B. & Han, S., 2021). Entering the domain of social psychology, Forsyth, D.R. (2006) defines Distributive Justice as perceived fairness of how rewards and costs are shared by (distributed across) group members. His studies on ethics concluded that the link between moral values and moral behaviour differ geographically, i.e. international differences in work and environmental related values. A country’s level of idealism and relativism (figure 2.2) vary and correlate to cultural dimensions, like individualism and avoidance of uncertainty. Forsyth, D. et al. (2015), found a geographical difference in observing that pro-environmental behavioural intentions were stronger when identity was more localised, such as being neighbourhood-based rather than regionally based. Their findings support a concentrated concept of place-based community identity, which could guide strategies to promote EI initiatives and participation. Lamont, J. et all (2017), explained that societal frameworks, including laws, institutions and policies, determine how benefits and burdens are distributed among members, are shaped by political processes, evolve over time and vary between societies.

	Low Relativism	High Relativism
High Idealism	**Absolutists:** Principled idealists who believe people should act in ways that are consistent with moral rules, for doing so will in most cases yield the best outcomes for all concerned	**Situationists:** Idealistic contextualists who favor securing the best possible consequences for all concerned even if doing so will violate traditional rules that define what is right and what is wrong
Low Idealism	**Exceptionists:** Principled pragmatists who endorse moral rules as guides for action, but admit that following rules will not necessarily generate the best consequences for all concerned	**Subjectivists:** Pragmatic relativists who base their ethical choices on personal considerations, such as individualized values, moral emotions, or an idiosyncratic moral philosophy

Figure 2.2: *Forsyth D. (1980) scales of relativism & Idealism.*

Forsyth, D. et al. (2015), found a geographical difference in observing that pro-environmental behavioural intentions were stronger when identity was more localised, such as being neighbourhood-based rather than regionally based. Their findings support a concentrated concept of place-based community identity, which could guide strategies to promote EI initiatives and participation. Lamont, J. et al. (2017), explained that societal frameworks, including laws, institutions and policies, determine how benefits and burdens are distributed among members, are shaped by political processes, evolve over time and vary between societies. Their structure significantly impacts people's lives, and debates about the moral preferences of these distributions fall under the topic of Distributive Justice. Advocates of welfare-based principles contend that material goods and services are valuable only insofar as they enhance welfare. They believe distributive principles should be evaluated based on their impact on welfare, whether through its maximisation or distribution (Lamont, J. et all, 2017). Energy inclusion, achieved through increased community access to renewable energy, is closely linked to the distribution of welfare and the means to create it. Addressing energy insecurity and providing economic benefits through renewable energy access maximises the overall impact on welfare. In contrast, libertarians argue that prioritising welfare-based principles undermines the more crucial moral imperatives of liberty and self-ownership. Liberty encompasses two main aspects:

self-ownership and resource-ownership. Self-ownership refers to the rights over one's body, labour, and the resulting benefits. Resource-ownership pertains to the rights to own external resources and their produce. The libertarian's view is that reductions in government intervention in the economy will better respect liberty and/or self-ownership of its citizens. However, without government involvement, EI is unlikely to occur. The development of SI through the establishment of EI in a community or region will create opportunities for self-ownership and resource-ownership. Feminist critiques then again highlight that traditional distributive principles often overlook women's unique circumstances, advocating for principles that consider women's primary roles in child-rearing and their reduced participation in the market economy compared to men (Lamont, J. et al., 2017). This feministic view is arguably also commencing with opportunities deriving from EI. Through SI, these opportunities can facilitate the fair feministic distribution of welfare within the community. It is evident that establishing EI is a first, to be able to obtain Distribute Justice according either welfare-based, liberty-based or feminist-based theories. In Distributive Justice, egalitarianism is the simplest principle as it is that of strict equality and is most commonly justified on the grounds that people are morally equal and that equality in material goods and services is the best way to give effect to this moral ideal. However, it is difficult to measure and compare the well-being of individuals or groups over time or across different contexts. The Index Problem within Distributive Justice refers to the difficulty of measuring and comparing legality. This problem arises because well-being can be influenced by a variety of factors, including income, health, education and personal preferences, which are not easily quantifiable or comparable. In the earlier paragraph on Energy Democracy, I raised the question of which community segments are involved in the allocation of EI. To ensure that all stakeholders can participate in a SI project with an EI aim, it is crucial to address the issue of Distributive

Justice. This ensures fair distribution of benefits and resources across different groups. A further understanding of the four main theories of Distributive Justice is beneficial, which are Rawlsian egalitarianism or justice as fairness, Dworkinian egalitarianism or equality of resources, Steiner-Vallentyne's libertarianism or common ownership and Nozickian libertarianism or entitlements (Allingham, M, 2014). In the context of renewable energy, Rawlsian egalitarianism, defines justice as a fair if it maximises the energy that a person with the least energy receives. This does imply that an energy connection infrastructure is available. Rawlsian egalitarianism does adjust for preferences, ability and the capacity of the energy infrastructure. Inequalities in income, subject to the maximin requirement, are accepted because of the benefit they bring to the individual with the least income. The maximin requirement in the philosophy refers to maximise the minimum gain, in an economic driven project with an aim to maximise EI, it balances between ROI for investors and supply of energy to the community possible at a preferential price. In this Rawlsian principle no rights are considered for self- and resource-ownership, nor is responsibility recognised. This may contradict the Social Innovation principles of community stakeholder participation to achieve EI and create social value. Dworkinian egalitarianism, equality of resources states that distribution is just when all have the same effective resources for the given amount of effort, in the context of EI being accessibility and tariff, each person could obtain equal energy benefits. Gaining energy benefits from renewable energy access is closely tied to the Social Innovation it fosters. The true value of energy access lies in its ability to drive social change and promote sustainable development within communities. It further raises the (research) question if SI starts with making the resources available or with creating the resources and use it to obtain the benefits. Responsibility of the person is important, which agrees with the Dworkinian egalitarianism theory, however rights for self and resource-ownership are not. The common ownership theories from Steiner-

Vallentyne's libertarianism view, define a distribution to be just if each person initially has the same amount of energy and all transactions between individuals are voluntary. This confirms that firstly energy needs to be available to create opportunities for self-ownership and resource-ownership to take effect. The theory assumes that the level of energy available, in tariff, in (required) capacity and accessible, is equal to all. Here the rights to self-ownership are maintained but the rights to resource-ownership are not considered. Nozickian libertarianism or entitlements theory defines a just distribution of energy when it is historically justified. This historical principle does associate with Baker's et al. (2019), "Just Transition" philosophy that advocates remedying the injustices of the fossil-fuel energy system and the related extractive economy. It also refers to the enormous entry barrier of new innovative renewable energy sources due to current carbon based energy systems having path-depended innovation processes, which creates a lock-in through capital intensive fossil based energy technologies and analogous compatible energy offtake markets (Path-Dependent innovation). The entitlements theory makes no adjustments, aside from correcting historical energy-related injustice, and requires no external institution to enforce it. It accepts all inequalities, while upholding self-ownership and resource-ownership rights. Energy Inclusion in communities will address current and future energy related distributive injustices and arguably can be a method of compensating historically injustices. This entitlement theory gives an added level of complexity when trying to define the level of EI in different economically segmented communities with each a different history. The definition of Energy Inclusion and the dimension of Distributive Justice may, very well, be different between the various stakeholders, specifically when foreign direct investment is involved. Such differences may raise the question to what extend the private sector will consider communities to play a role in their commercial driven project next to the governmental parties. These theories of Distributive Justice make

defining the level of inclusion complex and suggest a common ground is to be found among the affected stakeholders within a EI project or within society as a whole when considering policy making.

2.6.4 Definition of Energy Inclusion

The World Economic Forum's systems approach to Energy Inclusion (EI) is primarily directed toward advancing policy development and monitoring thereof. In contrast, socioeconomic and human-centered literature examines EI through a social lens. To enable a meaningful comparison between these diverse definitions and the established WEF EI framework, I categorise the nine principal human-oriented EI definitions into four core areas, shown in figure 2.3. These nine definitions are the foundation of the to be developed evaluating indicators, discussed in Chapter IV. Energy Justice being closely linked to Environmental and Climate Justice, I conclude that a minimal requirement of monitoring EI is to establish an environmental pollution indicator. Environment; Pollution Reduction is driven by laws and regulations. Energy Justice/Equity aims at achieving equity in both social and economic participation in the energy system and falls together with Energy Democracy, community engagement in energy generation, distribution and transition activities, within juridical and democratic domain. Power Decentralisation, i.e. empowerment of those closest to the means of production, is taken as actual participation in energy systems, while Energy Democracy is chosen to represent the democratic processes required to support Power Decentralisation. Together with Energy Burden, the Power Decentralisation definition falls within the Society & People domain, subcategory influence of accessibility of energy. Physical Energy Insecurity and Energy Poverty have within the Society & People domain a relation with infrastructure. All four indicator terms have a direct impact on society. Equitable Distribution refers to the actual benefits and harms, though not easy to quantify, where Distributive Justice with the perceived fairness

of benefits, burdens and harms. The numbering of the nine principal EI definitions selected as EI evaluating indicators are an initial selection of the sequence of importance. This is explained later.

Law & Enforcment	1	Environment; Pollution Reduction	Management by laws
Democratic processes	4	Energy Justice/Equity	juridical & democracy
	5	Energy Democracy	
Impact on society & people	2	Physical Energy Insecurity	Infrastructure
	3	Energy Poverty	
	6	Power Decentralisation	Influence of/say in, accessibility of energy
	7	Energy Burden	
Equitability & perceived fairness	8	Equitable Distribution	Community inclusion
	9	Distributive Justice	

Figure 2.3: *Categorising nine principal human-oriented EI definitions.*

Figure 2.4 illustrates the overlap between the nine principal EI definitions and the five inclusivity areas of the World Energy Forum (WEF). Only three of the five WEF inclusivity areas correspond with the EI evaluating indicators, showing the discrepancy between policy and human-oriented approach. The Energy Transition Development Project (ETDP) is the party that adds the necessitating resources for ET development and makes Power Decentralisation and Equitable Distribution at project level possible. The principal themes of Social Innovation (SI), cover the same three WEF inclusivity areas. The Geo-inclusivity aligns with the research objective of a universally applicable definition of EI that accommodates diverse socioeconomic contexts, alongside a methodology for evaluation and international benchmarking.

	Regulatory inclusivity		Industrial inclusivity	Society and people inclusivity	Technological inclusivity	Geo-inclusivity
Energy Inclusion	Law & Enforcement	Environment; Polution Reduction	ETDP	Physical Energy Insecurity	Technical Innovation	Benchmarking
				Energy Poverty		
	Democratic processes	Energy Justice/Equity		Energy Burden		
		Energy Democracy	Power Decentralisation			
		Equitble Distribution				
				Distributive Justice		
Social Innovation	Collaboration					
			Socioeconomic value			
				Community		

Figure 2.4: *WEF and literature EI overlap according to definitions.*

It is observed that the detailed nine principal human-oriented EI definitions are an essential element complementing the established WEF policy guiding framework. When following their governmental policy approach, all five inclusivity areas are to be concurrently addressed. This seems to be a possibility considering the overlap, but concerns can be raised at the ETDP implementation stage. Policy regulations on both stimulating and directing ET investments, on technical innovation and on required infrastructure investments can result in energy transition and development (ETD) project investments. Yet, the critical question remains if projects can comply to an appropriate all-encompassing EI implementation trajectory designed to maximise EI over time? And if a SI program can be integrated in project developments. An alternative is to detach Energy Inclusion (EI) from the WEF's policy-guiding framework and instead emphasise the interaction between policy-driven objectives and EI practical implementation. Within this approach, the nine human-oriented EI definitions serve as a supplementary, secondary layer that complements and enriches the overarching policy framework. This approach allows for the systematic prioritisation of EI indicators to facilitate and accelerate EI implementation, while simultaneously enabling a more coherent integration within a broader Social Innovation (SI) program. A different approach involves establishing a prioritised sequence of the nine Energy Inclusion (EI) indicators, based on the premise that certain foundational conditions must be in place before subsequent elements can be effectively developed or realised. Where environmental concerns are commonly well regulated by local laws governing industrial development, the succeeding problematic environmental consequences of industry, like harmful emissions into the air and water, arguably requires sufficient rigorous policies to reduce or prohibit such emissions. As Energy Justice is closely linked to Environmental and Climate Justice, I conclude that Energy, Environment and Climate Justice are a minimal requirement, so called hygiene factor, for Energy Inclusion. Without

considering potential adverse environmental impacts from ETDPs and other potential negative effects, i.e. increased energy costs or limited employment opportunities, which certainly will not affect society equally, no true EI can occur. Hygiene factors in EI are therefore defined as the elements minimal required to be in place for the EI of a society or community to be appropriate (figure 2.5).

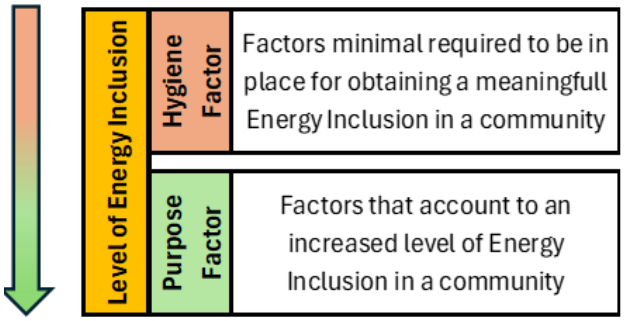


***Figure 2.5**: The two-factor framework for Energy Inclusion (Author's illustration, 2024).*

Guided by Herzberg's two-factor theory (Handy, C., 1999, pg.31, 341), EI can be similarly split into two factors. Herzberg's Two-Factor Theory, also known as the Motivation-Hygiene Theory, is a classic framework in organisational psychology that explains what drives employee satisfaction and what prevents dissatisfaction. Herzberg proposed that job satisfaction and dissatisfaction stem from two distinct sets of factors, not just one continuum, namely Motivators (Satisfiers) and Hygiene Factors (Dissatisfiers). Hygiene Factors are extrinsic to the job and help prevent dissatisfaction, but they don't necessarily motivate or satisfy employees. Motivators are intrinsic to the job and lead to positive satisfaction when present. Where hygiene factors in EI are minimal requirements to prevent "dissatisfaction" of negative impacts of EI on society, the "satisfiers" lead to increasing inclusion of energy in the society. When the hygiene factors are not fulfilled, EI cannot be achieved. However it is expected that the two tier EI model, corresponding to the Herzberg's Two-Factor Theory, is not one continuum. Factors may develop positively in both categories. The amendment made is to redefine Herzberg's Motivators to Purpose

Factors. Purpose Factors are key to assure EI in the complete spectrum of definitions found in the literature. Figure 2.6 shows the proposed nine levels in two tiers. Level 1 of EI is related to Regulatory Inclusion (WEF, 2024), where government requires to have environmental policies in place that not only address the transition to renewable energy but also adhere to internationally accepted environmental standards and process regulations. No EI is possible without a level of Physical Energy Security (Level 2), the infrastructure to supply energy into homes or businesses, where the availability of (renewable) energy is expressed in Energy Poverty (Level 3). Energy Justice/Equity (Level 4) needs to measure the equity in both social and economic participation in the energy system. This is the minimum required basis to step up to the more elaborated Energy Democracy level.

Level of Energy Inclusion			Description	Topic	Realated to
	Hygiene Factor	1	Environment; Pollution Reduction	Policies - Regulations	Health & Safety
		2	Physical Energy Insecurity	Deficiency in Infrastructure	Home environment
		3	Energy Poverty	Lack of availability of energy	Energy sources
		4	Energy Justice/Equity	Social & Economic equality	Functioning of legal processes & outcomes
	Purpose Factor	5	Energy Democracy	Participation in Energy Transition	Democratic environment for community inclusion
		6	Power Decentralisation	Empowerment	Community Ownership/Decision-making in energy systems
		7	Energy Burden	Affordability of Energy	Energy cost related to income
		8	Equitable Distribution	Within local project community	Benefits & Harms
		9	Distributive Justice	Level of Energy Inclusion	Fairness of perceived resource allocation

***Figure 2.6**: Energy Inclusion Two-Factor multi-continuum Sliding Scale (Author's illustration, 2024)*

With the minimum Hygiene factors addressed, the Energy Inclusion level can advance to the higher Purpose factors. Energy Democracy, level 5, firstly emphasises the role of communities and individuals in having a say in energy-related decisions, ensuring that the transition to sustainable energy systems is inclusive, participatory and socially just. Without the involvement and participation of communities and individuals in a sustainable energy system, the other Purpose factors are not achievable. Level 6, Power Decentralisation, is a real applied goal of Energy Inclusion, which in turn is directly linked to Level 7 Energy Burden, the affordability of that energy. Equitable Distribution, Level 8, is the fair and just allocation of both the positive and negative outcomes associated with

energy production, distribution and consumption and is not necessarily concurrently achieved with establishing level 6 and 7. Enclosed in these two levels are the equitable benefits of access to affordable renewable energy, whereas health and environmental benefits are addressed in the Hygiene Factors. The additional economic benefits going beyond community-owned energy projects and access to energy efficiency programs are included in Level 8, such as job creation, access to education, and opportunities for communities to participate in innovation, start-ups, and small business ventures. The equitable distribution of harms involves ensuring that no community bears a disproportionate share of environmental impacts, such as pollution or resource depletion, from renewable energy projects. This also includes addressing the displacement of communities or livelihoods by providing adequate compensation or relocation support. Additionally, it involves preventing disproportionate costs of transitioning to renewable energy and addressing legacy pollution through clean-up and remediation of contamination from past energy projects. The final level, Level 9, Distributive Justice, will need to capture the perceived fairness in the distribution of costs and benefits among stakeholders and ensure that resource allocation decisions are conceived to be made appropriately. Although the prioritising of EI is herewith outlined, the weighing or measurement method of each level is not. To be able to benchmark between regions and projects, a standardised quantifiable level definition needs to be developed. The methodology shown in figure 2.6 is termed the Levelized Energy Inclusion Model (LeiM). This hypothesis of a two-factor Energy Inclusion model and the individual level benchmarking method, is in detail examined and researched in Chapter IV. Chapter V will elaborate on the rationale for selecting this two-factor, or an alternative hypothesis that adopts an integrated policy approach with the five WEF inclusivity dimensions.

CHAPTER III

METHODOLOGY

3.1 Overview of the Research Problem

Despite growing global interest in Energy Inclusion (EI) as a policy priority, particularly in Europe and the United States, there is a lack of a universally accepted definition and a measurable framework for EI in the academic literature. This absence hinders the ability to benchmark EI across regions and integrate EI meaningfully into Social Innovation (SI) and Energy Transition (ET) initiatives, especially in developing and emerging economies. Existing research and policy discourse predominantly focus on public sector-driven ET efforts, overlooking the role of private enterprises and the broader community in operationalising SI with the objective of advancing EI.

Energy Inclusion (EI) refers to society's equitable access to energy, particularly for underserved and disadvantaged communities. The access to energy to disadvantaged communities is often overlooked when businesses and financing institutions decide to invest in larger scale renewable energy projects which have the primary objective of creating shareholder value and the related profit maximisation. This disconnect underscores the need for a redefined approach to Energy Transition (ET), one that integrates EI objectives from the outset of project planning and investment decision-making. Therefore, a pressing need exists for an applicable, non-financial business framework that embeds Social Innovation (SI) initiatives aimed at advancing regional Energy Inclusion (EI). Such business framework needs to enable collaborative public-private-community partnerships and be supported by EI benchmarkable performance indicators that enable the assessment and continuous monitoring of EI outcomes, both regional and global.

3.2 Operationalisation of Theoretical Constructs

Three theoretical constructs are designed to define the scope and focus of the research frameworks in line with the research methodology. The constructs will support the analyses of the four research hypothesis to be described later in paragraph

3.4.5.**Construct: Energy Inclusion (EI)**

Energy Inclusion is conceptualised as a dynamic, multi-level construct shaped by regional, technical and policy-specific factors. It cannot be captured by a singular definition instead it is represented through a two-factor sliding scale model comprising nine progressive levels. These levels are divided into two categories:

Hygiene Factors (Foundational Conditions)

1. Environmental; Pollution Reduction.
2. Physical Energy Security.
3. Energy Poverty.
4. Energy Justice/Equity.

Purpose Factors (Advanced Inclusion Goals)

5. Energy Democracy.
6. Power Decentralisation.
7. Energy Burden.
8. Equitable Distribution.
9. Distributive Justice.

To enable benchmarking across regions and projects, the construct requires a standardised, quantifiable definition of each level. This part of the thesis proposes a methodology for measuring and comparing EI performance globally and explores the applicability of two hypothesises defined in paragraph 3.4.5.

Construct: Energy Inclusion through Hybrid Entrepreneurship

Energy Inclusion (EI) within the context of the Energy Transition (ET) is driven not only by environmental objectives but also by the economic imperatives of private sector investment. In the current landscape, EI is frequently neglected in large-scale renewable energy investments, which are primarily driven by shareholder value and profit maximisation. Technological innovation and entrepreneurial processes, particularly those rooted in Social Innovation (SI), are essential to advancing EI by fostering collaboration among businesses, governments and communities. To address this gap, the construct proposes the development of a non-financial business framework that integrates Social Innovation (SI) initiatives aimed at advancing EI. This framework must facilitate collaborative partnerships among public, private and community stakeholders and be supported by benchmarkable performance indicators that allow for the assessment and continuous monitoring of EI and SI outcomes across diverse geographic and socioeconomic contexts. This construct emphasises Social Entrepreneurship and serves as the foundation for operationalising EI in a way that is inclusive, measurable and adaptable to both developed and developing regions, thereby aligning social equity with sustainable energy development. The disconnect between private investors and EI highlights the need for a reimagined approach to the Energy Transition (ET), one that embeds EI objectives from the earliest stages of project planning and investment decision-making.

Construct: Generalised SI-ET Project Implementation Framework

This construct defines a structured business management approach that embeds Energy Inclusion (EI) into renewable energy investments through Social Innovation (SI) principles. It addresses the strategic, organisational and methodological gaps that currently hinder meaningful EI outcomes.

Key Components:

- Early-Stage SI Integration

Embedding SI and EI objectives in project planning, investment decisions and implementation from inception.

- Social Entrepreneurship Contexts

Recognising varied organisational settings (new entities, inter-organisational collaborations) where EI innovations emerge.

- Hybrid Organisational Dynamics

Managing resource allocation and power sharing in Coupling Hybrid models that separate commercial customers from social beneficiaries.

- Collaborative Partnership Requirements

Establishing clear business agendas, strong partner commitment, shared investments, deep community engagement and long-term focus to achieve sustainable, reproducible results.

- Normative Analyses Tools

Developing analyses tools matrices and guidelines for actionable mechanisms tailored to diverse projects and stakeholder requirements.

- Generalised SI Implementation Framework

Adapting and merging business and SI models into a modifiable blueprint that integrates three SI design steps with linked SI & ETDP implementation stages.

This model provides an adaptable framework for practitioners and researchers to systematically integrate SI in renewable ETDP across regions and contexts.

3.3 Research Purpose and Questions

The purpose of this research is to develop a globally applicable, non-financial business framework that embeds Social Innovation (SI) initiatives and benchmarkable

performance indicators to advance Energy Inclusion (EI) in renewable energy investments across diverse regional contexts.

To achieve this, the study will:

- Establish a standardised methodology for defining, measuring and comparing EI levels among nations, socioeconomic contexts and projects.
- Adapt and synthesise existing business management and SI models into a sequential implementation blueprint that practitioners can apply to specific technical, policy and socioeconomic contexts.
- Design actionable guidelines and best practices for collaborative public–private–community partnerships that ensure SI and EI objectives are integrated from the earliest stages of Energy Transition projects.
- Apply the framework to case studies in different socioeconomic contexts, to demonstrate its capacity to differentiate in SI analyses and implementing decisions.

3.3.1 Research Questions

RQ1) How can Energy Inclusion be conceptualised and measured through a benchmarking model that is globally applicable across diverse regional contexts?

Energy Inclusion is interpreted variably in the literature and the absence of a unified definition impedes its implementation, monitoring and cross–regional comparison.

RQ2) What structures and processes are required to embed Social Innovation within capital-intensive Energy Transition Development Projects (ETDPs) to induce Energy Inclusion?

Anchoring EI through SI demands a comprehensive understanding of SI design and stakeholder collaboration, including the role of ETDP developers and the alignment of diverse stakeholder objectives.

RQ3) How can a Blueprint be designed to plan, implement and monitor SI and EI objectives throughout the lifecycle of ETDPs, integrating business management theories and existing SI models?

This applied question seeks to integrate established business management frameworks into the SI design process to propose innovative business and funding models for ETDPs and SI projects.

3.4 Research Design

The research philosophy and methodology of this research follows the method of Saunders, M., et al. (2019). Concepts, definitions and models are attributed to his book on research methodology.

3.4.1 Research Strategy

The study is an emergent Case Study (Saunders, M., et al., 2019, p. 196), where the qualitative research design evolves organically during the course of the study. Instead of following a rigid, pre-defined review structure, I adapted the research to unfold in response to, at the start unknown insights and arising knowledge during literature research and analysis. With these amendments new or expanded search definitions within the scope of the research questions were introduced, aimed at deepening the investigation of key concepts directly linked to the primary search definition or the study's central theme. The amended literature searches remained well-aligned with the primary search scope by employing appropriate targeted search terms to ensure relevance. The Cross-Sectional study has both an exploratory objective and, due to its deductive approaches, a descriptive objective. The study aims to analyse two project cases according the research findings, to gain a minimum level of insight into the replication of the findings in different socioeconomic contexts, referred to by Yin (2018, as cited in Saunders, M., et al., 2019, p. 198) as theoretical replication.

3.4.2 Research Methodology

The research methodology is a mix of Basic Research and Applied Research. The approach is best illustrated by means of table 3.1 where the cascading research stages of Basic Research at the top to Applied Research at the bottom becomes clear.

Table 3.1

Cascading Research approaches.

All-encompassing	Energy Inclusion			
Integrating	**Social**	**Innovation**	**Technical Innovation**	**ETDP**
Aplication	**Social Design**		**Business Management Principles**	
	-Social Process & Outcome			
	-Social Value Creation		-Stakeholder Management	
	-Social Demand		-Management of Change	
	-Social Entrepreneurship		-Finance	

The first stage refers to defining an all-encompassing Energy Inclusion (EI) definition and is classified as Basic Research. It aims to enhance the understanding of the management process of benchmarking Energy Inclusion through defining and generalising its definition and measurement and leads to a universal process principle that has a significant contribution to addressing the global ET (Saunders, M., et al., 2019, pg. 10). It adopts an abdicative approach, delving deeper into existing literature, but remains within the existing theoretical framework on Energy Inclusion (EI) and seeks to answer several questions.

- Define each of the proposed Energy Inclusion levels of the Two-Factor Multi-Continuum framework based on the existing literature.
- Verify if other forms of EI definitions are encountered in policy documents and determine if and how they fit the proposed EI levels.
- Determine the needed indicators, data sources and structure for global benchmarking.

- Identify further areas of research and propose alternatives when information is lacking.

Upon the identification of relevant data sources, the selected level indicators are quantified and benchmarked across selected countries and global regions using the established methodology. The result will illustrate the practical application of the EI definition, affirms the operational validity and indicates any possible weaknesses. At this point the research enters into Applied Research, as here the purpose of the practical problem of measuring and comparing EI is solved, new knowledge limited to this problem is gained, with a practical relevance to the business community. The second cascading stage of table 3.1 relates to the second research question of how to anchor EI through SI in a capital intensive Energy Transition Development Project (ETDP). This cascading stage also involves a desktop research where the theory of SI is analysed and expanded with relevant literature topics from the psychology literature. Also here the research remains within the existing theoretical frameworks. The deducted concepts are integrated into analysing models for use within the context of an ETDP. This is classified as Basic Research for the reason that it enhances the understanding of a specific business management process and generates new knowledge related to integrating SI, psychology and business management concepts for universal project application, with the intention to improve societies socioeconomic circumstances (Saunders, M., et al., 2019, pg. 10). The concepts of the second cascading stage form the basis of a predominantly Applied Research methodology at stage 3, where guidelines and best practises for Social Innovation engagement in a real-world project is presented. These best practices and guidelines being applied to example practical case studies in different socioeconomic contexts, improves the understanding of a differentiation in SI analyses and implementing decisions and result in knowledge specific for these case studies. Concluding, the research can largely be

defined as Basic Research due to the anticipated novelties that establish the relationship between universal principles of business and SI processes and their outcomes, with added value to the society in general. (Saunders, M., et al., 2019, pg. 10). On the other hand, the research also has significant real-world applicability, aiming to enhance the understanding of both socio-business management challenges in a specific context, recommend valuable solutions for stakeholders while adding new process knowledge. This constitutes Applied Research. Overall the research can be classified as a mixed research.

3.4.3 Data and information analyses

Due to the type of research, the study has in principal a qualitative data collection, but with developing the EI benchmarking tool quantitative data is procured and applied. Therefor the first stage is a mixed-method study. The second research stage is a qualitative study where theories of SI and Psychology are looked at through the lens of Business Management. The third research stage is predominantly qualitative research, although the analyses of the case studies do include the quantitative benchmark and socioeconomic context figures from Stage 1 together with quantitative analyses takes place. The approach of coding the qualitative data is explained in the following paragraph, where the quantitative data is derived from public databases and subsequently analysed in the context of the quantitative research findings.

3.4.4 Thematic analyses and coding qualitative data

An initial literature review was conducted with the main research topics of Innovation, Social Innovation, Energy Inclusion and Industrial Development. The searches yielded 53 relevant papers within a five-year timeframe, with similar results across platforms, ensuring comprehensive coverage (table 3.2). These papers primarily addressed Social Innovation (SI), Energy Transition (ET) and developing countries. The analysis highlighted a gap in research on SI in underdeveloped regions, despite its relevance to ET

in these contexts. Energy Transition (ET) was rarely found to intersect with Social Innovation (SI) and Industrial Development seldom appears in conjunction with ET or SI. The various other papers and journal articles identified, showed disparities across the EI, ET and SI domains and predominantly revolved around related topics. The search was intentionally biased toward SI. A follow-up search combining SI and ET yielded 25 additional papers, 21 being relevant, increasing the ET/SI ratio from 53/6 to 78/31. Notably, 53% of these additional papers were published in the last four years, reflecting growing research interest in the intersection of SI and ET.

Table 3.2:
Categorisation of initial research papers.

Variables	Context	Variables
1) Industrial Development (4)	Social Innovation (33)	3) Underdeveloped regions (6)
2) Energy Transition (6)		4) Developed regions (46)

The following databases were used during the various stages of the literature review and the desktop research:

- Google (Scholar)
- Science Direct
- Mendeley
- EBSCO

With second main literature review the eligibility criteria were more narrowly defined by publication years, language, geographic location, publication status and type of publication (Covidence, 2024). The search inclusion/exclusion criteria were set firstly by the principle research questions, i.e. defining Energy Inclusion, fostering SI and implementing a SI project with EI goals. The paper publication period is 5 years, from 2019. to 2024, albeit many researcher made reference to papers from 2000 and onwards.

This reflects the long history of technical innovation and the academic interest of social research in the first decennia of this century. Due to the limited availability of novel research across the consulted databases and search engines, sources outside the predefined temporal scope were included, provided they remained thematically relevant and closely aligned with the topic. Energy Inclusion research is from the last decade, from 2014 onwards, where a broad variety of SI related theories where researched. Only papers in the English or Dutch language were considered, and no geographic exclusion boundary was considered, as the preliminary literature review showed an underrepresentation of underdeveloped regions and the research has a global focus. The type of publication was set at academic literature papers from researchers linked to reputable research, governmental, or not-for-profit social organisations. Published books on systematic literature review of SI was taken as a basis.

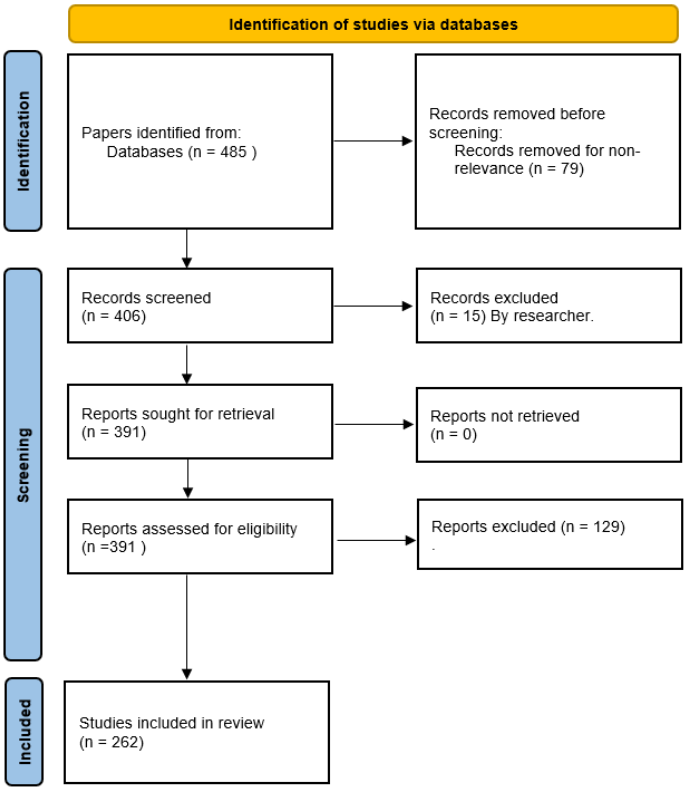


Figure 3.1: *PRISMA flow diagram for the main systemic literature review, Chapter II.*

The literature review conducted during the main research were based on the same eligibility criteria, but as many specific topics were not found in the academic literature, more grey literature sources were consulted. References of white literature in these grey literature publications was checked to judge its academic standard, where information on reputable organisational websites have the objective to complement the white literature reviewed or the existing business management theories that are not necessarily reviewed in this study. Sporadically a reference is made to draft academic paper and not to its published version. Information in such paper was found to be relevant to the topic at hand despite that it can be questioned if such information is part of the body of knowledge. The grey literature in this study broadly includes:

- Reports
- Theses and dissertations
- Conference proceedings and presentations
- Technical documentation
- Datasets from reputable public institutions, i.e. WB, EU, etc.
- Preprints
- Web content
- Government documents

The taken emergent Case Study approach (Saunders, M., et al., 2019, p. 196) whereby codes emerge naturally from the literature, resulted in a broad variety of terms as Social-technical systems and change, Social Business Model Innovation, Energy Poverty, Financial Inclusion, Energy Justice, and Climate-Gender Justice, to name a few. It was not evident to remain within the search topic due to the many sub-definitions within Innovation and Energy Inclusion and cross references with other related topics. This underscores the complexity inherent in topics related to Energy Transition (ET), Social Innovation (SI),

and Energy Inclusion (EI). While code clustering provided useful insights regarding the locations of studies, particularly in distinguishing between developed and underdeveloped regions, the aggregation of coding terms proved too intricate and did not yield meaningful contributions to the core objectives of the research. With pursuing an emergent Case Study approach during the second principal literature review (chapter II), the search topics where scoped to Energy Inclusion, Social Innovation and related Business Management topics. The goal was to understand and become familiar with these core research topics and then assess how they interconnect to address the research questions. Full text screening resulted in summarising concepts and text related to a topic within the study and cross linking with other topics as found of interest. No protocol for this was considered by forehand, as an Emerging Case Study Research was applied. A concept matrix giving an overview of topics and the research questions themes was maintained. The tables in Appendix A illustrate this developed thematic matrix framework that helped to track overlaps and ensured an integration of insights during the review across the research topics of SI, EI. Data extracted from public databases, i.e. values for indicators, is done via the database search tools and the data introduced in Excel sheets. Here certain values are combined as part of the research into appropriate EI benchmarking indicators. The indicators are represented in tables with references in the thesis document. This process of extraction and combining is reproducible.

3.4.5 Hypothesises; Energy Inclusion Framework & Social Innovation

Based on the Energy Inclusion (EI) literature review, two hypotheses concerning the measurement of EI are defined. Both are grounded in the nine principal EI definitions identified in the literature. **H1)** The first hypothesis posits that these benchmarked definitions are to be embedded within the governmental Energy Transition (ET) policy and monitoring framework, thereby subject to centralised control and communication by public

authorities. This configuration is likely to result in a top-down governance model, wherein EI is steered through extended regulatory and policy instruments. **H2)** The second hypothesis decouples EI measurement from the governmental ET framework and advocates instead a complementary Two-Factor Multi-Continuum EI Sliding Scale. This alternative approach affords greater autonomy to project developers, enabling the implementation of context-specific EI initiatives at the local level. The research objective is twofold. First, to conduct more detailed research across both scholarly literature and databases maintained by reputable, accessible institutions in order to develop a multi-scaled definition of Energy Inclusion (EI) and quantify its constituent components. Second, to formulate a recommendation regarding the integration, or deliberate separation, of the indicator methodology within the governmental Energy Transition (ET) policy framework. **H3)** The third hypothesis posits that Social Innovation (SI) contributes to the advancement of Energy Inclusion (EI) by embedding SI within Corporate Social Responsibility (CSR) initiatives at the local project level. This integration facilitates the emergence of socially innovative ecosystems that promote the socioeconomic development of targeted communities. **H4)** The fourth hypothesis proposes the separation of SI processes from the implementation of the EI framework, allowing SI initiatives to proceed in parallel of EI initiatives led by project developers. To obtain further theoretical replication (Yin, 2018, as cited in Saunders, M., et al., 2019, p. 198), the findings from the desktop basic research were sounded through an online anonymous questionnaire among my general ET (project) network. This questionnaire is included in Appendix B and consists, next to general demographic classification questions, a query to sound the individual themes of the Energy Inclusion framework, and four SI value driver questions. It concludes with three opinion questions on the likelihood of SI being successful in a collaborative Public-Private setting. The five SI topic questions can be summarised in three themes and cross-referenced against

the three SI stakeholders to determine a level of alignment of the individual and the collective responses (table 3.3).

Table 3.3

Cross referencing key themes among SI stakeholders

Themes	Private firm	Government	Community
Taking the lead	Move beyond CSR Financial vs. Social returns		
Collaboration	Community involvement & Mutual trust	Community participation in policy making & processes	Use of knowledge & Resources. Resilience.
Results-driven approach	Organisational Social purpose	Cross sector cooperation	Grassroot innovations

The survey aimed to gauge the level of agreement, comprehension and consistency around the topics in my broader public and private network, primarily engaged in operational and project-based work across ports, shipping, logistics, industry and research, where energy transition plays a pivotal role. Few people in my network are involved in SI and those who are predominantly relate to non-profit organisations. They tend to appreciate the value of private-public-community collaboration far more, where people in private sector are likely to focus more on economics. Yet it's within that private segment where people need to take the initial lead to get beyond CSR and get SI and EI initiatives starting.

3.5 Population and Sample

The online survey questionnaire was communicated via my professional Linked-In network which has a global reach. The questionnaire could be filled in anonymously and was online for a period 3 months between June and August 2025. My network includes 3,573 direct connections, 3,915 followers, and active participation in 87 professional groups spanning a wide spectrum of stakeholders, ranging from private companies in the port and energy transition sectors to universities, government bodies and consultancy firms. Three repeated requests in the 3 month period resulted in 16 persons responding.

Table 3.4 shows the geographic and demographic data of the respondents.

Table 3.4

Geographic and demographic data of the survey respondents

Country	Total respondents	Sector			Function			Gender		Age	
		Private	Government	Knowledge	Mngmt	Line staff	Research	Male	Female	25-50	50+
Australia	2	2			2			2		2	
Brazil	6	4	2		4			6		3	3
Namibia	1		1		1			1		1	
Netherlands	4	2	1	1	3		1	3	1	4	
Nigeria	1		1			1		1		1	
South Africa	2	2			1	1		2			2
Average	**16**	**10**	**5**	**1**	**11**	**2**	**1**	**15**	**1**	**11**	**5**

3.5.1 Data Analyses

The first observation is that the majority of responses come from the private sector, followed by the governmental sector. No responses came from the non-profit sector and the respondents are all, except one, male. Predominant age is between 20 and 50 years. Although the survey drew a small number of respondents, it still provides a reasonable cross-section of industry, management function and age, offering valuable insight into how these groups view the topic. It does, however, omit perspectives from women and the non-profit sector. While the African continent is on the overall number of respondents well represented, the countries in the survey have distinct socioeconomic conditions. Likewise, both Brazil and Australia, despite being single nations, encompass a wide spectrum of socioeconomic contexts within their borders. The questionnaire's first part probes the perceived importance of the 9 different levels of the Energy Inclusion Two-Factor multi-continuum Sliding Scale. Figure 3.2 illustrates which of the survey questions related to EI does refer to a particular EI level. Analyses of the level of importance of the 14 questions per country as shown in figure 3.3 shows several discrepancies. The Republic of South Africa (RSA) a country with severe energy shortages, scores relatively low for Distributive Justice and Energy Burden (Q.13 & 14), implying that energy availability is more important than affordable energy prices (Energy Burden).

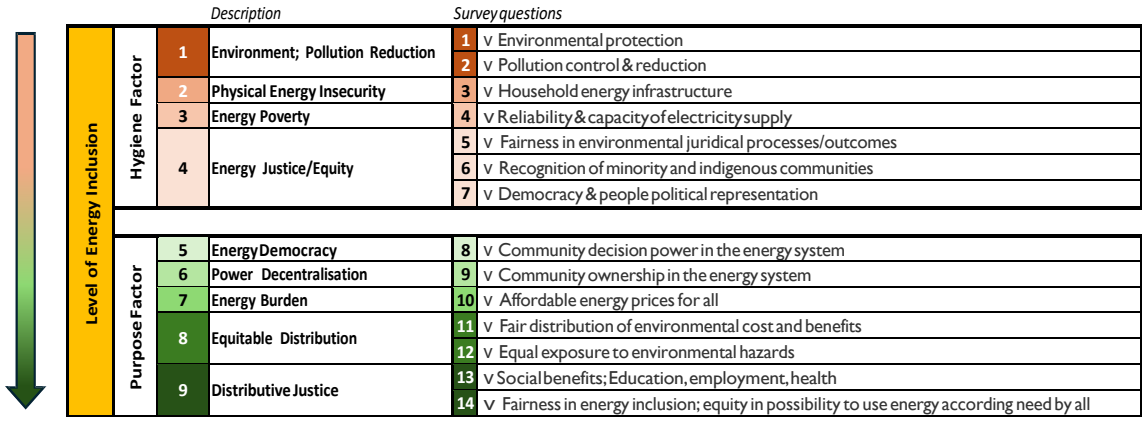


Figure 3.2: *Energy Inclusion levels linked to the survey questions.*

Then again RSA scores geographically the highest for Equitable Distribution, which may be related to the pollution levels of the large use of coal for energy. Given the responses from the two South African participants, it appears that the terminology and definitions may not have been fully understood. This aligns with feedback from discussions within my network, where the term EI is often described as difficult to grasp, or simply just interpreted as access to energy. As reflected in the literature, interpretations of the complex EI concepts tend to vary significantly from person to person. In general the importance of all questions by scoring of 4 and higher, within all regions, are seen as important, with the exception of Power Decentralisation by a Dutch responder. Possibly a similar argument of misunderstanding, as the Netherlands have worldwide the highest number of solar panels per capita, of which 33% are privately owned by households. The Energy Inclusion Framework has two tiers, Hygiene Factors and Purpose Factors. This assumes EI levels of the basic requirements of environment and pollution protection and energy infrastructure are most important, building up towards ultimately the benefiting socioeconomic benefits for all. Several EI levels cannot be achieved without earlier levels being achieved, like having energy infrastructure in order. The respondents scored the importance of the questions without having seen the framework.

This possibly explains the result of a divergent order of importance. However as previously stated, the EI framework will be a multi-continuum sliding scale with EI advances at different levels. The figures in Appendix C present the overall results of the 14 questions, scores on stakeholders SI value drivers and the importance of reporting social & energy aspect. Where relevant, the survey results will be analysed in relation to the corresponding thematic context within the research. One sampling constraint of the conducted survey is the limited number of participants. However, the use of an open and anonymous online format helps mitigate the risk of overrepresentation of specific viewpoints. Despite the modest response rate, the survey serves as a supplementary instrument rather than the primary method of inquiry and it provides a generalised perspective on the concepts explored, offering a degree of external validation within the broader research framework.

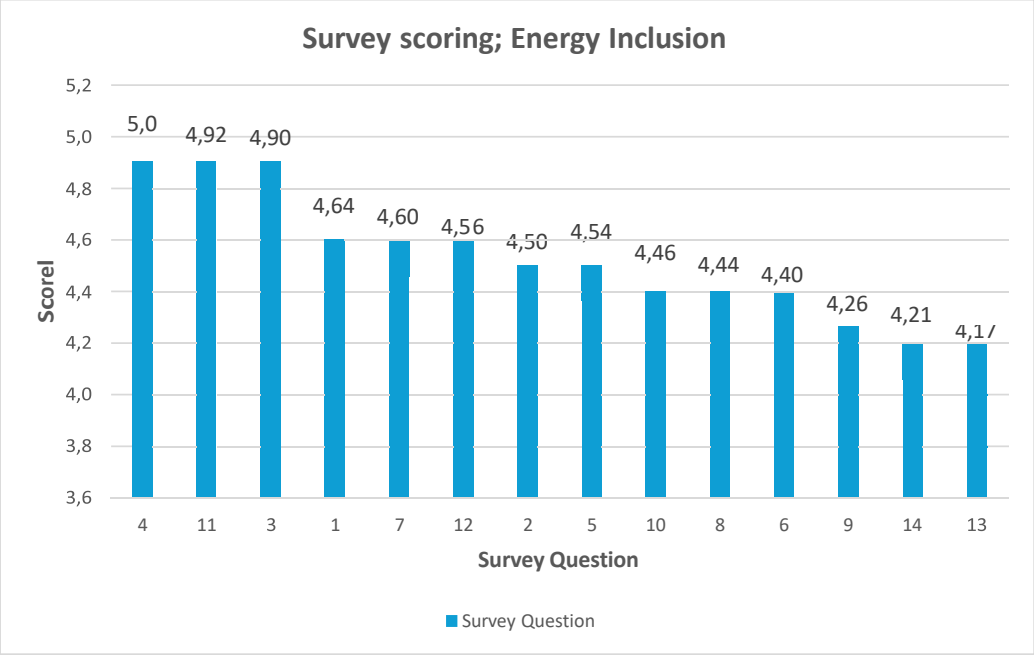


Figure 3.3: *Ranking of Survey scores of Energy Inclusion related questions.*

3.6 Subjectivity and Researcher Bias

My philosophical position, i.e. perspective, background and assumptions may influence the interpretation of findings. My beliefs can be categorised in the philosophical position of Critical Realism for the domain of Ontology (Saunders, M., et al., 2019, pg. 144). In a consumption-driven economy, the majority of business managers predominantly strive for profit maximisation and shareholder value creation. While companies acknowledge the importance of CSR and its contributions to the society, they often do so within a profit maximisation framework. Despite regional and industry variations, firms need to be encouraged to embrace CSR through policies governmental policies. My philosophical position within the Epistemology domain is Positivism, which will influence my analyses. My research conclusions demonstrate the business "logic" of adopting SI initiatives to promote EI. Successful application of the findings in a real project will depend on the philosophical positions of the stakeholders. Generalisability may present a limitation in this research, given the aim to replicate findings across regions with differing contextual factors. However, the study also demands substantial depth and thoughtful integration of multiple themes. Theme reflexivity and cross references between differentiated theories and conclusions is important. Through rigorous exploration of both core and related topics, and careful cross-referencing throughout the analysis, I believe the generalisability limitation is effectively mitigated.

CHAPTER IV

RESULTS

4.1 Introduction

This chapter's research follows a predetermined sequence of topics designed to progressively address the three central research questions. This structure as is illustrated in table 4.1, provides clarity in the integration of the multiple disciplinary theories, assisting in the discussion, summary, and implications presented in Chapters V and VI.

Table 4.1

Sequence of research topics for Chapter IV.

Chapter III	**Starting point**	Preliminary literature review	
		Survey	Evaluate the understanding of EI
Chapter IV	**Energy Inclusion**	Reality context	Socio-economic
			Social Economy
		LEIM	Integrating EI concepts in the model
			Explaining the significance & need of level selection
			Search & Select appropriate data sets
			Design performance indicator
			Calculate the performance indicator
			Construct the Leim/EI level for case study countries, regions and the world.
	Social Innovation	Geographic analyses	National system context; evaluate
			National Ethics & Values; geographic evaluation
		Management process	Social demand, needs & value; definitions and opportunities
			Process Design; Theoretical approaches, selecting the approach
			Social resources; definition & contribution
			Outcome & Social value creation
			SI business model & Financing
Chapter V & VI	**Discussion**		
	Summary, implications, and recommendations		

4.1.1 Global reality

Energy Inclusion (ET) focuses on ensuring access to energy, for both communities in deprived, emerging and developed economies without considering the negative

environmental effects of industrial development. This research emphasises the crucial role of SI in achieving EI within ETDPs. These projects involve diverse stakeholders with varying motivations, and their benefits include economic development through industrialisation, innovation, employment and financial viability. The ET unfolds in a dynamic landscape influenced by the different types of innovation and the key objective of this research is to be able to apply the methodology framework to other ETDPs across global regions and socioeconomic contexts. The LeiM must be examined concurrently with a contextual, regional, socioeconomic analysis containing factors critical for SI.

4.1.2 Global benchmarking

In today's era of Global Energy Transition, marked by the geographical shift of renewable energy supply chains and an enhanced focus on sustainability and environmental protection, it is essential to understand the complexity of global benchmarking in the ET domain, and especially the objectives, its boundaries and limitations. Broome, A. and Quirk, J. (2015), observe that key indicators require to both ‘neutralise’ and ‘universalise’ a range of overlapping normative values within the economic, political, social and market domains. The aggregated benchmark indicators, through the translation of data into numeric representations, form a common foundation of normative values to set political and business agendas. As my methodology for establishing comparative performance metrics for a LeiM is novel, it inherently sets an international normative standard for EI. Benchmarking serves as an umbrella term encompassing a wide range of comparative evaluation techniques, including audits, rankings, indicators, indexes, baselines and targets, that systematically assess the performance of actors, populations, or institutions using standardised measurements, metrics and rankings. It involves three forms of comparative assessments, the quality of conduct, the quality of design and the quality of outcomes (Broome, A. and Quirk, J., 2015). In International Relations, the quality of

conduct expresses how nations, or actors, take their responsibility in relation to the benchmark standards. This indicates that next to designing a comparative performance metric, a definition of a preferred performance needs to be set. With regards to the Levelized Energy Inclusion Model (LeiM), a "standard" is set by comparing the designed national indicators with the average of those indicators at a national level, i.e. Latin America, Southeast Asia, Europe and the world. Broome, A. and Quirk, J. (2015), describe benchmarking as a form of indirect governance that shapes standards and institutional obligations. Within the LeiM framework, the quality of policy and institutional design, set by public actors, combined with private-sector expertise and community-led SI, determines achievement of individual indicators, making the delivery and alignment thereof a shared responsibility. This is supported by Koremenos, B., et al. (2013), who observe that rationalist theories can generally be grouped around the core idea that both state and non-state actors share a mutual interest in coordinating and codifying their activities across different areas of global governance. Alexander L. et al. (2005, as cited in Broome and Quirk, 2015, p. 833), distinguish four types of global benchmarking practice e.g. statecraft, international governance, private market governance and transnational advocacy. Here benchmarking practices are categorised by the class of actor subsequently, states, international organisations, profit-driven private institutions and non-profit private institutions. Statecraft benchmarking is where national government agencies, such as ministries of finance and foreign affairs, create benchmarks to project national values and extend state influence internationally. International governance benchmarking, by contrast, is a form of international governance, typically carried out by international or regional organisations like the World Bank, IMF, or EU and is managed by international agencies rather than national policymakers. States may still use these benchmarks to advance their interests. Private market governance benchmarking is led by profit-driven institutions and

includes long-standing practices such as sovereign credit ratings and corporate self-benchmarking within global production networks. Finally, transnational advocacy benchmarking is primarily undertaken by civil society organisations, non-profit think tanks, and academic institutions, sometimes in collaboration with for-profit entities. The LeiM is a global benchmarking model, with a realisation of the standards laying both at a national and localised level. Governments through policies, laws and regulations have an important contribution to achieving EI levels, while private sector organisations and communities play a crucial role at ETDP level. The LeiM is therefore both a benchmarking tool for external transnational actors and an internal project benchmarking tool. To bring the project part of the benchmarking up to national level and compare the LeiM transnational, aggregation of the different national projects is needed. The motivation for private investors, governments and civil society organisations to accept the LeiM as a global best practises benchmark and EI methodology, depends firstly on the dissemination of the findings of my research and subsequent the successes when applied.

4.1.3 Neutrality and objectivity

Quantification requires reliable, comprehensive data, which are often scarce, so I avoided extrapolation when designing LeiM metrics; instead I used available data to justify the theoretical relevance of selected metrics while keeping the metrics themselves unchanged because they originate from reputable sources. Definition of the socio-economic reality and the LeiM are based on verifiable public parameters and are both comparable and replicable in time. The data is obtained from a limited number of reputable institutes among others the World Bank (https://www.worldbank.org), Our-World-in-Data (https://ourworldindata.org), a collaboration from the University of Oxford and the non-profit organisation Global Change Data Lab, and the Organisation for Economic Co-operation and Development (OECD).

4.2 Defining of reality

This research emphasises the crucial role of SI in achieving EI within ETDPs. These projects engage diverse stakeholders and primarily deliver economic benefits, industrialisation, innovation, jobs and financial viability, so their success in an innovation-driven ET depends on being assessed within a social and economic context. Data must come from reliable sources, be updated ideally annually and cover a broad set of countries to support aggregated regional indicators. The key indicators presented in Appendix D offer a concise overview of the main social and economic parameters within the study's contextual scope. Country data is presented at the national level, while the data for the selected benchmark regions is the average derived from the national-level datasets of the countries in that region. Much more data can contribute to a socioeconomic analysis, but here I connect selected indicators to get an understanding of the key under laying factors related to the main research topics of Energy Inclusion (EI) and Social Innovation (SI). In this context the quantitative data is interpreted for a qualitative EI/SI analyses with Brazil as the research case study country. In Brazil the ratio rural/urban population is 0.14. In the LATAM region and the World the population ratio urban/rural is higher, i.e. 0,23 and 0,76. From table D3 we learn that for Brazil an access to electricity exists of 100% in urban areas and 97.3% in rural areas. In the LATAM region a similar pattern is seen where the access to electricity for urban and rural areas is subsequently 99,6% and 96,8. These parameters give an understanding on the level of EI that can be expected. To improve the community's socioeconomic development through SI, Social Entrepreneurship is a means. A flourishing service industry, which is the evolutionary step up from an industrial economy to continue economic growth, facilitates Social Entrepreneurship (SE) initiatives. With Brazil having an Industry value added (GDP) / Services value added (GDP) factor of 0.39, its service industry is less contributing to national GDP than the region (0,49) and the world (0,44).

Brazil has a well-established and expanding service sector that offers fertile ground for social entrepreneurship. High mobile phone subscription rates relative to fixed broadband and landline connections, indicate widespread mobile internet use and smartphone-based services, presenting clear opportunities for SI initiatives. Where GDP (Gross Domestic Product) measures all economic activity within a country's borders, GNI includes earnings from abroad. The nominal difference between GNI and GDP is essentially the net primary income from abroad. This is captured in what I called the Level of Internationalisation, which in turn is compared to the Foreign Direct Investment (FID). For Brazil the net internationalisation, outflow of earnings, is 2.35 times the value of FDI or 9.87% of GNI. This is not exceptional within the region, but in large contrast with Europe, which has an inflow of funds four times higher than the nominal FDI value (Appendix D). For Brazil it indicates a large foreign ownership of domestic businesses, or a substantial debt servicing to foreign lenders. Together with a relative high FID, 30% of the LATAM region, ETDP investors may find a favourable investment climate, with nonetheless a high risk premium of 26%. A large labour force, 50.6 % of the population and a relative low unemployment figure (9.28%), has advantages of stable consumer demand and strengthens public finances. A large workforce has a broader expertise in different areas and facilitates innovation. A high rate of self-employment, 32% of the total people employed in Brazil, often reflects strong entrepreneurial energy of individuals actively creating businesses and driving innovation across sectors. This contributes to a more flexible labour market, as self-employed workers can adapt quickly to changing economic conditions. However, self-employed individuals may face income volatility, which complicates financial planning, limits access to credit and many will operate without the safety net of traditional employment benefits leaving them more vulnerable during economic downturns. From the 32% self-employed people, 27.7% are vulnerable employed, which consists of self-

employed, own-account workers with no employees and of people who work in a family business without formal pay or contracts. The rural-to-urban electricity access ratio in Brazil is 0.97, with urban access at 100%, while the rural-to-urban ratio for access to clean cooking fuels is 0.84, with 98% of urban residents having access. Clean fuels are also part of the Energy Inclusion two-factor framework, as discussed later. The GDP value added for industry, versus de total energy consumption is an indication how much value is added to the economy with 1 MWh of energy consumed. This can be a comparing indicator of the type of industrialisation and for Brazil this is with 119.351 US$/MWh below the LATAM region. In West and Central Africa, the value added per unit of energy is $216,607/MWh and in Namibia $154,652/MWh. These regions derive much of their GDP from energy-intensive oil, gas and the mining of high-value minerals (gold, diamonds, bauxite, uranium and other critical materials), whereas Brazil's lower value added per energy unit likely reflects its large service sector, which accounts for about 59% of GDP. This service sector consists mainly of finance and banking, retail and wholesale trade, telecommunications, education, healthcare, hospitality and tourism (www.worldbank.org). Brazil's agriculture sector contributes a modest share of GDP (6%), yet it remains important for employment and trade and is supported by a large service industry. The country's robust services and available communications and healthcare technologies create a favourable environment for SI and SE. Namibia's services sector also contributes about 55% of GDP, indicating a shift from a resource-dependent economy towards a diversified economic activity and a potentially favourable environment for social entrepreneurship similar to Brazil. However, Brazil represents a substantially larger market, with an annual GDP of $210.3 billion versus Namibia's $2.9 billion and West and Central Africa $62.4 billion. With higher GDP per capita, e.g. larger available service market, Brazil is a more

attractive market for SI and SE initiatives. Overall, a large service industry in a country is expected to have an appropriate environment for the emergence of a SI and SE.

4.2.1 The Social Economy

A Social Economy is characterised by distributed networks, blurred boundaries between production and consumption and a shift toward collaboration, care and sustained interaction rather than transactional exchange (Murray, R., et al., 2010). It is driven by values, missions and ethical considerations and serves as a key source of SI. This Social Economy depicted by the shaded area in figure 4.1, is inherently hybrid, intersecting with four sub-economies, i.e. the market, the state, the grant economy and the household. The grant economy refers to the ecosystem of civil society organisations, foundations, charities, and philanthropic institutions that provide non-market, non-state funding, typically in the form of grants, to support social initiatives. The market economy functions through commercial exchange and profit-driven activity, often involving social enterprises that blend financial sustainability with social goals. The state economy delivers public services and infrastructure through taxation and public governance, shaping the conditions for innovation. The household economy encompasses informal care, volunteerism and domestic contributions, which are essential yet often undervalued sources of social support and innovation. While each sector operates with distinct logics, resource flows, and governance structures, the Social Economy draws from all four, unified by its commitment to social goals and reciprocity. It encompasses a wide range of activities, from domestic care to national welfare services and includes social enterprises, charities and even private firms with socially oriented missions. Organisations in the Social Economy frequently cross sectoral boundaries and despite their primary affiliations, these entities operate across sectors, reflecting the fluid and integrative nature of the Social Economy. Importantly, no single sub-economy is exclusively dedicated to social outcomes. The social economy

emerges from overlapping areas within each. Taking CSR further and embed SI to foster socioeconomic development, fits within Murray's, R., et al. theory. The idea of collaboration between values and ethical driven parties existing, a general method from a business perspective is not encountered in the literature search.

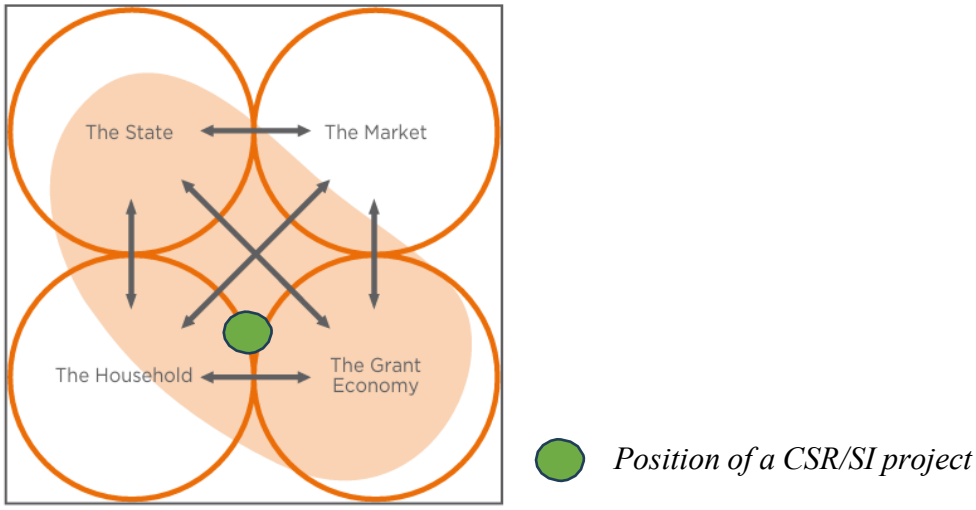


Figure 4.1: *The Social Economy and its interfaces (Murray, R., et al. (2010).*

The position of a stakeholder-collaborative CSR/SI entity within the Social Economy depends on the influence of the stakeholders, which is determined by the resources each brings in. Stakeholder analyses and subsequent management is of importance in the SI processes. SI is examined in chapter IV and stakeholder analyses in chapter V. In a system composed of four sub-economies there are six key interfaces where these sectors interact and exchange resources, ideas and influence. Three of these interfaces involve the state. Financial flows are central here, money moves inward through taxation and fees and outward via grants, procurement and investment. Beyond finance, the state also shapes innovation through regulation, legal frameworks and infrastructure. These mechanisms not only support SI in other sectors but are themselves subject to innovation. The fourth interface connects the private market and the grant economy. This includes corporate

sponsorships, charitable donations, mentoring and CSR initiatives. Increasingly, private companies and NGOs collaborate to create new models of service delivery (Murray, R., et al., 2010). The final two interfaces involve the household economy's relationship with the market, the grant economy and the state. The household–market interface is the traditional space of consumption and labour, but also includes informal economies like gift-giving and social networks. Households also engage with the market through activism and partnerships that push for systemic change, such as environmental movements influencing corporate behaviour. The private actors in the market economy are traditionally seen as the principal engine of innovation. State and grant-funded sectors are often criticised for weak incentives to innovation to eliminate inefficiency. The household economy contributes abundant ideas and distributed creativity but generally lacks the resources and organisational capacity to scale innovations independently. Between households and the grant economy, there is a two-way flow, individuals donate time and money, while receiving services in return. The household–state interface is increasingly shaped by innovations like personal budgets, allowing individuals to co-create support services that blend informal care with formal provision, defined as the "support economy" concept (Murray, R., et al., 2010). As elaborated in chapter IV, next to financial resources, four social resources can be defined, all being exchanged in the Social Economy. Figure 4.2 analyses the type of resources being exchanged in the interfaces, showing that overall the most number of resources are being received by the Grant Economy and given by the Household economies. It also reveals that the exchange of financial recourses is most often received by the Grant Economy, supplied by the Household Economy. This is just a relative perspective as it is difficult to quantify the social resources exchange against financial resources, of which the latter are generally found to be the most important in SI. However, as we will understand later, without the four social resources, SI and EI cannot be obtained

and subsequently need to be quantified and ranked of equal importance in implementation programs. This relativity analyses do suggest a position of a CSR/SI project inside a Social Economy towards the lower-middle part of figure 4.1, between the Household and Grant Economy, indicated by the green spot. This underscores the need for an emphasis on institutional support and financial incentives from government, alongside the private investment and input of knowledge and expertise from the ETDP developer, dedicated to their regional ETDP. This according practical requirements and equitably balanced between the stakeholders.

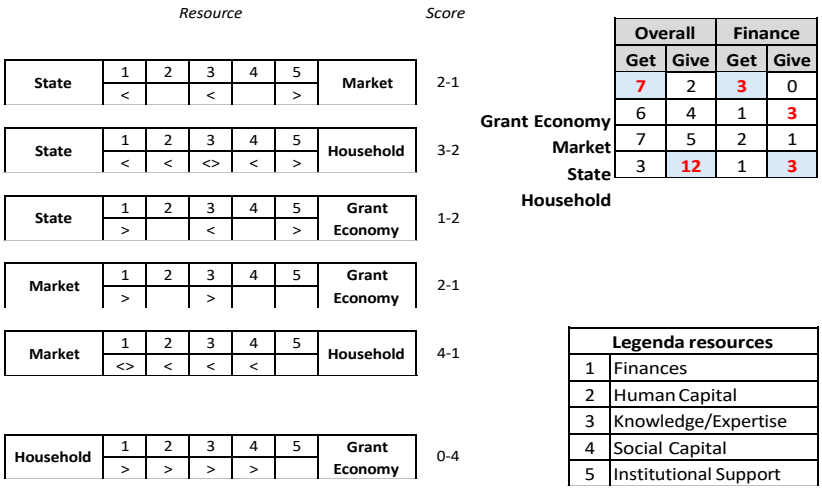


Figure 4.2: *Resource type exchange analyses within the Social Economy (Author, 2025).*

4.3 Energy Inclusion

Here is addressed on how to conceptualise and measure Energy Inclusion (EI) through a benchmarking model that is globally applicable across diverse regional contexts. For each LeiM level, its definition and rationale for inclusion are first discussed. Subsequently, the selected indicator data sources are detailed, followed by a presentation of the scoring methodology in a table. EI is not easily captured in a single phrase, rather, it is a dynamic concept shaped by numerous factors. The two-factored Levelized Energy Inclusion Model (LeiM) of figure 2.5, consisting of hygiene factors representing the essential baseline required to achieve any meaningful form of EI and of Purpose Factors

that drive the ambition to maximise the level of Energy Inclusion is explained in detail. This approach allows for better comparison across different socioeconomic regions, highlighting in detail where improvements are needed within the levels and which areas should be prioritised to achieve the desired impact objectives. The LeiM is designed to enable comparative Energy Inclusion analysis through structured country benchmarking using five reference regions, i.e. the European Union, Latin America and the Caribbean, West and Central Africa, East Asia and the Pacific (excluding high-income countries) and the World. The indicators of the LeiM are aimed to be SMART with the following characteristics:

- **Specific**; Clearly define what is being measured and ensure the indicator directly relates to the goal. Depending on the availability of reliable public data, indicators have a specific direct relation to EI, where others have a higher level and an indirect effect on EI. A mix of both are included in a LeiM level.
- **Measurable**; Be quantifiable and assessable through reliable data. Opted is to obtain publicly available data from reputable organisations like the World Bank, OurWorldInData.org and Governmental websites.
- **Achievable**; Be realistic and within the scope of what can be influenced or improved. The difficulty is the achievability of performance indicators with a higher level scope, which are not easily or timely changed.
- **Relevant**; Must align with broader EI objectives and have meaningful implications.
- **Time-bound**; Assessed within a specific timeframe to be able to track progress effectively. World Bank and OurWorldInData.org data are publicised annually, though often with a delay, but serve well for a comparative analysis. Additional project indicators are to be developed.

4.3.1 LeiM 1; Environment; Pollution Reduction

The primary driver of the global energy transition is the environmental impact of fossil fuels, which cause pollution, harm public health, threaten biodiversity and contribute to adverse climate changes such as floods and droughts. EI must go beyond simply providing access to energy, it should focus on ensuring access to renewable energy that foster socioeconomic development for all sectors of society, including individuals and businesses. To ensure that communities have sustainable access to renewable energy without long-term negative impacts, government policies and regulations are essential to protect both the environment and public health from harmful environmental effects. The first level of the LeiM observes the status of environmental policies. When in place we may assume that ET takes place without harming the society in the long run. Environmental policies are necessary because decision-making often ignores environmental values due to externalities and the historical under-pricing of natural resources. Polluting industries typically do not bear the full costs of their actions because harms are displaced in space or time. Treating natural resources as communal assets means that unregulated, short-term exploitation by profit-driven actors leads to depletion and long-term societal harm. LeiM level 8 addresses the equitable distribution dimension of these environmental challenges.

Background and Approach

Policies and regulations need to promote an integrated approach to prevent, reduce and control pollution at the source and facilitate the exchange of best practises. A robust environmental monitoring and reporting system is essential to credibly evaluate the environmental impacts of policies and regulations, while policies must be implemented with care to avoid harming the environment, local communities, or the economy. Aligned with the SMART approach, the Environment: Pollution Reduction indicator comprises five primary assessment criteria outlined below and discussed in detail.

1. The scope of the existing policies.
2. Monitoring (implementation) of policies.
3. Enforcement of policies.
4. Reporting requirements, data availability
5. The existence, type and number of policies.

A verification if the government is committed to protecting the environment and reduce the harmful effects on the society is both the existence of policies on itself and the number of policies at national/federal, state/provincial and local level. The OECD database for Policy Instruments for the Environment (PINE) (OECD, 2024) is a public information source that contains among other data the number of different environmental related policy instruments of 146 countries. Table 4.1 shows the total number of policy instruments in a region and the number of policies in areas of principal importance to environmental protection, i.e. air, water, soil, waste, ozone, noise. A further policy verification is on chemical management and circular economy. The last, together with policies on renewable energy, is related to adoption of industrial practises. Also looked at is the number of policies related to "universal" mitigation of environmental damage and at the number of adaptive policies. Adaptive policies are policies that are flexible, responsive and adaptable to changing environmental conditions, scientific advancements and societal needs. Notably there are few adaptive environmental policies, but in the context of the rapidly evolving, technology-driven energy transition, adopting policies could enhance their effectiveness and impact. Here the objective of the applied scoring becomes clear, improvement and stimulation towards three or more adaptive policies is achievable. The impact on such improvement on the overall score is limited. The weighing of the LeiM indicators is not considered to avoid complexity of deciding on the importance of indicators and requires

detailed assessment in relation to an objective. Assigning different weights to indicators could also lead to varying impacts across countries and regions.

The scope of the existing policies.

Environmental protection encompasses various factors that collectively influence the health and sustainability of the environment and a broad variety of environmental parameters have emerged from Carbon emission reduction to mortality rates. Ten environmental policies can be directly linked to energy consumption, i.e. industrialisation, transport, urbanisation and need to be addressed to reduce negative health impacts on the society. Included in table 4.2 are policies on renewable energy, chemical management and the circular economy. Air, (surface)water and soil quality are impacted by hazardous chemicals entering the environment and have a significant impact on the human health. In underdeveloped regions unsafe drinking water and sanitation and health impacts associated with particulates when cooking inside, are of great importance. Air quality is of importance in industrialised countries as it impacts on the health of people living in cities and close to industry. Elevated ozone and other air pollutants harm respiratory health and contribute to smog formed by vehicle and industrial emissions. Indoor air pollution from primitive cooking and heating in underdeveloped areas adds significant health burdens. Noise pollution from industry and transport has also become a standard environmental policy concern over the past two decades, especially in industrialised regions. Waste management relates to harmful health impacts on waste disposal, which aligns with a circular economy were waste is reused to reduce the need of raw materials from its original source. Throughout the LeiM, a scoring system ranging from 0 (worst) to 100 (best) is consistently applied.

Table 4.2

Policy existence and scoring methodology.

	2023 indicators		Score			
Environment; Pollution Reduction - Policies	**EU**	**World**	**EU**		**World**	
Total number of policy instruments	47.2	21.8	100		50	
Total number of policy instruments; **air polution**	12.5	6.7	100		50	
Total number of policy instruments; **water pollution**	5.2	2.4	100		50	
Total number of policy instruments; **soil pollution**	2.3	1.0	50		25	
Total number of policy instruments; **solid waste**	10.9	4.4	100		25	
Total number of policy instruments; **ozone**	2.4	1.0	50		25	
Total number of policy instruments; **noise**	5.3	2.3	100	**86.5**	50	**38.5**
Total number of policy instruments; **fresh water**	3.9	1.5	100		25	
Total number of policy instruments; **renewable energy**	3.7	1.8	100		25	
Total number of policy instruments; **chemical management**	7.0	2.7	100		50	
Total number of policy instruments; **circular economy**	10.9	5.6	100		50	
Total number of policy instruments relating to mitigation	22.9	11.5	100		50	
Total number of policy instruments relating to adaption	1.6	0.8	25		25	

References:

- OECD (2024), Policy Instruments for the Environment (PINE) Database, http://oe.cd/pine, July 2024 version.

Range	<15	15-30	30 >	<5	5-10	10 >
Score	25	50	100	25	50	100
Range	<10	10 - 15	15 >	<2	2 - 5	5 >
Score	25	50	100	25	50	100
Range	<2	2 - 3	3 >	***Score when no***		
Score	25	50	100	***policy exists:***		0

Monitoring (implementation) of policies.

Air quality & Ozone

Air quality is monitored by governmental agencies, research institutions and private organisations. Governmental agencies do so for management and control of air quality in general like in urban areas, industrial zones, ports and airports, highways and traffic zones. Governments may also monitor in rural & remote areas with objective to establish baseline air quality and track transboundary pollution. Examples are monitoring areas in the Swiss Alps or the Himalayas to study global pollution transport and in the Amazon rainforest to assess the impact of deforestation. Information gathered from air quality monitoring programs helps shape policies and regulations aimed at reducing emissions and improving air quality. Key air pollutants measured are particulate matter (PM), nitrogen dioxide (NO2), sulphur dioxide (SO2), ground level ozone (O3), carbon monoxide (CO)and volatile organic compounds (VOCs) (RSB Environmental, 2025). The monitoring of private organisations is often part of their license to operate. Industries do measure air

quality to be able to adjust technical processes assuring they remain within the air quality specifications as stipulated by government. Record keeping and periodical reporting of measurements to government agencies are mandatory in many countries. Industries may need to measure next to the key air pollutants, specific harmful pollutants inherent to their industrial processes. Air quality can be monitored through fixed ground-based monitoring stations that continuously measure air quality and data is collected and analysed in real-time. Monitoring stations are typically integrated into larger air quality networks, consisting of multiple interconnected stations spread across a city, region, or country. These networks collect data that offer a comprehensive view of air pollution patterns, sources and long-term trends. Despite the many monitoring stations, not all areas can be covered and satellite-based monitoring cover the globe (ESA, 2025). The report "Open Air Quality Data: The Global Landscape" provides the only global assessment of how national governments monitor and share air quality data. Carried out by OpenAQ (openaq.org), a non-profit organisation managing the world's largest open-access air quality database, the analysis evaluates whether governments have air quality monitoring programs and the extent to which they provide public access to the data (Marciel C. et al., 2024).

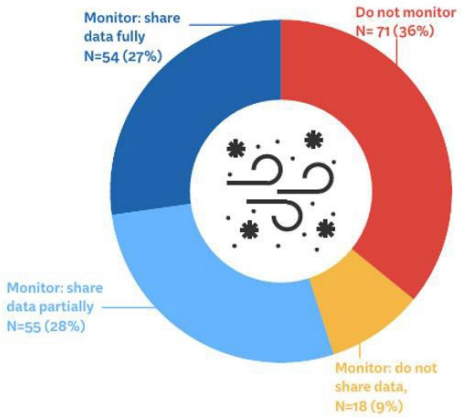


Figure. 4.3: *Percentage of countries that monitor air quality and their data sharing status. Total N=198 (Marciel C. et al., 2024).*

Findings reveal that only a small number of countries provide fully transparent air quality data, while many restrict access or fail to monitor air pollution at the national level. Notably, some of the most populated and polluted nations lack any formal air quality monitoring systems. The report underscores the urgent need for greater data transparency to support public health, environmental policy and global air quality management. Open data enhance government accountability and responsiveness while helping to correct public misconceptions and build support for evidence-based policy interventions. If high-precision data from reference-grade air quality monitors remain private while less-accurate air sensor data are made public, the public may misinterpret the severity of air pollution. Additionally, open data promote knowledge sharing among government agencies involved in air pollution management, leading to improved governance and more efficient service delivery. The report finds that all countries that monitor and share air quality data meet at least one of the four key criterion for fully open data, e.g. Physical Data Units, Station-Specific Coordinates, "timely fine scale" and Programmatic Access. Countries that share data but do not meet the criterion "timely fine scale, may lack real-time monitoring capabilities, implement processes that delay data release, or choose to report less frequently. In the context of the LeiM, the criterion "Physical Data Units" and Programmatic Access are key to policy effectiveness. Physical measurements are essential for accurately analysing air pollution and developing effective mitigation strategies. Programmatic Access relates to the sharing of data in a compatible standardised data format to enable analyses and statistical impact assessments. The 2024 Environmental Performance Index (EPI) ranks 180 countries on sustainability based on 58 indicators across 11 categories, assessing climate change, environmental health and ecosystem vitality (EPI, 2025). It measures how close nations are to environmental policy targets and serves as a tool for identifying issues, setting goals, tracking progress and refining policies.

By analysing data at a detailed level, by category, policy objective and peer group, it provides valuable insights for policymakers seeking to enhance environmental performance (Block, S. et al., 2024). The health domain has a total weight of 25%, the other two domains Ecosystem Vitality and Climate Change, respectively 45% and 30% within the total Environmental Performance Index. Several of the indicators, i.e. air quality, waste and water, will be used as indicator within the LeiM. The EPI Air Quality category measures the direct health impacts of air pollution on a 1 to 100 scale with 100 as best. It can be correlated with the policy status reported by OpenAQ and used to track policy effectiveness over time. Responses to the questions in table 4.3, drawn from the OpenAQ Air Quality database, are recorded as yes or no and scored as 100% or 0% respectively. Regional and global are averages of the percentage of the related countries.

Table 4.3

Air Quality monitoring and data sharing scoring methodology.

	2024 indicators		Score			
Environment; Pollution Reduction - Air Quality	**EU**	**World**	**EU**		**World**	
Is there an government operated AQ monitoring system?	100%	64%	100		64	
Is AQ information publicly accessible?	100%	55%	100		55	
Is Physical AQ Data shared?	100%	46%	100		46	
Are monitoring station specific coordinates given?	100%	46%	100	93.9	46	47.7
Is AQ data timely shared (Timely fine scale)?	100%	53%	100		53	
Is data programmatic accessible?	100%	28%	100		28	
EPI Air Quality score	57.3	42.3	57.3		42.3	

Range	No	% yes in	Yes
Score	0	region	100

References:

- EPI, Environmental Performance Index (2025), https://epi.yale.edu/measure/2024/WRS.
- CCAC, Climate Clean Air Coalition (2025), https://www.ccacoalition.org.
- The Global Landscape" Climate Clean Air Coalition, https://www.ccacoalition.org. (Marciel C. et al., 2024)

Water quality; Ambient water

Water pollution globally threatens public health, food security and biodiversity and addressing inadequate water quality is crucial for protecting ecosystems. Water plays a crucial role in advancing government priorities, including public health, food and energy security, economic development, climate action, environmental protection and disaster risk reduction (Water Policy Group, 2023). Contaminated drinking water poses serious global

health risks linked to pathogens and toxic compounds (Fuller et al., 2022 as cited in UN-Water, 2024). Pollutants often travel beyond their source via the food chain and global trade, contaminating crops and food products, for example, cadmium in cocoa beans, thereby threatening food safety (Gall, S., et al., 2015; Maddela et al., 2020 as cited in UN-Water, 2024). Water pollution severely degrades biodiversity and ecosystem function, chemicals, heavy metals and plastics produce toxic conditions and nutrient overloads create oxygen-depleted dead zones (Diaz, R. & Rosenberg, R., 2008; Dudgeon, D., et al., 2006). Freshwater ecosystems are especially vulnerable, with freshwater biodiversity declining about twice as fast as terrestrial biodiversity, imperilling one-third of all vertebrate species that depend on these habitats (Tickner et al., 2020).

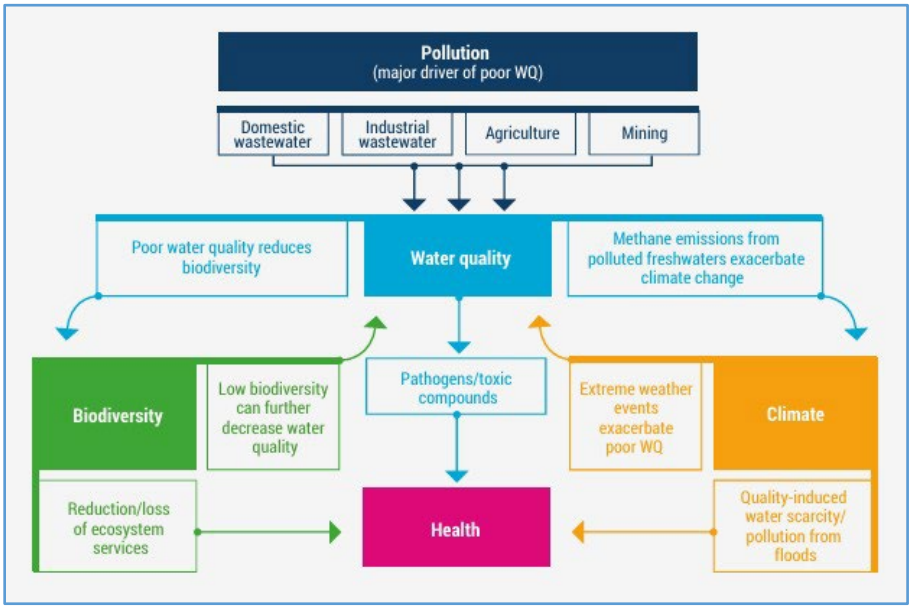


Figure 4.4*: Schematic of water quality linkages to the triple planetary crisis and health (UN-Water, 2024).*

The relationship between climate change and water quality is bidirectional, while floods and droughts alter water conditions, polluted water bodies contribute to climate change by releasing methane, a potent greenhouse gas (Rosentreter et al., 2021, as cited in UN-Water, 2024 pg. 8). This creates a feedback loop, where worsening water quality

further accelerates climate change impacts (Lenton et al., 2023, as cited in UN-Water, 2024 pg. 8). The Global Environment Monitoring System/Water (GEMS/Water), part of the (UNEP), supports Member States in collecting, analysing and sharing of water quality date to inform policy and decision-making for sustainable water management. Currently, the expanding database includes approximately 30 million records on rivers, lakes, reservoirs, wetlands and groundwater systems from 91 countries and over 20,000 monitoring stations parameters (Gemstat, 2025). For this study we use the aggregated "all water bodies" indicator, which covers water quality in lakes, rivers and groundwater. In table 4.4 this appears as Ambient Water Quality expressed as the percentage of targets achieved. Data are missing for several countries, likely because remoteness or geographic conditions limit monitoring and reporting, reducing coverage and may bias comparisons.

Water Quality; drinking water

In addition to the quality of ambient water, the safety of drinking water is crucial for public health, as the former directly impacts the latter. UN-Water has a monitoring program and monitors the UN indicator 6.1.1 which represents the proportion of the population using an improved drinking water source that is located on the premises, available when needed and free from faecal and priority chemical contamination. Improved sources include piped water, boreholes or tube wells, protected dug wells, protected springs, rainwater and packaged or delivered water. If an improved source does not meet these criteria but has a collection time of no more than a 30-minute round trip, it is classified as a "basic" service. Household surveys and censuses from the National Statistical Office are the primary sources of information on the types of facilities used by the population, supplemented by data on service levels from administrative sources and regulators (UN-Water, 2025). In the UN-SGD indicator 6.3.1 measures the proportion of wastewater from households, services and industrial activities that is safely treated before being discharged

into the environment. A good indicator to include, be it that the database has no data after 2020 and only of limited countries, illustrating the difficulty in obtaining reliable data.

Table 4.4

Water Quality monitoring and data sharing scoring methodology.

	2024 indicators		Score			
Environment; Pollution Reduction - Water Quality	**EU**	**World**	**EU**		**World**	
Ambient Water Quality	56.7%	56.0%	56.7		56.0	
Proportion of population using safely managed drinking water services						
Safely managed services	96.9%	72.9%	96.9		72.9	
Basic services	2.4%	18.3%	97.6	86.0	81.7	68.6
Proportion of population using safely managed sanitation services						
Safely managed services	86.4%	56.6%	86.4		56.6	
Basic services	7.4%	24.2%	92.6		75.8	

References:

- UN-Water (2025a), https://sdg6data.org/, visited March 2025.
- Gemstat (2025)

Score | 100 minus % indicator

Soil pollution

Soil pollution refers to the presence of chemicals or substances in the soil that are either out of place or present at higher-than-normal concentrations, adversely affecting non-target organisms. (Rodríguez-Eugenio, N. et al., 2018, pg. VIII). The main anthropogenic sources of soil pollution include chemicals from industrial activities, domestic, livestock and municipal wastes, agrochemicals and petroleum-derived products. These pollutants can be released accidentally, such as through oil spills or landfill leaching, or intentionally, like with fertilizers and pesticides. Emerging concerns include pharmaceuticals, endocrine disruptors, hormones, toxins and biological pollutants like bacteria and viruses (Rodríguez-Eugenio, N. et al., 2018). The FAO elucidates in a global assessment report that soil pollution poses a significant threat to public health due to its diverse impacts. Pollutants from the soil can also leach into groundwater and surface water, contaminating drinking water supplies and aquatic ecosystems. Overall, tackling soil pollution is crucial for protecting public health, ensuring food safety, maintaining clean water sources, preserving ecosystems and supporting socio-economic stability (FAO &

UNEP, 2021). Heavy metals like arsenic, cadmium, chromium, lead and mercury are highly toxic to nearly every organ system in the human body (Tchounwou et al., 2012, cited in Block, S. et al., 2024, pg. 77). Lead exposure is widespread globally, especially in low-and middle-income countries (Ericson et al., 2021, cited in Block, S. et al., 2024 pg. 77). Due to the long-lasting health and cognitive effects, even countries that have successfully reduced lead exposure through policies still face the consequences of exposure from decades ago (Block, S. et al., 2024). Due to limited availability of data on heavy metals in the environment the indicator for Lead (Pb), as published by the Environmental Performance Index (EPI, 2025) is used in the LeiM indicator and shown in table 4.5. This EPI indicator focuses on the public health impacts of lead exposure as a representative measure of heavy metal pollution. The maximum and best score is 100.

Solid Waste

The world generates 2.1 billion tonnes of municipal solid waste annually, projected to rise to 3.8 billion tonnes by 2050. A significant portion of this waste is improperly disposed of, leading to the spread of diseases and high management costs. Mismanaged waste contributes to environmental issues, including methane emissions from landfills and air pollution from open burning. Plastic waste, making up 12% of the total, severely impacts ecosystems, with millions of tonnes leaking into the environment each year (Block, S. et al., 2024). To achieve true sustainability, the world must enhance waste management practices and reduce waste generation. The EPI, based on two existing indicators, introduced a new indicator measuring a country's average solid waste generation per capita. The first EPI metric, Controlled Municipal Solid Waste, measures the share of waste safely managed via recycling, composting, digestion, incineration, or sanitary landfills. The second, Recovery of Energy and Materials from Waste, tracks the proportion treated

to both mitigate environmental risks and recover resources, supporting a circular economy (Block, S. et al., 2024). These three form the EPI Waste Management indicator in table 4.5.

Table 4.5

Soil pollution and Solid waste monitoring and data sharing scoring methodology.

	2024 indicators		Score			
Environment; Pollution Reduction - Soil & Waste	**EU**	**World**	**EU**		**World**	
Soil polution				67.6		43.9
Heavy Metals (Lead)	80.4%	53.0%	80.4		53.0	
Solid waste						
Waste Management	54.8%	34.8%	54.8		34.8	

References:

- EPI, Environmental Performance Index (2025), https://epi.yale.edu/measure/2024.

Noise pollution

The effects of environmental noise, both physiological and psychophysiological, are impacting a growing number of individuals, especially those living in urban areas, near industrial zones, ports and airports, highways and traffic zones. Noise pollution refers to the presence of unwanted or harmful noise that disrupts the natural balance of the environment and poses risks to human health or impact on ecosystems and the environment. This type of pollution is often overlooked and can be reduced with technical measures such as acoustic insulation, quieter technologies and urban noise regulations. Urban planning and public awareness further reduce noise by using buffer zones, redesigning infrastructure and promoting noise-aware behaviours. Practical measures include low-noise asphalt, quiet tyres on public transport, expanded electric vehicle infrastructure, promotion of walking and cycling and car-free zones (EEA, 2021). Underwater radiated noise has received less attention historically but is now an increasing international and European focus, reflected in the IMO's Revised Guidelines for reducing URN from shipping (IMO, 2023 as cited in EMSA, 2025). Due to the dispersed nature of land and underwater noise sources and the complexity of URN measurement (WHO, 2022), a LeiM indicator is not feasible. Cross-country variation in industrialisation,

economic conditions and maritime activity further hinders benchmarking, violating LeiM's SMART criteria. An indicator is absent and only an indicator for noise pollution policy instruments is included in table 4.2.

Enforcement of policies and regulations.

Environmental compliance plays a vital role in safeguarding ecosystems, public health and economies worldwide. By implementing stringent regulatory frameworks, continuous monitoring and robust enforcement, nations effectively control pollution, conserve natural resources and mitigate greenhouse gas emissions (GHG). Policies and regulations drawn up by governments on their own do not automatically result in compliance and an enforcement mechanism is needed. Enforcement of policies is firstly to embed them in (national) laws and have them supported by detailed regulations that specify the various standards, limits and procedures. A country's environmental agency develops and update these regulations, monitor compliance and investigate violations. Part of preventing the risk of and pollution itself is to have a permitting and licensing procedure for activities with an environmental impact. Gunningham, N. (2011) identifies seven complementary enforcement and compliance strategies used in environmental governance. The Advice and Persuasion approach prioritises cooperation, negotiation and education to prevent harm, relying on voluntary compliance and using legal sanctions only rarely. Rules and Deterrence depends on formal rules, detection and sanctions to deter violations, assuming firms respond to the threat of punishment. Deterrence tends to influence rational actors who weigh risks and rewards, but is less effective with those who are not able to make that assessment (Kagan, R. and Scholz, J., 1984 & Braithwaite, J. and Makkai, T., 1991 as cited in Gunningham, N. 2011, pg. 186). Gunningham, N. (2011) states that Responsive Regulation aims to address the shortcomings of both Rules and Deterrence and Advice and Persuasion by combining their strengths and offsetting their weaknesses. Its

key advantage lies in its flexibility, allowing it to respond to a wide range of organisational motivations, from proactive leaders who exceed regulatory requirements to reluctant or incompetent laggards struggling to meet basic legal standards. The Criteria Strategy gives inspectors a flexible set of factors to evaluate cases and select context-appropriate enforcement responses rather than prescribing a single action. Responsive Regulation applies a graduated model that begins with persuasion and escalates to stronger measures when compliance is not achieved. Smart Regulation promotes the coordinated use of multiple regulatory actors and instruments, including market mechanisms and civil society, to improve efficiency and legitimacy. Risk-Based Regulation directs resources and enforcement effort toward activities that pose the greatest environmental risk and potential impact. Meta-regulation shifts compliance responsibility to regulated entities, mandating internal risk-management systems subject to regulatory audit and intervention upon failure. In practice, Smart Regulation and Meta-Regulation are observed less often, while Advice and Persuasion, Rules and Deterrence, the Criteria Strategy, Risk-Based Regulation and Responsive Regulation are commonly found in legislation and regulatory practice.

Rule of law and corruption

Considering the various enforcement models, in particular the two "repressive" enforcement models, a correct functioning non-corrupt juridical system is essential to assure compliance to environmental laws and regulations. The IAIA (2023), confirms that it is imperative to establish national legislation, policy and procedures to inform institutional interactions and engage all levels of government and institutions with influence, responsibility and authority to promote environmental compliance. Responsibilities and clear definitions of laws, framework legislation, the constitution, or other legal vehicles are to avoid duplication or confusion as to what needs to be complied with. Key to fairness and the rule of law in nations are transparency, judicial independence

and the fight against corruption. Justice is a cornerstone of any society committed to fairness, the rule of law and the protection of human rights, including environmental protection. However, the operation of judicial systems differs widely across countries. One of the most well-known reports in this field is the Global Rule of Law Index, published by the non-governmental organisation World Justice Project (WJP, 2025). It evaluates 142 countries and territories across eight criteria: constraints on government powers, absence of corruption, transparency, fundamental rights, public order and security, law enforcement and the effectiveness of civil and criminal justice. An important LeiM indicator included in table 4.14.

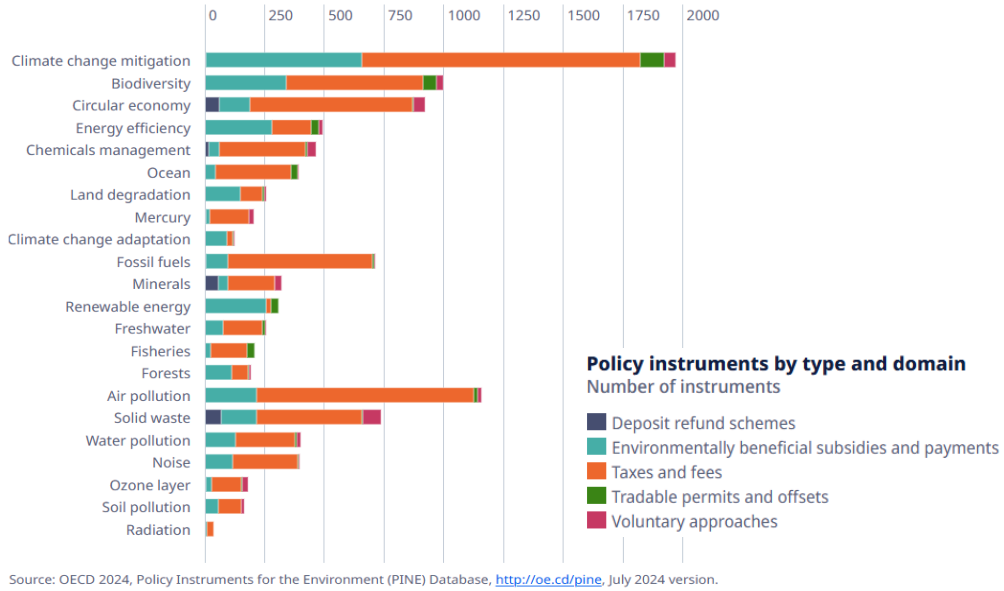


***Figure 4.5**: Policy instruments by type and domain; Nr. of instruments (OECD, 2024).*

Economic policy instruments

Enforcement of environmental regulation can be achieved by economic instruments like taxes, subsidies and incentives to shape the behaviour of companies and industries. Imposing taxes on sources of environmental pollution is an efficient and effective method to address climate change, biodiversity loss and pollution, while it can aid in revenue generation and redistribution (OECD, 2025) to areas in society that are disproportionately

affected by pollution. Environmentally related taxes and fees raise the cost of polluting products or activities, thereby discouraging their consumption and production and is most commonly used in regulating environmental policies. Figure 4.5 illustrates the total number of various policy instruments across different environmental domains for the 146 countries included in the PINE Database (OECD, 2024). The primary policy instruments are taxes and fees, targeted subsidies, tradable permits or offsets and voluntary measures. The remaining five instruments from Gunningham's (2011) study are reflected in the legislative frameworks analysed in table 4.6 and serve as LeiM indicators in table 4.7. Their benchmarking is supported by the periodically updated PINE database. Ultimately, the most effective policy mix aligns with the principles of Responsive Regulation. This allows for flexibility and escalation based on the behaviour and risk profile of regulated entities. Such approach begins with voluntary measures and beneficial subsidies to encourage cooperation and innovation, among motivated organisations. When needed, it escalates to more coercive tools such as taxes and fees to address non-compliance or higher-risk actors.

Table 4.6

Policy instruments applicable to the different environmental compliance strategies.

	Rules & Deterrence	Advice & Persuasion	Criteria Strategy	Risk-Based Regulation	Responsive Regulation
Taxes and fees	☑	✗	⚠	☑	☑
Beneficial subsidies	✗	☑	⚠	☑	☑
Tradable permits/offsets	☑	✗/⚠	⚠	☑	☑
Voluntary approaches	✗	☑	⚠	⚠	☑

By integrating all four instruments in a tiered manner, regulators can balance encouragement with enforcement, making the strategy both adaptable and effective across different contexts. The scoring methodology in table 4.9 allows a higher total score with a small increase of the number of policy instruments for the Voluntary and Tradable permits and offsets approaches, to encourage a more effective Responsive Regulation approach.

Table 4.7

Enforcement instruments monitoring and data sharing scoring methodology.

	2024 indicators		Score			
Environment; Pollution Reduction - Enforcement instruments	**EU**	**World**	**EU**		**World**	
WJP Rule of Law Index	0.73	0.55	73.00		55.00	
Taxes and fees	31.7	16.9	100.0		50.0	
Environmentally beneficial subsidies and payments	18.9	7.8	100.0	84.6	25.0	36.0
Tradable permits and offsets	2.5	1.3	50.0		25.0	
Voluntary approaches	6.3	0.9	100.0		25.0	

References:

- OECD (2024), Policy Instruments for the Environment (PINE) Database, http://oe.cd/pine, July 2024 version.

Range	<10	10-25	25>	<2	2 - 3	3 >
Score	25	50	100	25	50	100
Range	<10	10 - 15	15 >	<2	2 - 5	5 >
Score	25	50	100	25	50	100

Reporting requirements, data availability.

Open data increases government accountability, improves responsiveness, corrects public misconceptions, supports evidence-based policy and underpins Responsive Regulation in environmental enforcement. The reporting of polluting data is covered in table 4.5 to 4.6, respectively covering pollution factors on air, water and waste. The chosen indicators are mainly driven by government policy, but private firms can contribute to LeiM level 1 scoring through their corporate environmental policies (table 4.8). Many such measures are legally required, yet companies can strengthen their score by reporting voluntary, supplementary actions, at the business level. Not all parameters in table 4.8 may be relevant for an ETDP and the average score contributes to the overall LeiM.

Table 4.8

Environment; Pollution Reduction - ETDP contribution Measurements.

Environment; Pollution Reduction - ETDP contribution	**Region / EDTP**
Air/Water/Co2 management/reduction policy in place.	
Co2 firm footprint monitoring & reduction plan, Co2 reduction plan during construction.	
Monitoring of polluting factors; own or third party - water, air, soil.	
Waste Management policy in place.	
Waste management plan & reduction/circular initiatives, aggregate with waste of community.	
ESG reporting (voluntary)	

	Yes	**No**
Score	100	0

4.3.2 LeiM level 2: Physical Energy Insecurity

Hernández D. (2016), defined Energy Insecurity as a multi-dimensional construct consisting of Economic Energy Insecurity, Physical Energy Insecurity and Behavioural Energy Insecurity. Economic Energy Insecurity is related to a disproportionate financial

burden of energy costs and is incorporated in level 7 of the LeiM, Energy Burden. Behavioural Energy Insecurity according to Hernández is related to the strategies people use to counteract the impacts of Economic and Physical Energy Insecurity and has a detrimental impact on people's health. Physical Energy Insecurity has a technical, an availability and a utilisation component. The latter are covered in LeiM level 3, Energy Poverty. The technical component refers to the deficiencies in the physical infrastructure of the home environment impacting thermal comfort, inducing harmful exposures and increased energy costs (Hernández D, 2016) and is captured in this LeiM level 2.

Housing infrastructure

The availability of reliable infrastructure in rural areas varies by country and region, with developed nations generally providing better rural services than developing ones. Urban homes, especially in densely populated cities, are often designed as multi-story buildings or apartments to maximise space efficiency. In contrast, rural traditional housing often incorporates locally available materials such as wood, mud bricks, bamboo, or thatch. Urban areas generally have well-developed infrastructure, including access to electricity, running water, sewage systems, internet connectivity, natural gas and centralised heating or cooling systems. Rural areas frequently lack these amenities, relying instead on alternative solutions such as wells, septic tanks, solar energy and off-grid power systems. Housing infrastructure is an important factor in energy usages as houses with poor insulation or structural issues may struggle to retain heat during winter or stay cool during summer, leading to increased energy consumption and costs. Cities are increasingly adopting sustainable practices such as green buildings and renewable energy solutions, where in rural areas, energy use is more diverse, with some households depending on firewood, biomass, or solar panels. The differences between rural and urban housing reflect broader economic and infrastructural disparities and does have an impact on physical

insecurity. In the developed region of Europe energy is not self-evidently available or affordable for everybody. Low income citizens, living predominantly in older, cheaper, housing, which are substandard isolated for cold weather make them susceptible to Physical Energy Insecurity. In the United States, disparities in race, income, wealth and housing conditions persist (EIA, 2020). Many households face economic hardship, elevated energy burdens and substandard housing that compromises thermal comfort, increases exposure to environmental risks and drives up energy costs (Hernández et al., 2023). The underprivileged communities living in rural areas of underdeveloped countries, making use of traditional biomass like wood or charcoal to heat their basic houses, have a health risk due to smoke exposure. For certain, within the broader definition of EI is affected by housing infrastructure.

Physical Energy Insecurity indicators

The in table 4.9 Physical Energy Insecurity indicators are elaborated. High domestic electricity generation means lower dependence on imports, greater energy security and moreover reflects substantial infrastructure investment. It can enable exports and earn foreign exchange when production exceeds domestic demand. The electricity generation-to-consumption ratio gauges a country's investment in power infrastructure and a surplus, especially from renewable sources, signals robust energy infrastructure development. The percentage of fixed broadband and telephone subscriptions give an indication of the physical cable connections to households for both internet communication and the needed electricity. As we will understand later in paragraph 4.3, Social Innovation, access to internet and social media aids Social Innovation. Lanckton T. et al. (2021), observe further that internet and telecommunications is important to ensure equity in the accessibility and affordability of energy as to be discussed in LeiM level 4, Energy Justice/Equity.

Table 4.9

Physical Energy Insecurity indicators scoring methodology (World Bank, 2024).

	2023 indicators		Score			
Physical Energy Insecurity indicators	**EU**	**World**	**EU**		**World**	
Fixed broadband subscriptions (per 100 people)	38.68	18.43	*100.00*		*50.00*	
Fixed telephone subscriptions (per 100 people)	35.52	11.00	*100.00*		*50.00*	
Access to electricity (% of population)	100.00	91.28	*100*		*91.28*	
Access to electricity, urban (% of urban population)	100.00	97.64	*100*		*97.64*	
Access to electricity, rural (% of rural population)	99.99	83.89	*100*	**100.00**	*83.89*	**79.57**
Electricity Generation (TWh) vs. Total Energy Consumption (TWh) - %	0.17	0.17	100		100	
Ratio GDP per Capita / rural populatio nwith access to electricity	37,947	*10,685*	100		100	
Access to clean fuels and technologies for cooking, rural (% of rural population)	100.00	54.43	*100*		*54.43*	
Access to clean fuels and technologies for cooking, urban (% of urban population)	100.00	88.90	*100*		*88.90*	

Range	<10	10 - 30	30>	<5,000	5,000 - 15,000	10,000>
Score	25	50	100	25	50	100
Range	<0,10	0,10-0,15	0,15 >			
Score	25	50	100			

The share of population with access to energy is direct related to the actual level of EI, for both electricity and fuels for cooking and heating. The division of indicators for urban and rural population with access to both energy sources is made to understand how rural access might be lagging behind. The main driver for improved infrastructure is GDP, which according to Ribeiro H. et al. (2021) agglomerates in urban areas. They state that population distribution and scaling of urban GDP are correlated to each other. Urban areas generally show higher GDP per capita than rural areas because of agglomeration effects, i.e. denser markets, better access to education and healthcare and faster diffusion of technology. They also observed that large cities concentrating complex economic activities can widen the development gap between urban and rural regions. This according to Ribeiro H. et al. (2021), help explain the positive correlation between urbanisation and per-capita income seen across countries. Assuming that higher GDP per capita corresponds with better housing and infrastructure in urban areas, lower GDP per capita paired with a larger rural population indicates poorer housing conditions in these rural areas. Although direct rural GDP per capita data are unavailable, the ratio of national GDP per capita to the share of rural population can serve as a proxy for rural income. A relatively higher ratio suggests better rural housing infrastructure, in line with Ribeiro's findings. The GDPcap/Rural ratio is incorporated into the LeiM to support the national housing infrastructure conditions. The

trend as seen in the detailed LeiM tables (Appendix J) confirms this assumption. Where an underdeveloped region of C&W Africa and Namibia score low (respectively 451 and 1,444), Brazil scores higher (9,031) and is the EU scoring very high (37,947). This implies that the African countries generally show predominantly lower quality housing infrastructure, Brazil and LATAM moderate quality housing and the EU the highest average housing infrastructure. Obviously this is rated at a national average level for benchmarking objectives and ideally this is verified through specific research in this area.

4.3.3 LeiM level 3; Energy Poverty

Energy Poverty refers to a lack of energy itself (Baker, S. et al., 2019), but next to availability it extends to issues of energy capacity, reliability and quality. The World Bank with their ESMAP program recognises the multi-facetted aspect and addresses Energy Inclusion through a Multi-Tier Framework (MTF) for measuring access to electricity (Bhatia, M. and Angelou, N., 2015, pg.20), which include these extended energy issues. They also state that EI extends further to cooking and space-heating and introduced a MTF for access to cooking solutions and space heating. Bhatia and Angelou (2015, pg.16), state that the usability of supplied energy is more important than mere the supply of energy and recognise that socioeconomic development is the main objective of both expanding the access. In the context of this research, I add the renewability, of the energy. Interventions in Energy Inclusion include not only new electricity connections or LPG bottled gas, but may extend to power generation through mini-grid systems, biogas projects, solar home systems, energy transmission, gas pipelines, etc. This variety of technical interventions create a diverse entrepreneurial ecosystem while soft aspects like policy formulation, regulatory frameworks, credit mechanisms, institutional capacity development, etc. also contributing to enhanced Energy Inclusion (Bhatia, M. and Angelou, N., 2015, pg. 2).

Multi-Tier Framework (MTF); Measuring Access to Household Electricity

The Multi-Tier Framework (MTF) aims to address the multi-facetted aspects of electricity access and measures electricity access based on seven attributes, leading up to 6 tiers, each tier indicating the minimum requirements of access. The Multi-Tier Matrix (MTM) begins with Tier 1, the lowest level of access, which provides limited electricity for a few hours per day, sufficient for basic needs like electric lighting and phone charging (Fig. 4.6). This level of access can be delivered by any technology, including small solar lighting systems. Higher tiers of access are characterized by greater capacity and longer supply durations, allowing for the use of medium- and high-load appliances, such as refrigerators, washing machines and air conditioners. While grid connections are the most common source for achieving higher tiers, diesel generators or large mini-grids can also meet these requirements. The approach stresses primarily the technical and qualitative access to electricity, like safety, affordability and supply contract formalisation.

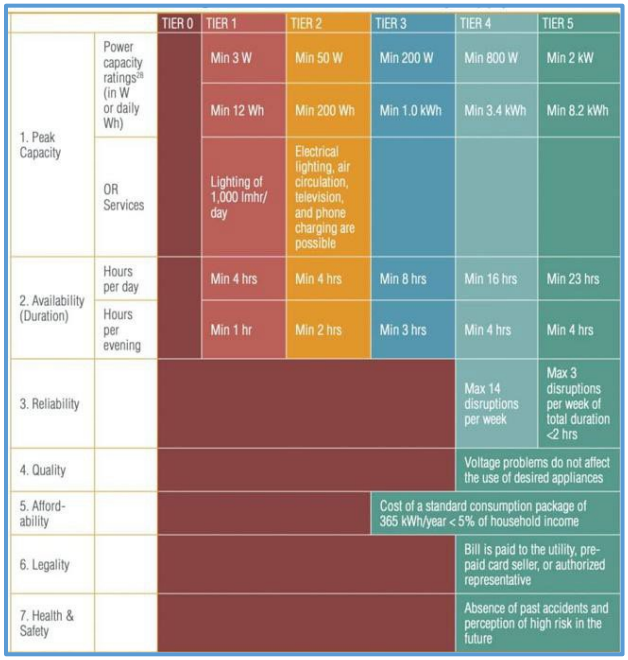


Figure. 4.6: *Multi-Tier Matrix for Measuring Access to Electricity (Bhatia, M. and Angelou, N., 2015).*

An overlap of the MTF is observed in LeiM level 2, Physical Energy Insecurity, Level 4, Energy Justice/Equity and in level 7, Energy Burden. The World Bank frame work was developed for developing countries with the objective to monitor capacity up to 2KW, while in Europe the average household connection is between 3.7 and 5 KW. Larger homes with higher energy needs (electric heating, Electric Vehicle chargers, etc.) have an 11 kW connection capacity. The socioeconomic circumstances in Europe differ from the World Bank targeted countries and were in developed countries like the EU legislation does stipulate standardised connection capacities, this might be in underdeveloped regions lacking and resulting in different actual capacity connections. The connection capacity cannot be traced from the data available and hence cannot be included in the LeiM. The availability is the duration electricity can be used and is in the MTF segmented in hours per day. In most developed countries the availability is 99% or more, where in Africa and Asia this can indeed be significantly less due to infrastructure or insufficient generation capacity (LeiM 2). Statistics on the availability or reliability of electricity are also not widely available.

Benchmarking

From the available data from different databases some global benchmarking for electricity and gas consumption data can be constructed. To address availability, reliability and quality as included in the Multi-Tier Matrix for measuring access to electricity (figure 4.8), the average quantity of electricity being used per household will be used as an indicator. Electricity use depends not only on supply but also on demand. Stern et al. (2019) note that electricity drives development, which then increases energy demand. Reliable energy supports education, healthcare and living standards, while also enabling businesses, industry growth and job creation in the energy sector. While benchmarking the average electricity consumption (KWh) by the number of households, the difficulty of obtaining

data becomes evident. Data needs to be obtained from different sources as this type of data is not encountered directly in the national data bases. Households in Latin America & the Caribbean consume about 25% of total energy, including electricity, gas and other residential sources (Statista Research Department, 2024). In Southeast Asia, this share is 20% (Statista Research Department, 2025). For calculation purposes, 25% of total electricity and gas values are attributed to household use and reflected in tables 4.12 and 4.14. West & Central Africa households count for 50% of the total energy consumption and a significant portion, 95%, comes from traditional biomass sources (AFREC, 2023). The 5% non-traditional biomass sources of the 50% of total energy consumed by households, results in 2.5% household electricity consumed. Many African countries lack up-to-date, comprehensive energy statistics, so total electricity consumption figures are uncertain and the AFREC report alone cannot reliably track household energy use over time. The 2024 Energy Inclusion value provides a useful regional snapshot for benchmarking but highlights a gap in systematic, comparable data. Future assessments should cross-reference AFREC with other reputable sources as they become available to improve accuracy and continuity. Having said this, at country level, e.g. for Brazil, Namibia and South Africa, more accurate data is available. Table 4.10 outlines the process of determining the average annual electricity consumption per household, starting from the total electricity consumption (OurWorldInData, 2024), population with access to electricity (WB, 2024), and the average household size. The LeiM regional benchmarking is based on a average yearly household consumption (KWh) with the important observation that this derived from several resources which each a level of error in accuracy and in averaging the data. This indicator is for national comparison purposes only. The share of renewable electricity is key in ET and included in LeiM level 3. Table 4.11 presents the electricity production by source and overall renewable percentage (OurWorldInData,

2024). Lanckton T. and DeVar S. (2021), finds the level of renewable energy important in environmental equity, to be discussed in LeiM level 5.

Table 4.10

Average electricity consumption (KWh) per household connection (2023).

Region	Electricity Consumption (TWh) - 2023			Population			Avrg. Nr. of people in a household	Avrg. Nr. of households with access to Elec.	Avrg. yearly elec. Consumption
	Total	Household		Total	Access to Electricity				
					%	Number			KWh
LATAM & Carribian	1,283	25%	**321**	653,104,771	99	**643,823,312**	3.1	**207,684,939**	**1,544**
W&C Africa	155	2.5%	**4**	497,387,180	56	**276,492,102**	5.4	**51,202,241**	**76**
East Asia & Pacific*	1,276	20%	**255**	731,821,393	49	**356,704,698**	4.42	**80,702,420**	**3,162**
EU	2,824	26%	**729**	447,847,220	100	**447,847,220**	3.1	**144,466,845**	**5,043**
World	29,664	29%	**8,603**	7,989,981,520	91	**7,293,083,612**	4.9	**1,488,384,411**	**5,780**

** Excluding high income* *Population figures; 2022*

References:

- World Bank (2024), Databank, https://databank.worldbank.org/, visited November 2024.
- Our World in Data (2024), Access to Energy, https://ourworldindata.org/electricity-mix
- United Nations (2022), Household Size and Composition, www.un.org
- Galan, S. (2025) Average household size worldwide, by region 2019, www.statista.com
- Jones L. (2024) Special Reports; Countries With The Largest Household Size, 2024, https://ceoworld.biz
- DFS (2025), https://popdiv.dfs.un.org/household/#/countries/, visited February 2025.
- Statista Research Department (2024) "Electricity in Latin America Statistics & Facts", www.statista.com
- AFREC (2023) "Household energy use in Africa", African Union
- Statista Research Department (2025) "Electricity prices in Asia-Pacific region", www.statista.com
- Eurostat (2024), "Energy consumption in households", https://ec.europa.eu/103urostat/statistics
- EIA (2024), www.eia.gov/international/data/world, visited February 2025.
- EMBER (2024), ember-energy.org/data/yearly-electricity-data, visited February 2025.

Table 4.11

Electricity production by source for the different benchmarking regions (2023).

Electricity production by source (TWh)											%
2023	Other	Bioenergy	Solar	Wind	Hydro	Nucluair	Oil	Gas	Coal	Total	Renewabl
World	89.81	618.74	1,629.90	2,304.44	4,211.01	2,685.74	786.55	6,622.93	10,467.93	29,417.05	**30%**
Brazil	0.00	53.72	51.72	95.74	431.28	14.51	10.68	38.16	17.07	712.88	**89%**
Namibia	0.00	0.00	0.50	0.02	0.78	0.00	0.00	0.00	0.05	1.35	**96%**
RSA	0.00	0.43	15.57	11.62	1.96	8.16	5.32	0.00	185.29	228.35	**13%**
LATAM & Carribian	4.70	77.10	102.21	155.03	788.10	35.80	132.79	427.25	89.95	1,812.93	**62%**
East Asia & Pacific*	0.00	0.00	927.75	1,045.16	1,788.22	781.05	113.66	1,501.88	8,612.44	14,770.16	**25%**
EU	6.93	165.03	210.75	419.95	276.24	609.26	105.88	534.72	488.77	2,817.53	**38%**
West & Central Africa	-	-	-	-	-	-	-	-	-	-	-

* Excluding high income *Excludes Nuclear* [1]

References:

Our World in Data (2024), Access to Energy, https://ourworldindata.org/electricity-mix

MTF for measurement of access to energy for cooking and heating

The Multi-Tier Framework (MTF) for measuring access to energy for cooking solutions, as outlined in the World Bank study (Bhatia, M. and Angelou, N., 2015), focuses on indirect energy-related attributes such as air quality, cooking efficiency, fuel usage convenience and affordability. The five tiers reflect progressive improvements in these

attributes. However, while enhanced energy inclusion is aiding these improvements, integrating this MTF for cooking into the Levelized Energy Inclusion Model (LeiM) is challenging and complex, as LeiM aims to distinguish between direct EI interventions and not measure the results achieved by it. The Multi-Tier Framework (MTF) for cooking applies to underdeveloped, frontline communities, aiming to transition them from basic energy sources like charcoal and wood to LPG bottled gas, kerosene or ethanol.

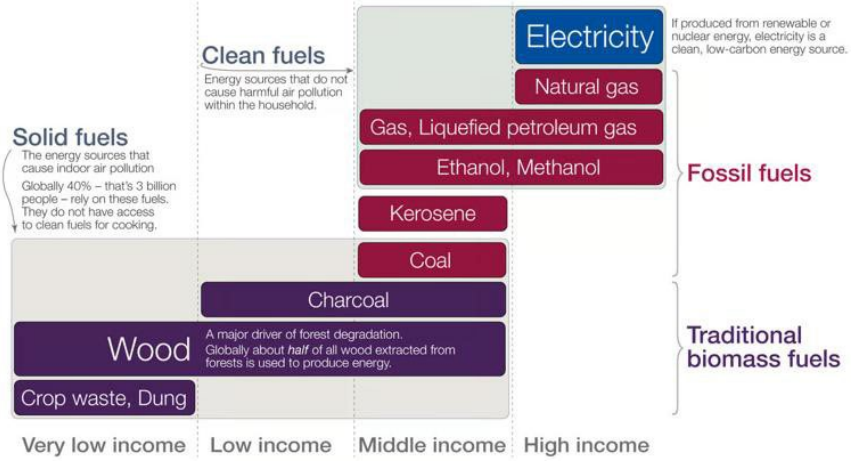


Figure. 4.7: *The energy ladder; the dominant fuel per income level (Our World in Data, 2024).*

In contrast, the Levelized Energy Inclusion Model (LeiM) focuses on capturing the utilisation of renewable energy sources and in this context, LPG, kerosene and ethanol does not qualify as renewable. To maintain consistency with the methodology applied to electricity, the renewable score in table 4.13 will remain "zero" until alternative renewable fuels are introduced. This is also applicable to developed countries, where cooking often relies on natural fossil gas supplied through a pipeline distribution network. The renewable alternative, e.g. renewable hydrogen gas or large scale biogas, is not yet widely available in households. With the ET, gas is to be replaced by renewable gasses on different scales in different regions and a gas indicator needs to be part of the LeiM. Currently ETDP investors and government in Egypt and Namibia that aim to produce green Hydrogen for

exports consider to fill up small bottles of hydrogen gas for the cooking. In developed regions, especially across Europe, natural gas continues to play a dominant role in household heating. Monitoring its usage and the gradual integration of renewable gas alternatives is therefore important.

LeiM level 3; Energy Poverty indicators-gas

The selected gas energy indicator is defined as the total annual volume of gas consumed by households, expressed in cubic meters per year (m^3/year). In regions equipped with a centralized gas pipeline network, this figure corresponds to the metered consumption delivered through the infrastructure. For underdeveloped regions, where infrastructure may be limited, the indicator refers to the total volume of liquefied petroleum gas (LPG) distributed in bottled form. To align with the electricity indicator the unit to use is TWh which makes it easier to compare data on total energy consumption including commercially-traded fuels (coal, oil, gas), nuclear and modern renewables.

Table 4.12

Average gas consumption (KWh) per household connection (2023).

Region	Total Gas Consumption - 2023				Total population	Avrg. Nr. of people in a household	Avrg. Nr. of households	Avrg, yearly gas consumption
	EJ	TWh	Household use					KWh
LATAM & Carribian	5.82	1,616.68	25.0%	404.17	653,104,771	3.1	**210,678,958**	1,918
W&C Africa	1.31	363.89	2.5%	9.10	497,387,180	5.4	**92,108,737**	99
East Asia & Pacific*	6.23	1,730.57	20.0%	346.11	731,821,393	4.42	**165,570,451**	2,090
EU	16.68	4,633.37	25.8%	1,195.41	447,847,220	3.1	**144,466,845**	8,275
World	144.35	40,097.54	29.0%	11,628.29	7,989,981,520	4.9	**1,630,608,473**	7,131

** Excluding high income* *Population figures; 2022*

References:

- Energy Institute (2024), Statistical Review of World, Home | Statistical Review of World Energy
- See table 3.

Table 4.12 shows the average natural gas consumption per household for the benchmarked global regions. Caution is needed with the reported natural gas consumption (Energy Institute, 2024) and the subsequent 50% energy allocation to households in West and Central Africa (AFREC, 2023) considering the limited (gas) infrastructure in this underdeveloped region. Likely this general aggregated figure does not represent a country

situation accurately. The developments in the gas energy market increases the complexity of capturing the role it represents in the Energy Inclusion (EI). Introduction of bio- and renewable gasses, possibly being mixed with fossil based natural gas and subsequent utilised for diversified applications, e.g. cooking, heating, or electricity generation requires to be captured in the indicator. Statistics on renewable gas consumption or not yet broadly available. Both the electricity and gas consumption are introduced in the LeiM level 3, Energy Poverty and illustrated in table 4.13.

Table 4.13

Energy Poverty indicators scoring methodology.

	2023 indicators		Score			
Energy Poverty	**EU**	**World**	**EU**		**World**	
Average yearly elec. consumption per household connection (KW)	5,043	5,780	100		100	
Percentage of renewable electricity for households	38%	30%	50	**68.75**	25	**62.50**
Average yearly gas consumption per household	8,275	7,131	100		100	
Percentage of renewable gas consumed	-	-	25		25	

Range	<2000	000-350	3500 >	<3000	3000-5000	5000 >
Score	25	50	100	25	50	100
Range	<30%	30%-50%	50% >			
Score	25	50	100			

4.3.4 LeiM Level 4; Energy Justice/Equity

Growing evidence shows that, depending on their social and economic conditions, some communities and groups are more likely to experience greater exposure to environmental hazards, shoulder an unfair share of the costs of environmental policies, or encounter greater obstacles to participating in environmental decision-making (OECD, 2024a). Baker, S. et al. (2019) defines Energy Justice as achieving equity in both social and economic participation in the energy system, “while remediating social, economic and health burdens on marginalised communities”. It focuses on ensuring that no group of people is unfairly disadvantaged by energy production, distribution, or consumption and that everyone can participate in shaping energy policies and systems. The latter, participation, is related to Energy Democracy and addressed in LeiM level 5. Baker, S. et al. (2019) also noted that Energy Justice is closely linked to Environmental and Climate

Justice. Lanckton T. and DeVar S. (2021), observe that a substantial body of literature underscores the importance of equity in sustainability initiatives and energy policy. Walker G. (2012, as cited in OECD, 2024a, pg. 18) observed that no universal definition, nor an indicator to measure environmental justice exists. Schlosberg, D. (2004, cited in OECD, 2024a, pg. 18) observed recurrent elements that can be considered as key conceptual pillars of Environmental Justice, being Distributive Justice, Procedural Justice and Recognitional Justice.

Procedural Justice

Procedural justice is about the fairness in both processes and the outcomes. It recognises the importance to understand how decisions are made, who are involved and influence environmental decisions. It is both the means to correct for inequitable distribution as well as an end to achieve environmental justice (Bell and Carrick, 2017, as cited in OECD, 2024a, pg. 18). The procedural justice is embedded in a governmental justice system and their accountability. Procedural and recognition justice are founded on a nations legal system and the rule of law and an indicator for the rule of law was included in table 4.9, WJP Rule of Law Index (WJP, 2025). The Corruption Perception Index (CPI) which ranks 180 countries worldwide and scores their perceived levels of public sector corruption on a scale of 0 to 100 aggregates data from various sources that provide perceptions by business people and country experts of the level of corruption in the public sector. Transparency International (2025), states that corruption deepens the climate crisis by diverting funds for emissions reduction and protection of vulnerable communities and by enabling undue influence that blocks effective climate policies and causes environmental harm. Another four indicators to relatively measure procedural justice in governances in a country comes from the Worldwide Governance Indicators (WGI), project from the World Bank Group (WGI, 2024 update). The WGI compile and synthesise

data from over 30 existing sources that capture the perspectives and experiences of citizens, entrepreneurs and experts across the public, private and NGO sectors worldwide, regarding the quality of various aspects of governance. The first indicator is Government Effectiveness and captures perceptions of public service quality, civil service independence, policy formulation and implementation and government credibility. The second indicator is Regulatory Quality which captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The third, Political Stability and Absence of Violence/Terrorism, measures perceptions of the likelihood of political instability, politically motivated violence or terrorism. Political stability is a foundational element for effective governance, economic growth and sustainable development. Countries with stable political environments are more conducive to consistent policy implementation and provide better public services.

Recognitional Justice

Recognitional justice is about acknowledging and respecting the distinctive needs, experiences and rights of vulnerable groups in society. A lack of appreciation arises from not accepting varying environmental and cultural identities and heritages, often related to racialized minorities and indigenous peoples (Schlosberg, D., 2004, cited in OECD, 2024a, pg. 19). Those are the groups that are often impacted unequally concerning equal rights and opportunities and the benefits and burdens in the Energy Transition. Acknowledging and respecting the diverse values and experiences of communities is thus considered a foundational requirement for achieving both distributional and procedural justice. The WGI Voice and accountability (VEA) indicator demonstrates the level of acknowledgment and the respect of distinctive needs, experiences and rights of vulnerable groups in society. It captures perceptions of the extent to which a country's citizens are able to participate in

selecting their government, as well as freedom of expression, freedom of association and free media. Another issue that exhibits recognitional justice is the level of gender equality which refers to a condition in which individual's rights, responsibilities and opportunities are not determined or constrained by their gender. The pursuit of gender equality does not imply uniformity in the distribution of resources or outcomes, but rather the equitable treatment of all individuals, ensuring that access to opportunities and the exercise of rights are not influenced by gender identity (United Way NCA, 2024). The Equal Measures 2030 a "coalition of national, regional and global leaders from feminist networks, civil society and international development, united in achieving gender equality through data-driven advocacy" (Equal Measures 2030, 2024)) developed the 2024 SDG Gender Index measuring the progress on gender equality in 139 countries (covering 96 per cent of the world's women and girls) scoring each country from zero to 100 on 56 gender equality issues aligned with 14 of the 17 United Nations (UN) Social Development Goals (SDG). Therefore the Equal Measures 2030 SDG Gender Index goes beyond the UN SDG 5 indicator "Achieve gender equality and empower all women and girls" and the indicators either specifically reference gender equality or relate to issues that have a disproportionate effect on women and girls, such as access to clean water and sanitation or climate change vulnerability (Equal Measures 2030, 2024). The Index supports collective action and systemic change and is audited by the European Commission's Competence Centre on Composite Indicators and Scoreboards (COIN) (Casabianca, E. et al., 2024). Vulnerable employment is informal or precarious work, such as self-employment without employees or unpaid family labour, that lacks labour protections, social security and formal recognition, leaving workers economically insecure. Vulnerable employment is often socially undervalued and is often performed by women, Indigenous peoples and marginalised communities and overlooked in policy frameworks. Using World Bank data

(Appendix D), we calculate the share of women and men in vulnerable employment as a percentage of the total employed labour force. Contrary to much of the literature, male and female rates are similar overall, except in Namibia and East Asia & Pacific where female shares are higher. Energy Justice to achieve equity in both social and economic participation, the male/female vulnerable-employment score aims a gender balance (male and female parity = 1). Table 4.14 lists the selected indicators.

Table 4.14

Procedural and Recognitional Justice indicators scoring methodology.

	2024 indicators		Score			
Proceduraljustice	**EU**	**World**	**EU**		**World**	
Corruption Perception Index; Transparency Inter	64	*43*	64.0	91.0	43.0	48.3
Government Effectiveness	0.95	-0.04	100		50	
Regulatory Quality	1.08	-0.03	100		50	
Political stability & Absence of Violence	0.63	-0.07	100		50	
Recognitional justice	**EU**	**World**	**EU**		**World**	
Voice & Accountability	1.12	-0.03	100	77.0	50	55.4
2024 SDG Gender Index	81.1	66.1	81.1		66.1	
Vulnerable employment, female vs. male (on total	0.60	0.67	50		50	

References:

- WJP World Justice Project (2025), https://worldjusticeproject.org.
- Transparency International (2025), https://www.transparency.org.
- Worldwide Governance Indicators (2024 Update), World Bank, www.govindicators.org.

(-2.5 weak; 2.5 strong)		
<-0,3	0	0,6>
25	50	100
<1	1	1>
50	100	25

Distributive justice

Distributive justice, LeiM level 9, is the core of Energy Equity, which is about fairness in the outcomes of Energy Justice.

Environmental/Climate Justice

Environmental Justice addresses the unequal distribution of environmental hazards and benefits among different communities, often influenced by factors such as race, income and social status. While there is no universally accepted definition, the concept includes efforts to mitigate challenges like disproportionate exposure to environmental risks, unequal access to environmental amenities and limited participation in environmental

decision-making processes. Another term Just Transition ensures that the move to environmentally sustainable economies is fair and inclusive, addressing both the economic opportunities and the social disruptions that arise from deep structural change. It requires policies that protect affected workers and communities through reskilling, new job creation and social safety nets and that involve those communities in decision-making to ensure equitable outcomes. (Intergovernmental Panel on Climate Change, 2023, as cited in OECD, 2024a, pg.21). Environmental Justice, Climate justice and Just Transition all centre on equity and fairness, highlighting how certain communities face disproportionate burdens and the need for fair distribution and participatory processes (McCauley and Heffron, 2018, as cited in OECD, 2024a, pg. 21). Although environmental justice research is often linked to localised, community-specific impacts (Rasmussen, M. and Pinho, P., 2016), it also encompasses significant national and regional dimensions. Likewise, while Climate Justice is frequently framed in terms of international climate disparities, the unequal impacts of climate change and corresponding adaptation needs also emerge at local, regional and national levels (Schlosberg and Collins, 2014, as cited in OECD, 2024a, pg. 21). Environmental Justice concerns often share key commonalities across space and time, centring around three core issues, i.e. unequal exposure to environmental hazards, unfair distribution of the costs and benefits of environmental policies and barriers to accessing environmental information, participating in decision-making and seeking legal rights.

Unequal exposure to environmental hazards

Several types of exposures can be defined, point source exposure, non-point source exposure and natural hazards. A point sources concerns single, identifiable polluters like factories producing concentrated local impacts, a non-point sources concerns diffusion of pollutants from many origins such as agricultural runoff, urban storm water and vehicle emissions that are harder to trace. Natural hazards relate to storms, floods, earthquakes,

droughts, wildfires, etc., that threaten people and assets. Communities near point sources or in hazard-prone areas often face disproportionate risks. Preventing pollution and reducing exposure requires government policies to measure, monitor, enforce standards for air, water, soil and waste and prioritise early prevention.

Unfair distribution of environmental cost and benefits

The EJAtlas raises awareness by mapping global environmental conflicts and litigation (www.envjustice.org), but quickly becomes outdated and is unsuitable for benchmarking. The EU's assessment using robust statistical data shows that air and noise pollution and extreme temperatures disproportionately burden lower-income, less-educated and higher-unemployment groups (EEA, 2018). Because the levels of education and unemployment are of importance in relation to Environmental Justice, both unemployment levels and educational attainment, available from the World Bank and the Wittgenstein Centre for Demography and Global Human Capital (Wittgenstein Centre, 2025) are included in this LeiM level 4. Improving education and reducing unemployment increases community resilience to pollution and hazards, so the LeiM currently focus on these indicators for unequal resilience until other indicators exist. The World Bank's Gini coefficient, which measures income inequality, is a relevant indicator, but it is often unavailable or outdated for many countries. Selecting educational attainment and unemployment as an indicator of environmental justice aligns with the Capability Approach to environmental justice (M. Nussbaum, 2011, as cited by Martin, A., 2020). The capabilities approach evaluates justice by people's real freedoms and opportunities to achieve valued states and activities, not by income or material wealth alone (Sen, A., 1999). It focuses on ensuring individuals possess the capabilities needed for health, education and social participation, treating these as thresholds for a dignified life. Applied to environmental justice, this perspective shifts attention from exposure or resource access to

how environmental conditions expand or constrain people's genuine opportunities to lead lives they value (UN, 2025). The Global Sustainable Development Report highlights related indicators, subjective well-being (SDG 3), unemployment (SDG 8) and education quality (SDG 4), as key levers for transformative change that expand capabilities (UN, 2025). A thresholds of capabilities is influenced by unemployment and education. In practice, this perspective calls for development and environmental policies that go beyond economic indicators or environmental exposure, by also accounting for the impacts on people's real freedoms, such as their ability to live in safety, access education, or preserve cultural identities. This human-centred, holistic view makes the capabilities approach especially powerful for promoting justice in complex, unequal societies. (Nussbaum, M., 2011). The SDG-3 indicator subjective well-being from the UN Sustainable Development Report is placed in Level 4 of the LeiM alongside three education metrics: lower secondary, upper secondary and post-secondary attainment. A higher percentage of people with upper secondary education and post-secondary education increases the employment opportunities in the labour market, reduces vulnerable unemployment and a better position for entrepreneurial activities, e.g. small businesses. Upper secondary and post-secondary attainment are scored by their share of the total population. To prevent conflicts between indicators, since higher shares are desirable for both, lower secondary education is expressed as its proportion of the combined total of all three levels. In several regions this proportion is 50% or more. The European Climate Adaptation Platform Climate-ADAPT (ADAPT, 2025), is a starting resource for public authorities to design indicators for monitoring and evaluating adaptation measures. Indicators are classified into three domains: risk, response and result (figure 4.8). Risk is in the communality of unequal exposure to environmental hazards and is linked to identifying and measuring pollution-related risks. Response covers policies and enforcement that address unfair distribution of

environmental costs and benefits and is addressed in LeiM Level 1, Environment; Pollution Reduction. Result or impact measures are hardest to quantify because of limited data, situational complexity and regional differences in industrialisation and socioeconomic conditions. Further research and development of data capturing in inequality measurements are needed for comparable inequality metrics, to fulfil the benchmarking objectives of LeiM Level 4.

Figure. 4.8: *Environmental Justice indicator domain classification (ADAPT, 2025).*

Two more indicators for assessing progress toward Environmental Justice are included, the ratio of GHG (CO_2) emissions to industrial value added and the ratio of GHG emissions to the total primary energy consumption (TWh). With declining trends this signals the decoupling of industry and energy use from emissions, a critical step for climate mitigation and reduced hazard risk. Both indicators are included in table 4.15.

Barriers to access of environmental information, participating in decision-making and seeking legal rights.

To quantify environmental justice is often difficult due to data limitations that obscure the full scope of environmental injustices and hamper the creation of effective policies. To address this, mutual learning, impact assessments and vulnerability screening methods are increasingly used to capture its complex dimensions (OECD, 2024a). Schlosberg, D. (2007), agrees and observes that that while environmental justice theory

and practice must incorporate distributive aspects of justice, it should also encompass principles of recognition, capabilities and meaningful participation.

Table 4.15

Environmental/Climate Justice indicators scoring methodology.

	2024 indicators		Score			
Environmental/Climate justice	**EU**	**World**	**EU**		**World**	
Total Unemployment (% of labour force) (modeled ILO estimate)	6.1	5.3	50		50	
Wittgenstein Projection: % total population with Upper Secondary ed.	0.39	0.22	100		50	
Wittgenstein Projection: % total population with Post Secondary ed.	0.24	0.12	50		25	
(Wittg. Pr.) % of Lower Secundary ed. of total Low., Post & Upper ed.	0.24	0.50	100	70.1	50	43.7
Total Energy Consumption vs. GHG (Kg/Twh)	180	220	25		25	
CO2/GHG vs Value added (% of GDP) - (Kg / US$)	0.7	1.4	100		50	
Subjective Well-being - UN SDG 3 score *(10 is best score)*	6.56	5.61	65.6		56.1	
Wittgenstein Projection: % total population with Lower Secondary ed.	*0.15*	*0.17*				
Total Primary Energy Consumption (TWh)	*15,662*	*172,119*				
Industry (including construction), value added (billion US$)	*3,894*	*27,704*				
CO2/GHG emmisions million tons/year	*2,815*	*37,791*				

Range	<5	5 - 10	10>
Score	100	50	25
Range	<15	15 - 25	25>
Score	25	50	100
Range	<25	25 - 50	50>
Score	100	50	25
Range	<130	130 - 150	150>
Score	100	50	25
Range	<1	1 - 3	3>
Score	100	50	25

References:

- Our World in Data (2025), https://ourworldindata.org.
- Equal Measures 2030 (2024), https://equalmeasures2030.org.
- World Bank (2024), https://databank.worldbank.org.
- United Nations (2024a), Global Sustainable Development report, https://dashboards.sdgindex.org.

Information sharing

Two areas of information sharing are identified, mutual learning and environmental impact assessments, an intergovernmental data sharing capability and data available for non-governmental organisations and the general public to establish transparency on environmental important information. Government data sharing requires active coordination and infrastructure across sectors, not just publishing datasets. Government IT departments are central because they create and hold critical data, use it for policy and services and act as trusted coordinators among stakeholders. Strong legal frameworks, technical capacity and adaptive governance are needed to enable effective, equitable data sharing (Oxford Insights, 2025). Estevez, E. et al. (2010), elucidates that intergovernmental data sharing requires a framework containing three layers, the first being a business layer that depicts the interoperability regarding legal, commercial and political concerns. The

second, an information layer defines data and process elements to manage the information, the data sources, sharing protocols and the reuse of information across sectors, the administrative requirements and information lifecycle management. The third layer is technical, referring to common language, conceptual models that the agencies need to use for implementing standards and policies. It identifies the technical domains of security, interconnection, data exchange, discovery, naming and metadata. Not all countries can be at similar levels of information sharing structures, creating a barrier to global information sharing for benchmarking. Despite this, in table 4.5 an air quality data indicator is included.

Seeking legal rights & Participating in decision-making

This theme corresponds with Procedural Justice and was covered in table 4.14.

4.3.5 LeiM level 5 - Energy Democracy

Energy Democracy is the engaging of the community in energy generation, distribution and transition activities and it can be reached if decision making power and control over the energy system is with the community affected by it (Baker, S. et al. (2019). Fairchild, D. and Weinrub, A. (2017), introduce the term “deep democracy” and argue that the energy participation of frontline communities need a deeper structural transformation of the economic and social structures that reinforce the energy system in transition. Burke, M et al. (2017), present Energy Democracy as a political framework that replaces centralised, fossil-fuel systems with renewable, equitable energy controlled by communities by decentralisation and public participation. Szulecki, K. (2018) frames Energy Democracy as an analytical tool with three operational dimensions, common authority, participatory governance and civic ownership. Common authority and civic ownership are allocated to LeiM 6, Power Decentralisation. Opoku and Acheampong (2023), find that energy access is an essential production input and that stronger democratic

institutions are associated with higher GDP per capita. Their analysis finds that participatory, deliberative, egalitarian, liberal and electoral forms of democracy each have a significant positive effect on per-capita GDP. These effects are strengthened when rural–urban equality in access to electricity and clean cooking fuels improves. The authors report similar interaction gains for deliberative and egalitarian democracy and note that the strength of these relationships differs across West, Central, Eastern and Southern Africa due to regional variation in energy access and democratic practices. The study, however, does not explain why liberal and electoral democracy indices did not show positive effects, nor whether those democratic forms are less present in the regions analysed. This evidence supports the inclusion of Energy Democracy indicators in the LeiM as well as indicators on the share of urban and rural population and levels of access to electricity and gas as discussed in LeiM level 2. Democratisation can occur in both centralised and decentralised energy systems and takes multiple forms beyond community projects, including co-creation, deliberation and public consultations. Political institutions are also arenas for contesting power and enabling democratic change in energy governance. Energy Democracy is a useful lens for tracing these power shifts, but it remains conceptually and practically underdeveloped. The focus in LeiM level 5, Energy Democracy, is on the reality situation of a country to foster democratic processes towards community involvement and how community decision-making is integrated at ETDP level. The countries reality level is of great importance in SI and is discussed in detail in SI, System Context. Democratic processes benchmarking indicators where included in table 4.14. Here I selected the Global State of Democracy Indices (GSoD Indices) as published by the International Institute for Democracy and Electoral Assistance (International IDEA, 2025). The Global State of Democracy (GSoD) Indices offer a broader, multidimensional assessment of democratic performance than the earlier indicators used in LeiM 4. The GSoD compiles data from 174

countries and is built from 165 individual indicators aggregated into four top-level indices and 17 second-level factors, providing greater granularity and scope (International IDEA, 2025). By conceptualising democracy as popular control over public decision-making combined with equal voice and respect for all citizens, the GSoD captures dimensions of participation and accountability that are directly relevant to Energy Democracy (International IDEA, 2025). Because of its depth and finer detail, the GSoD represents a step up for rating Energy Democracy within the LeiM framework, enabling more nuanced evaluation of participation, equality and governance in energy systems.

Project/Regional level community participation

Participation in ETD projects by local collaboration among government, civil society and firms, strengthens the LeiM Renewable Energy Inclusion score. Participation has two key dimensions, information sharing and community involvement in decision making, requiring mechanisms like consultations, participatory budgeting and cooperative governance to ensure inclusive engagement (Szulecki, K., 2018). Transparency, timely access to clear information and capacity building are essential for informed participation, trust and accountability (Burke, M. et al., 2017), increasing the likelihood that projects will deliver measurable improvements in EI and substantive Social Corporate Responsibility (CSR) outcomes. Local autonomy means communities have a voice in how energy is sourced, managed and locally priced, including choices about siting renewable infrastructure, selecting technologies and choosing providers. Accountability and governance structures need to be set up containing commitment to clear roles, responsibilities and accountability mechanisms for the various stakeholders. This often involves cooperative models, community energy boards, or local councils with formal decision-making power. Another aspects is moving beyond one-off consultations to long-term, sustained community involvement throughout the life cycle of energy projects

(Burke, M. et al., 2017). Young, I. (2000, as cited by Tarasova, E., 2025, pg. 2), states that decision-making processes take place at two levels, the first relates to formal inclusion in political discussion and decision-making, the second is labelled as internal and relates to how political discussion is shaped and whether all stakeholders are indeed included in the political processes. The internal inclusion is related to recognition of diverse interests and the acknowledgement of the involved parties, to rhetoric, or in other words style of internal discussions and the use of narratives to establish common grounds for political discussion. Following Young's theory, two localised indicators for the ETDP consortium stakeholders to score are included. Has local Government a formal process for community participation in political discussion and decision-making? And how is the community rating the effectiveness of this process? A local established Energy Inclusion Coalition (EIC) needs to answer these two questions. The government, ETDP developer and community representatives to establish an EIC and document governance structure, working processes, objectives and goals. This coalition oversees the different working programs that will be mentioned in LeiM level 5 and thereafter. These working programs in LeiM 5 are to document an education and training program and a collaborative ETDP SI program. Initially the EIC is a collaboration based on non-binding agreements and is the frontrunner of the Social Corporate Responsibility/Social Innovation (CSR/SI) partnership committee, which has a formal status to manage the SI project and its resources. The education and training program requires clear goals aiming at strengthening the labour market of direct ETDP employment and a variety of supporting business services, includes a preliminary budget and is developed in cooperation with key educational and training stakeholders. The SI program follows the recommendations in paragraph 4.2, SI and needs to include clear objectives, a preliminary budget elaborating on financial and social investments and subsequent, social impact goals. This working program may result in community

participative arrangements during the lifespan of the ETDP project, or in an understanding of (shared) community ownership structures. The democratic indicator, UN SDG 4 indices aims to provide quality education and lifelong learning opportunities for all. Table 4.16 shows these indicators.

Table 4.16

Energy Democracy indicators scoring methodology.

	2024 indicators		Score			
Energy Democracy	**EU**	**World**	**EU**		**World**	
GSoD; Representation	0.7	0.5	70		50	
GSoD; Rights	0.7	0.51	70		51	
GSoD; Rule of Law	0.64	0.48	64	72.8	48	57.6
GSoD; Participation	0.65	0.54	65		65	
UN-SDG 4; Inclusive and equitable quality education for all.	95	74	95		74	

Energy Democracy	**Region / EDTP**
Govt. has formal process for community political participation?	
How is this participation process rated by the community?	
Is an Energy Inclusion Coalition realised?	
Is a joint Educational & Training program documented?	
Is a collaborative social innovation program documented?	

	Yes	**No**
Score	100	0
	Worse	Best
Score	1	100

References:

- International IDEA (2025), Global State of Democracy Indices, https://www.idea.int.
- https://unstats.un.org/sdgs/dataportal.

4.3.6 LeiM level 6; Power Decentralisation

Power Decentralisation is the empowerment of those closest to the means of production, geographically, socially and economically (Baker, S. et al., 2019). In the economic context, decentralisation of power is not synonymous with empowerment, but rather about bringing energy generation within a region closer to the various demand locations. Power decentralisation however, goes hand in hand with one of Baker's et al. (2019) Energy Democracy concepts, namely community ownership and control of energy generation, distribution and transition resources. Such community ownership can be complex due to the different legal ownership forms, the various assets and technologies in an energy system and possibly shared ownership of the produced energy, i.e. electricity, itself. Community decision-making emphasises the democratic participation in decisions

regarding energy production and distribution and does not require direct ownership of energy infrastructure, rather, it entails inclusive governance processes. Shared ownership of energy resources gives communities a stronger stake and decision-making power in projects while also creating obligations and entitlement to benefits such as energy and revenue. Robust governance and accountability structures with clearly defined roles and mechanisms are essential for managing these shared projects. Access to benefits requires an investment, which can take the form of capital, social resources, or market access under social ownership arrangements. The contributions of private investors, government and community must be negotiated and agreed at project outset and may need periodic adjustment over the project's lifetime. Tarasova, E. (2025), observed that Energy Democracy is often linked to community-based renewable energy projects and prosumer models, but it encompasses a broader range of practices.

Table 4.17

Power Decentralisation indicators scoring methodology.

Power Decentralisation	Region/EDTP
A formal SCR/SI Partnership Committee is formalised.	
A formal agreement with community/government on shared benefits/contribution signed.	
Formal agreement to execute a Social Innovation program signed.	
Formal agreement to execute an Educational/Training program signed.	
Legislation for a Community Power Model is in place.	
Business(es) forthcoming from the Social Innovation program efforts have started.	
Local distributed/decentralised renewable generation and microgrid project realised*	

** Or a similar energy related community project.*

	Yes	No
Score	100	0

Szulecki, K. (2018), introduces the prosumer in participative energy policies, which is an individual, household or community that both produces and consumes energy, often from renewable source like solar panels or wind turbines. Prosumers produce electricity, often decentralised small scale, for their own use and sell surplus electricity through local energy markets, peer-to-peer trading platforms, or flexible energy services, e.g. demand response. Table 4.17 shows the selected indicators at ETDP level for LeiM level 6and the average score contributes to the overall LeiM score. The EIC is to be transformed into a

formalised Corporate Social Responsibility/Social Innovation (CSR/SI) Partnership Committee, which will enter into juridical formalised plans and programs. The juridical form depends on the local laws and regulations. This CSR/SI partnership committee will work out a preliminary business plan with a multiple stakeholder ownership structure for discussion with community representatives and stakeholders. This preliminary business plan has a clear cooperative socioeconomic objective and contains clear set of cooperative stakeholder's goals, input of financial and social resources and defined social impact goals. LeiM 6 scores for Power Decentralisation are increased by formalising agreements with the partners on executing a SI and Educational/Training program. The government needs to have legislation in place for a Community Power Model. Further enhanced scoring comes through a first business started through the SI project and the realisation of a local community renewable energy project. While the scores of LeiM levels 1 to 5 are predominantly raised within a framework shaped by global benchmarks and national policy enforcement, LeiM level 6 represents a shift. Responsibility for advancing Energy Inclusion moves toward corporate actors and maximising inclusion depends on active collaboration among private firms, public institutions and local communities.

4.3.7 LeiM level 7; Energy Burden

Baker, S. et al. (2019), define Energy Burden as the cost of energy in relation to the household income, where Hernández D. (2016) introduces Economic Energy Insecurity which is defined as the disproportionate financial burden of energy costs imposed on low-income households. Residential and business electricity rates are obtained from the World Population Review whom state make demographic data accessible to help researchers, students and policymakers (world population review, 2025). Residential natural gas prices are only encountered for a limited number of countries and hence not included. Households and NPISHs final consumption expenditure is the total spending by resident households

and non-profit institutions serving households on goods and services for direct satisfaction of needs and wants, including purchases, imputed rent for owner-occupied housing, own-account consumption and indirect financial services. This value per capita taken against the total energy consumption per capita and the electricity rate, give an average indication of the total energy burden compared to the household cost. The discrepancy with actual household costs exists because the per-capita figure incorporates a country's total energy consumption, including industry and transport, not just household energy. Table 4.18 shows 2 indicators deriving from 3 World Bank standard statistics.

Table 4.18

Energy Burden indicators scoring methodology.

	2023 indicators		Score			
Energy Burden	**EU**	**World**	**EU**		**World**	
Residential electricity rates; 2023-2025 average - US$/kWh	$0.267	$0.157	25	**37.5**	50	**75.0**
Energy cost per capita vs. Households final consumption per cpt.	$0.432	$0.179	50		100	
Households and NPISHs Final consumption expenditure per capita (current US$) - annual	$21,634	$18,500				
Energy Consumption per capita (KWh) - annual	34,972	21,115				
Households Energy cost per capita	$9,337	$3,315				
		Range	<1.50	1.50 - 1,80		1.80>
		Score	100	50		25
		Range	<0.35	0,35 - 0,50		0.50>
		Score	100	50		25

References:

- Our World in Data (2025), https://ourworldindata.org.
- World Bank Indicators (2024), https://databank.worldbank.org.

4.3.8 LeiM level 8; Equitable Distribution

The access to energy to disadvantaged communities can be overlooked when businesses and financing institutions decide to invest in larger scale renewable energy projects which have the primary objective of economic viability and creating shareholder value. Equitable Distribution means allocating both the benefits and burdens of energy production, distribution and consumption fairly. LeiM levels 6 and 7 covered fair access to affordable renewable energy, while health and environmental matters were addressed in the LeiM Hygiene Factors. However, Equitable Distribution treats shared natural resources, e.g. water, energy, land, etc. as communal assets to prevent short-term, profit-driven overexploitation. It requires cleaning up legacy pollution and remediating

contamination from past energy projects and mandates fair compensation, livelihood restoration, or relocation assistance for communities displaced by the ETDP development. It also ensures that the financial and social costs of shifting to renewable energy are not disproportionately borne by vulnerable groups. Equitable distribution considers equity through empowerment by prioritising the voices and control of frontline communities. And the associated Energy Inclusion (EI) refers to society's equitable access to energy, particularly for underserved and disadvantaged communities. These topics crossover into the Social Innovation theory. They are evidently social problems, may be resolved by new solutions that are more effective, efficient, sustainable, or equitable than existing solutions (Phills Jr., J. et al., 2008) and produce shared value that would otherwise not have been created (Nicholls and Murdock's, 2012, as cited in Logue, D. 2019, page 1, introduction).

Table 4.19

Social Demand ETDP indicators scoring methodology.

		Social demand topic				
Equitable Distribution	**Applica-ble**	**Remedia-tion**	**Participa-tion**	**Compen-sation**	**Cost advantage**	**Total**
Shared natural resources - Water, land, energy needs defined and addressed?	100		100			200
Legacy pollution remediation - Remediate contamination from past projects addressed?	100	100				200
Compensation and relocation - Is fair land compensation, livelihood restoration, or relocation assistance for displaced communities addressed?	100			100		200
Equitable transition costs - Is financial and social costs of shifting to (renewable) energy for vulnerable groups disproportionately affected addressed?	100					100
Community empowerment - Are the voices and control of frontline communities in decision making prioritised?	0		100			100
Energy Inclusion (EI) - Is equitable access to energy for underserved and disadvantaged communities guaranteed? (When affected negatively by the ETDP)	100		100			200
					**Example scoring*	**83**

Scoring:

- When applicable; score 100
- Only 1 social demand topic can be chosen per social need description. The score in the box is 100.
- The total possible score for all is 1200. The total score is divided by 12.

In the aspect of the SI process dimension, these conceivably to be neglected needs, require enhanced participation of the affected vulnerable communities, which boost subsequently their socio-political capabilities and may improve access to resources (Moulaert, F. et al., 2005). Moreover, it invites the CSR/SI Partnership Committee to move beyond traditional Corporate Social Responsibility and address the social demands through

applying a Social Return on Investment (SROI) concept to quantify social impact and compare the value of the benefits with the implementation costs. Implementing SROI collaboratively establishes a common understanding of the approach among ETDP and SI stakeholders for the continued CSR/SI program. Table 4.19, illustrates the social demand topics and the scoring methodology for LeiM level 8. These topics may be replaced with context-specific social needs and demands at the ETDP level. The integrity and scoring methodology of the LeiM must be maintained to allow for valid benchmarking. In the future a global indicator may be developed.

4.3.9 LeiM level 9; Distributive justice

The term Distributive Justice is related with the fairness of resource allocation decisions (Hu, B. & Han, S., 2021). Logue (2019), examines Social Innovation (SI) through the perspective of social value, linking it to ethical and moral considerations as well as to the assessment of both economic and social outcomes. A central challenge in this approach is the quantification of social value, which refers to the subjective significance individuals assign to the changes they experience (Social Value UK, as cited in Logue, 2019, p. 2, Chapter 2). In the realm of social psychology, Forsyth, D. (2006), characterises Distributive Justice as the perceived fairness in how rewards and burdens are allocated among members of a group, whereby values, beliefs and ethics play an important role. Since the ETDP stakeholders in this research are hypothetical and stakeholders are only physical identified when a ETDP is become concrete, a different approach is chosen. Combining Inglehart and Welzel's Cultural Map (WVS, 2025) with Forsyth's Ethics Position Theory (2006) enables estimation of a population's dominant ethical and moral orientations. When the definitions of both theories fit the key SI and EI characteristics, there is a great likelihood that the country's society and its government defend fairness and justice in EI related resource allocations. Values, beliefs and ethics differ across the national systems. Discussed in

paragraph 4.2 is how Forsyth's Ethics Position are projected on Inglehart and Welzel's World Cultural map, shown here in figure 4.9.

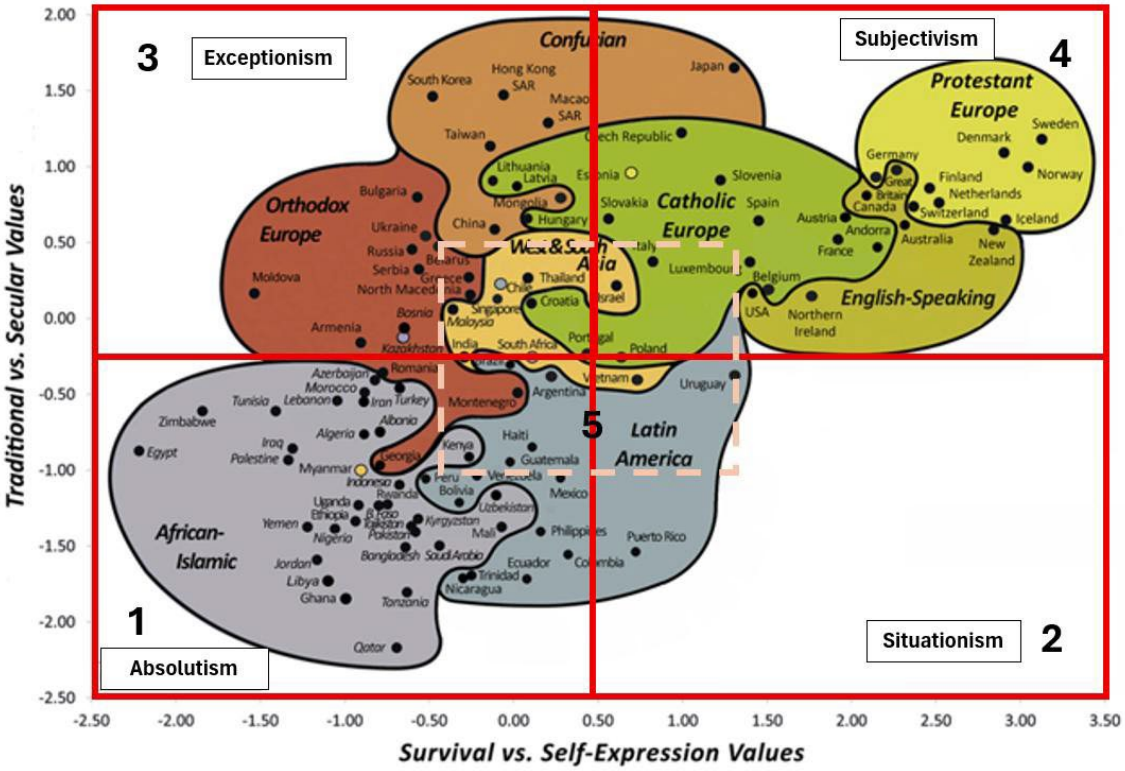


Figure. 4.9: *Forsyth's Ethics Position projected on Inglehart and Welzel's World Cultural map (adapted from Forsyth, D., 2006 & WVS, 2025).*

The definitions of both theories are quantified against the key corresponding SI characteristics using a (subjective) scoring method and allocated to 5 quadrants. This leads to the scoring methodology used in LeiM level 9 as shown in table 4.20. Once an ETDP project is established, its stakeholders must be identified and subsequently surveyed regarding their perceptions of fairness in resource allocation decisions, decisions which, at the beginning stage of the ETDP, may not yet have been made. Therefor in annual benchmarking of an ETDP's EI score, stakeholder and community surveys should be integral to the process. These surveys must focus on the at that time current state of taken resource allocation decisions and outcomes added to the prevailing ethical and value

orientations within a country's population. With this integration in LeiM level 9and considering a similar scoring methodology, it will be part of the EI outcome.

Table 4.20

Prevailing regional ethical & cultural values towards EI; indicators scoring methodology.

	2023 indicators		Score			
Distributive Justice	**EU**	**World**	**EU**		**World**	
Collaboration	3.00	2.75	100	**75.0**	100	**68.8**
Protection/Security	2.50	2.75	50		100	
Democracy	2.33	1.85	50		25	
Equality	2.67	2.38	100		50	
Average	2.63	2.43				

Range	<2.0	2.0 - 2.5	2.5>
Score	25	50	100

The Levelized Energy Inclusion Model

The LeiM-2024 scoring framework (figure 4.21) provides globally comparable benchmarks for EI. ETDPs will enhance the overall score by improving project-level performance scores in LeiM dimensions 1, 7 and 9and by contributing added value to dimensions 6 and 8.

Table 4.21

LeiM 2024 total score (author, 2025)

			2024	Brazil	RSA	Namibie	LATAM & Carribian	W&C Africa	East Asia & Pacific	EU	World
Level of Energy Inclusion	Hygiene Factors	1	Environment; Pollution Reduction	44.3	62.0	26.4	46.5	25.2	42.0	83.7	46.9
		2	Physical Energy Insecurity	78.2	70.5	38.7	78.3	38.0	65.2	100.0	79.6
		3	Energy Poverty	44.0	25.0	44.0	44.0	25.0	31.0	68.8	62.5
		4	EnergyJustice/Equity	50.8	51.1	39.1	50.3	38.1	51.7	79.4	49.1
	Purpose Factors	5	EnergyDemocracy	72.2	64.0	65.0	56.6	39.2	54.4	72.8	57.6
		6	Power Decentralisation								
		7	Energy Burden	50.0	25.0	100.0	62.5	75.0	62.5	37.5	75.0
		8	Equitable Distribution								
		9	Distributive Justice	68.8	68.8	56.3	68.8	56.3	68.8	75.0	68.6
			Total LeiM level*	**58.3**	**52.3**	**52.8**	**58.1**	**42.4**	**53.7**	**73.9**	**62.8**

**Average score without ETDP individual score*

4.4 Social Innovation

This research investigates how an ETDP contributes to regional socio-economic advancement through enhanced EI. By increasing access to renewable energy, the region can stimulate entrepreneurial activity, support the growth of small-scale enterprises and

improve community living standards. This chapter focuses on establishing an entrepreneurial ecosystem aimed at fostering the development of micro and small businesses. The starting point is to define the system in which SI will take place, as this sets the context for the intervention. Once the system is understood, identifying the social needs and objectives becomes essential. These insights are the input for the design of the SI process, guide the creation of Social Value and shape the development of a monitoring framework. The following sections elaborate on each of these components.

4.4.1 System context

Countries and regions operate under diverse structures and systems that shape policymaking in both social and economic spheres. These systems significantly influence capital investments, businesses and the broader social landscape. While the economic effects of these systems fall beyond the scope of this research, it is essential to understand their impact on social dynamics and the creation of shared social value. The social reality examined in this section complements the socioeconomic context discussed at the start of paragraph 4.1. Together, these perspectives form a foundational framework for integrating SI IN the Energy Transition Development Project (ETDP). Nine primary systems and their respective sub-systems are analysed and subjective quantified in relation to three critical dimensions: state control, societal inclusion and the impact of a system on SI (Appendix E). The political and economic systems of a country significantly shape its governance, innovation capacity and socio-economic development. **Politically**, systems range from Democracy, which emphasise free elections, civil liberties and pluralism and foster a balanced and representative political landscape (Dahl, R., 1982), to Authoritarianism which is marked by centralised power and restricted freedoms. Hybrid systems combine elements of both. **Economic systems** define how wealth, production and resources are managed, whereby Capitalist systems prioritise free markets and private ownership,

laissez-faire capitalism having no government intervention and in Regulated Capitalism government sets economic rules. In contrast, socialist systems involve state ownership of key industries and wealth redistribution, often limiting innovation due to the absence of market competition (Bouchrika, I. 2025). Democratic socialism blends socialism with democratic governance, while mixed economies integrate capitalist dynamics with social welfare principles, particularly in essential sectors like education and utilities (Amadeo, 2020; Gemma, 2020, as cited in Bouchrika, I. 2025). Informal economies, prevalent in parts of Africa and Latin America, operate outside formal regulation, relying on social and religious norms (Duffy, 2014, as cited by Bouchrika, I., 2025). These systems often experience slower innovation as individuals have little incentive to pursue change when their basic needs are sufficiently met. According to Depersio, A. (2019, as cited by Bouchrika, I., 2025), innovation processes are generally constrained in a socialist system, as the government serves as the sole market player. A **social system** refers to the structure and organisation of a society, encompassing aspects such as social hierarchy, mobility and welfare. These systems significantly influence individual's opportunities, access to resources and capacity to contribute to SI. The **class system** is characterised by a stratification of society based on factors such as education, income and wealth. Social mobility is possible, allowing individuals to move between classes depending on their achievements and circumstances. According to Gisbert, P. (2025, as cited by Kurukshetra University, pg. 1), a social class is defined as a group with a specific status in society, which determines its relationship with other groups and is associated with feelings of superiority or inferiority. Class consciousness plays a central role in shaping individual's identities and behaviours, often leading to collective actions such as the formation of trade unions. Although the class system creates social divisions, it remains relatively open, as individuals can ascend or descend the social ladder based on merit, age, gender, or other

factors (Civil Service India, 2025). This openness allows for greater participation in SI, as individuals from lower classes can potentially access opportunities to drive change. In contrast, the **caste system** is a rigid and hereditary form of social stratification, where individuals are born into fixed social groups with limited or no possibility of mobility. This system is most prominently associated with South Asia, particularly India, where it continues to influence social and economic outcomes despite being officially abolished (Mollenkamp, D. T., 2025). The caste system enforces strict hierarchies based on notions of purity and impurity and access to education, employment and innovation is often restricted for lower castes (Desai, A. 2010; Nanda, M. 2000). Unlike the class system, caste status is ascribed at birth and cannot be changed. This rigidity severely hampers SI, as marginalised groups are often excluded from contributing to, or benefiting from, social value creation. Higher castes may have more opportunities to engage in innovation, while lower castes face systemic barriers. **Welfare systems** are designed to promote social equity by providing state-funded services such as healthcare, education and unemployment benefits. These systems can be categorised into two main types, universal welfare and means-tested welfare. Universal welfare systems offer benefits to all citizens regardless of income or need, aiming to ensure a basic standard of living for everyone. While inclusive, they are often expensive and may allocate resources to individuals who do not require them. In contrast, means-tested welfare systems provide support only to those who meet specific income or asset criteria, making them more cost-effective. However, they can create disincentives for individuals to increase their income, as doing so may result in a loss of benefits (Gugushvili, D., et al., 2014). Welfare systems, particularly universal ones, can support SI by reducing inequality and enabling broader participation in economic and social life. **Patronage and clientelism** are systems based on unequal exchange relationships, where powerful individuals or groups provide resources, jobs, or favours in

return for loyalty and political support. Patronage typically involves the discretionary allocation of public positions by politicians to reward allies, while clientelism encompasses a broader range of resource exchanges between patrons and clients (Badie, B., et al., 2011). These systems are prevalent in regions such as Latin America and parts of Africa. Although both parties may benefit, the relationship is inherently unequal, with patrons maintaining control over access to essential resources. This dynamic often reinforces dependency and limits the autonomy of marginalised groups. As a result, SI is particularly difficult to achieve within patronage or clientelist systems, as opportunities for inclusive participation and bottom-up change are constrained. A **legal or judicial system** defines the framework through which laws are created, interpreted and enforced. It plays a critical role in shaping societal norms, protecting rights and enabling or restricting social innovation. Four main legal systems can be distinguished, **common law**, **civil law**, **religious law** and **mixed legal systems**. The **common law system** originated in medieval England and is characterised by the use of judicial precedents, where past court decisions guide future rulings. This system ensures consistency and adaptability in legal interpretation. It remains in use in countries such as the United Kingdom, the United States, India, Australia and parts of Africa, largely due to historical colonial influence (Britannica, 2025). The **civil law system**, also known as continental law, is the most widely adopted legal system globally. It is based on codified statutes derived from Roman law and further developed through major legal codes like the Napoleonic Code. Judges in civil law systems apply and interpret these codified rules rather than relying on precedent. Although codification is common, it is not universal, for example, civil law systems in Scotland and South Africa are not codified. Civil law systems aim to balance individual freedoms with legal necessity, providing a structured framework for private rights and obligations (New World Encyclopedia, 2025). The **religious law system** is based on sacred texts and religious doctrines. Examples include Islamic law

(Sharia), applied in countries such as Saudi Arabia, Iran and Pakistan, Jewish law (Halakha), used in religious courts in Israel and Christian Canon Law, Buddhist Law, Hindu Law and Confucian legal traditions. These systems often govern both personal conduct and public policy, integrating legal principles with spiritual beliefs. Religious law can influence societal values and ethics, which may either support or hinder social innovation depending on the inclusivity and flexibility of the religious framework (Johnson-Raisch, M., 2017). A **mixed legal system** combines elements from two or more legal traditions, often blending common law and civil law and sometimes incorporating religious or customary law. These systems are typically found in countries with complex legal histories or diverse populations. For instance, South Africa integrates civil, common and customary law, while Israel combines civil and religious law in matters of personal status (Palmer, V., 2012). Mixed systems offer flexibility but can also create legal complexity and ambiguity. Legal systems significantly impact the development of SI. Supportive legal frameworks can protect social enterprises and non-profit organisations, enabling them to address societal challenges effectively. However, overly rigid or bureaucratic legal environments may hinder innovation by creating barriers to entry or limiting operational flexibility. In particular, religious legal systems rooted in ancient traditions may restrict innovation if they impose strict norms that limit participation or creativity. Conversely, inclusive legal systems that accommodate diverse perspectives and reduce inequality are more likely to foster bottom-up social change and innovation. **Security and military systems** play a pivotal role in shaping a state's internal stability and external defence strategies. These systems are deeply intertwined with political structures and can either support or hinder the development of SI. Internally, three primary subsystems can be identified, civilian-controlled military, military-led systems and paramilitary/internal security forces. In democratic societies, the military is subordinated

to elected civilian authorities. This **Civilian-Controlled Military** model ensures that the armed forces operate within a legal and institutional framework defined by democratic governance. Wilén N. and Strömbom L. (2021), identify three core roles of the military in such contexts, collective defence, collective security and aid to the nation, including disaster relief and civil support. The clear separation between military and civilian elites, as described in Janowitz's M. democratic model (1964, as cited by Rehman, A. 2020), reinforces institutional checks and balances and creates an environment conducive to bottom-up innovation and civic engagement. In contrast, **military-led systems** are characterised by the direct involvement of the armed forces in political governance and are typically authoritarian. Rehman, A. (2020) notes that in many newly formed states, the military has emerged as a dominant political actor, often shaping policy, influencing governance and in some cases, directly ruling the country. This concentration of power tends to suppress civil liberties and restrict the space for SI, as dissent and independent civic initiatives are often curtailed. **Paramilitary and internal security forces**, such as Iran's Revolutionary Guard, are tasked with maintaining internal control and often operate outside traditional military hierarchies. These forces are commonly found in authoritarian regimes and are used to enforce regime stability through surveillance, suppression and political policing. Janowitz's totalitarian model (Janowitz, M., 1964, as cited by Rehman, 2020), describes such systems as ones where military autonomy is dismantled and replaced by party-controlled armed units and secret police. This model severely limits the potential for SI, as it restricts freedom of expression, civic participation and institutional independence. The structure and control of military systems have direct consequences SI. In contrast to democratic systems with civilian oversight, in authoritarian or military-led systems is innovation often stifled due to centralised control, suppression of dissent and lack of institutional transparency. Rehman A. (2020), emphasises that military dominance

in political affairs, particularly in developing countries, restricts bottom-up innovation and civic engagement. Therefore, fostering inclusive and democratic civil-military relations is essential for enabling SI and sustainable development. **Governance and administrative systems** define how power is distributed within a country and determine the degree of autonomy granted to regional and local authorities (Britannica, 2025a). These systems exist across all political contexts and significantly influence the potential for SI. Generally, SI tends to flourish more in decentralised systems where power is distributed closer to the societal base, allowing for greater local participation and responsiveness. A **unitary system** centralises authority in a single national government, which holds supreme power over all administrative functions (Britannica, 2025a). Regional and local governments operate under the directives of the central authority and possess limited autonomy. Laws and policies are uniformly applied across the country and decision-making is streamlined due to the concentration of power. This system is commonly found in countries such as France, China and Japan. While efficient in policy implementation, the lack of regional autonomy may limit the capacity for localised innovation and responsiveness to diverse community needs (Bognetti, G., 2017). In contrast, a **federal system**, or federalism, divides power between a central government and regional entities such as states or provinces. Each level of government has constitutionally defined authority, allowing for independent decision-making in specific domains (Britannica, 2025a). Federal systems promote local representation and accommodate diverse populations by enabling regional governments to legislate, taxand govern within their jurisdictions. Countries such as the United States, Braziland India operate under federal structures. This decentralisation fosters conditions conducive to SI, as regional governments can tailor solutions to local challenges and experiment with policy approaches (Bognetti, G., 2017). A **confederation** represents a loose alliance of sovereign states or regions that cooperate on specific matters such as

defence, trade, or foreign policy. The central authority in a confederation is weak and relies on consensus among member states for decision-making. Member states retain full sovereignty and delegate only limited powers to the central body (LegalClarity Team, (2025). The European Union exhibits many characteristics of a confederation, particularly in its emphasis on intergovernmental cooperation and limited central authority. While confederations allow for high levels of regional autonomy, their weak central governance can hinder coordinated innovation efforts across member states (Bognetti, G., 2017). **Media and information systems** define how information is produced, controlled and disseminated within a society. These systems play a critical role in shaping public awareness, civic engagement and the potential for SI. Generally, SI thrives in environments with open access to information, independent media and minimal censorship. Platforms such as social media and crowdsourcing tools facilitate collaboration, advocacy and innovation, while restrictive media environments tend to suppress these dynamics (Fuchs, C. 2012; Salverda I. et al., 2013). A **free press** operates independently of government control, allowing journalists and media outlets to report without censorship or political interference. This system is essential for democratic governance, as it enables public scrutiny of those in power, informs citizens and fosters open debate on societal issues. The presence of a free press supports transparency and accountability, which are foundational to effective social innovation (Principles of Democracy, 2025). In **censored media systems**, information is systematically restricted or manipulated to control public perception. Wright D. (2015), defines censorship as the deliberate control of media content through legal, administrative, or physical means imposed by ruling elites. Such systems are often found in authoritarian regimes, where monopolistic media groups may serve political or commercial interests. Censorship limits public discourse and restricts innovation. **State-controlled media** refers to outlets that are owned, funded, or heavily

influenced by the government. These media organisations typically align their content with government policies and priorities, often suppressing dissent and limiting critical reporting. Mechanisms of control may include blocking access to independent news sources, punishing journalists, or altering information to fit official narratives. This system is prevalent in authoritarian states and poses significant barriers to SI by restricting freedom of expression and civic participation. Technological and cyber systems define a country's digital infrastructure, policies and access to information. These systems are increasingly central to enabling or restricting SI. Nations that invest in digital literacy, broadband access and open-source technologies create environments conducive to innovation, collaboration and civic engagement. An **open digital system** promotes inclusivity, transparency and accessibility. It enables broad participation in governance, information sharing and innovation. These systems reduce digital barriers and empower individuals and communities to collaborate and co-create solutions to societal challenges. (a LeiM indicator included in table 4.11). Open digital environments are often supported by policies that encourage open data, digital literacy and decentralized technology development (Winby et al., 2018). Restricted cyber systems are characterised by government control over internet access and content. These systems often overlap with censored media environments, where access to independent platforms and information is limited. Such restrictions hinder collaboration, reduce transparency and suppress innovation by limiting the free flow of ideas and data. In **surveillance state systems**, governments monitor digital activity to control or suppress dissent. These systems are typically associated with authoritarian regimes and are closely linked to state-controlled media. Surveillance mechanisms may include data tracking, content filtering and punitive measures against online expression. While often justified as national security measures, such practices can significantly inhibit SI by creating a climate of fear and limiting civic participation.

Cultural and religious systems shape a country's identity and values, often influencing its legal and political structures. Geertz C. (1974), describes religion as a cultural system that guides moral and social behaviour. These systems can support or restrict social innovation depending on their openness. Understanding how different governmental authority systems interact is essential for assessing their impact on social dynamics and the creation of shared social value. A scoring framework on the three key SI topics is used to evaluate the nine discussed systems, each rated from 1 to 3 points based on their theoretical support for SI (Appendix E). The total score ranges from a minimum of 27 (highly supportive of SI) to a maximum of 81 (highly restrictive). Three impact categories are defined:

- **Positive impact**: scores close to 27
- **Average impact**: scores between 30 and 71
- **Negative impact**: scores close to 71

The most supportive combination includes systems such as democracy, democratic socialism, class system, common law, civilian-controlled military, unitary governance, free press, open digital infrastructure and secular culture. These systems collectively foster conditions for SI by enabling openness, participation and knowledge sharing. While a negative score does not mean SI is impossible, it indicates significant barriers such as restricted media, centralised control and limited civic freedom. Countries with average scores may require further investigation to identify specific challenges and opportunities.

4.4.2 Ethics and Values context

Ethics refers to the system of moral values that govern a person's behaviour or the conducting of an activity. Ethics are concerned with what is good for individuals and society and are often codified into rules or guidelines. They help determine what is considered right and wrong in various situations (AC, 2025). Global ethics addresses

pressing moral challenges in an interconnected world, including terrorism, child labour, climate change and humanitarian crises. It aims to inform global governance and promote sustainable, rights-based solutions with lasting impact. Environmental ethics has become central to global ethics, with climate change viewed as humanity's most urgent moral challenge. Its transboundary nature demands collective action and interdisciplinary collaboration. Ethical responses must connect theory with practice, addressing real-world injustices and influencing policy (Widdows, H., 2011). Colero, L. (2021), outlines a three-tiered Global Ethics Framework, Interpersonal Ethics, Professional Ethics and Global Ethics (figure 4.10). Interpersonal Ethics represent foundational moral principles, such as care, respect, honesty and justice, expected of individuals across societies. Professional Ethics build on these values, introducing formal responsibilities guided by sector-specific codes, including impartiality, transparency, due diligence, professional commitment and conflict of interest avoidance. At the highest level, Global Ethics represents an aspirational ideal, addressing complex, transnational challenges through principles such as respect for all life, collective responsibility, global justice, environmental stewardship and cultural recognition. This process supports more inclusive, responsive and ethically grounded decision-making throughout the project lifecycle.

Figure. 4.10: *Colero's (2021) Global Ethics Framework, UBC Centre for Applied Ethics.*

Colero's Eclectic Decision Model (2021), serves as a practical guideline, outlining key steps of defining the problem, gathering relevant facts, identifying affected stakeholders, recognising ethical issues and evaluating feasible options Social innovation (SI) is closely linked to values and morality, as highlighted by Logue (2019), underscoring the importance of ethical reflection within the social sciences. Analysing societal ethics and stakeholder values complements the previous systemic analysis (Appendix E) and enhances understanding of SI development. Value principles do guid behaviour and are shaped by cultural, religious and personal factors (Van Deth, J. et al., 1998), while beliefs, convictions held as true, form the foundation of both values and ethics (Fiveble, 2025). Religious and cultural beliefs influence ethical norms across communities (Benthahila, L. et al., 2021), where Graham, J. et al. (2016) state similarly that different cultures may have varying beliefs that shape ethical norms and practices. Narvaez, D. et al. (1999) in earlier research found beliefs to influence what individuals consider important or true, while ethics provide a framework for determining right and wrong actions. The World Values Survey (WVS, 2025) demonstrates that societal beliefs significantly shape economic development, democratic institutions, gender equality and governmental effectiveness. Since its inception in 1981, WVS has empirically tracked global value shifts, notably through the Inglehart–Welzel Cultural Map, which links value change to socio-political and economic outcomes. Inglehart and Welzel (2005), identify two key dimensions of cross-cultural variation: Traditional versus Secular-rational values and Survival versus Self-expression values. Traditional values emphasise religion, authority and family, while Secular-rational values reflect openness to practices like divorce and euthanasia. In the second dimension, survival values focus on economic and physical security, often accompanied by a more ethnocentric worldview and lower levels of interpersonal trust and social tolerance. Self-expression values, on the other hand, prioritise environmental protection, increased

acceptance of diversity and advocate for greater public involvement in political and economic decision-making. The second dimension values do align with Inglehart's (1971), materialist/postmaterialist theory. He states that materialist values prioritise economic and physical security, like maintaining order or controlling inflation, while postmaterialist values highlight individual freedom, self-expression and participation in decision-making. The Inglehart–Welzel Global Cultural Map (figure 4.9), indicates where a country is positioned within the two cultural value dimensions. The literature joins on the centrality of shared value in SI, linking intrinsic motivations and moral commitments to active participation in SI processes (Logue, D. 2019). Nicholls and Murdock (2012, as cited in Logue, D. 2019, pg. 1, introduction) reinforce this priority and Kanter (2019, as cited in Logue, D. 2019, pg. 2, Chapter 1), underscores the need for cross-sector collaboration, anchored by shared investments, deep community roots and partnerships with local organisations and inclusive community involvement. The European Commision Guide to Social Innovation (2013), highlights the sector's participatory ethos, driven by the creativity of citizens, civil society, communities and businesses. Caulier-Grice et al. (2012), stress that fostering improved social relations is crucial. Logue (2019) further identifies collectiveness as a consistent SI property. Together, these insights imply that effective SI demands openness to change, inclusive practices and collective action to address community needs through strengthened relationships. Quadrant 1 of figure 4.9, traditional, survival-oriented societies, prioritise social norms and hierarchies, often resisting change and grassroots experimentation, though their strong cohesion can support SI through the aligned accepted values. Quadrant 3, secular-rational, survival-oriented communities, are more willing to question conventions and explore innovations in gender equality, education and governance. However, both survival-oriented quadrants exhibit lower trust, openness and cross-group collaboration, conditions that hinder SI. By contrast,

societies high in self-expression values (quadrant 2) combine community solidarity with elevated trust and openness, fostering grassroots initiatives, inclusive participation and creative problem-solving essential to impactful SI. Conceptually, quadrant 4 offers the most enabling environment by combining secular-rational and self-expression values to foster diversity, individual agency and collective engagement. Most countries cluster in the central quadrant (5) of the Inglehart–Welzel Cultural Map (2005), reflecting average cultural profiles. Notably, no countries fall into quadrant 3, a pattern that may stem from incomplete 2023 survey coverage or from an inherent tendency for countries to gravitate toward the centre and quadrants 1 and 4.

Ethics: Idealism and relativism

Ethics is also a topic in psychological research and Forsyth's Ethics Position Theory argues that individual's moral judgments vary along two dimensions, idealism, reflecting a commitment to other's welfare and harm avoidance and relativism, denoting scepticism toward universal moral principles (Forsyth, 2025). His Ethics Position Questionnaire (EPQ) has been used in meta-analytic studies to document national differences in these dimensions (Forsyth, 2025; Forsyth, Nye, & Kelley, 1988). Building on these axes, Forsyth (2025), identifies four ethical types (the definitions in table 4.22):

- Situationists, who adapt moral rules to context;
- Absolutists, who uphold strict ethical certainties;
- Subjectivists, who rely on personal moral judgments;
- Exceptionists, who recognise necessary exceptions to rules.

Understanding these psychological profiles offers valuable insight into stakeholder ethics in energy transition projects across regions and does correspond to Inglehart and Welzel's (2005), cultural dimensions of social innovation. Forsyth's four ethical positions can be conceptually mapped onto Inglehart and Welzel's two cultural dimensions to

suggest systematic correspondences (figure 4.11). **Absolutism** maps squarely onto the high-Traditional, high-Survival quadrant of the Inglehart–Welzel value map, quadrant 1. Absolutists, characterised by high idealism and low relativism, align closely with the traditional dimension, given their emphasis on religion, respect for authority and conventional family structures and with the survival dimension through their focus on harm avoidance (Forsyth, 2025; Inglehart & Welzel, 2005).

Table 4.22

Donelson R. Forsyth's (2025) four positions of his Ethics Position Theory.

	Low Relativism	High Relativism
Low Idealism	**Exceptionists:** Conventionalists who tolerate exceptions to moral standard when benefiting offset potential harmful consequences.	**Subjectivists:** Realists who do not endorse moral standards that define right and wrong or the avoidance of harmful consequences.
High Idealism	**Absolutists:** Principled idealist who endorse both reliance on moral standards and striving to minimise harm done to others.	**Situationists:** Idealistic contextualists who value minimising harm rather than reliance on moral standards that define right or wrong.

Situationism fits the Self-Expression and Traditional quadrant 2 of the Inglehart–Welzel value map. Its high idealism inclines to supporting traditional family and religious values, while high relativism indicates case-by-case, pragmatic approach and preference of contextual reasoned, non-dogmatic problem-solving and meaning-making. Though, to consider is the that not a straight forward position on the two axes scale of Inglehart & Welzel can be argued from the definitions, but is assists in understanding the overlapping values and ethical positions and, as we see later on, the influence on SI principals. Regional ethical and cultural values relevant to Social Innovation (SI) and Energy **Subjectivism** fits

Self-Expression and Secular-rational values of the Inglehart–Welzel model, quadrant 3, because of its high relativism and low idealism. In its low idealism it elevates individual autonomy, diversity and experiential meaning over fixed norms or material security. Its high relativism corresponds with self-expression's tolerance for varied value claims and its

embrace of personal endeavour. On the other hand, it diverges from traditional values, which stress collective duty and immutable doctrines and from survival values, which prioritise security and uniform rule-following under threat. Subjectivists reflects openness to diversity, environmental protection and participatory governance.

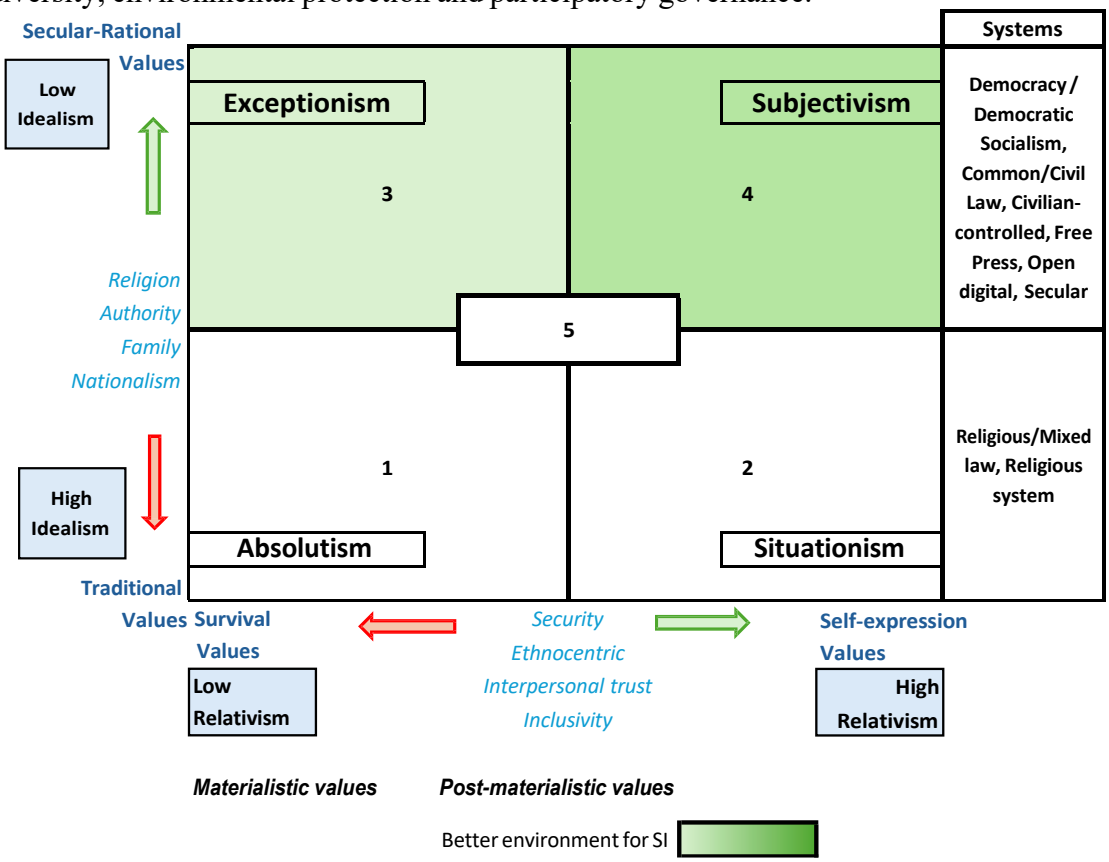


Figure. 4.11: *Forsyth's (2025) four Ethics positions projected on Inglehart–Welzel's 2-dimensional domains.*

Exceptionism with low realism and idealism balances moral rules with contextual exceptions. It maps onto the Survival and Secular–Rational quadrant 4 of the Inglehart–Welzel value map as it rejects both absolute moral codes and security-first imperatives. By insisting that ethical judgments depend on concrete circumstances rather than on inherited traditions, situationism stands apart from Traditional values (Forsyth, 2025; Inglehart & Welzel, 2005). Gladwin, T.et al. (1981), also found that a nation's ethical stance correlates with its position on cultural dimensions, like individualism and uncertainty avoidance. The

theoretical projection (figure 4.11) offers a heuristic to analyse how individual ethical dispositions influence SI, though this remains untested by statistical analysis. Analyses of **Quadrant 1** reveals traditional values offering strong support for protection and moderate backing for collaboration and equality through established norms, but that they tend to limit democratic inclusion. Survival values highly favour collaboration and security under pressure, while providing moderate support for democratic processes and equitable resource sharing. In **Quadrant 2**, Subjectivism ethics in social innovation encourages stakeholders to prototype ideas based on their own values and preferences, trusting individual judgment rather than universal rules. Personal stories and lived experiences are primary guides for design and evaluation, shifting the focus from abstract welfare outcomes to individual's meaning-making processes. SI Services are adapted to the distinct needs of each user group, rejecting one-size-fits-all models in favour of more personalised pathways. Recognising competing moral perspectives, it integrates multiple value claims into solution design, fostering inclusivity. By empowering individuals with autonomy and resources, subjectivist ethics cultivates ownership and long-term sustainability through self-determined action. In **Quadrant 4**, Secular-rational values support social innovation through formal, rule-based collaboration, legal safeguards, procedural democracy and equal-opportunity norms. These mechanisms provide predictability, transparency and institutional accountability, creating a stable environment for innovation. In contrast, self-expression values foster peer-driven networks, emotional and identity safety, participatory democracy and the recognition of diverse identities. This approach also rates highly by promoting creativity, inclusion and grassroots engagement. While both frameworks are favourable to social innovation, secular-rational systems offer stronger structural guarantees, whereas self-expression cultures emphasize empowerment, belonging and co-creative energy. A secular–rational contexts in **Quadrant 3** strongly support social

innovation through formal collaboration, legal safeguards, procedural democracy and equal-opportunity norms. These structures enable predictable, accountable and inclusive innovation across large-scale, multi-stakeholder settings. Survival-oriented cultures also foster innovation, particularly in crisis conditions, through pragmatic mutual aid and rapid resource pooling. Their emphasis on immediate protection and subsistence sharing offers high responsiveness, though centralised leadership and persistent structural inequalities limit participatory depth and long-term inclusivity. While both frameworks can enable innovation, secular–rational systems provide institutional stability, whereas survival cultures mobilise urgency and solidarity under pressure. Based on these deductions derived from the definitions in the literature, EI is assessed against 4 key characteristics of EI, e.g. collaboration, democracy, equality and protection-security, with the latter related to EI environmental and health concerns. The alignment of deductions and the SI characteristics is subjectively rated high (3), medium (2) or low (1) and shown in Appendix F. Averages of the scores between the two theories are taken for a combined quantification per quadrant, while for the LATAM & Caribbean and the World averages from multiple quadrants are taken. This scoring is included in LeiM level 9 as an indication to the prevailing likely acceptance of EI concepts in a country. It should be noted that identifying a consistent rational overlap between nations is challenging. Any discrepancy likely stems from the fact that prevailing psychological-ethical orientations within countries do not fully correspond with the 2 axes value dimensions of Welzel's World Cultural Map. More importantly deductions are derived from literature definitions rather than empirical data. The convergence of system scoring, Welzel's World Cultural Map and Forsyth's ethical positions indicates that these instruments collectively offer a framework for evaluating a country's sociocultural context and its relevance to EI. When identifying the combination of national systems most conducive to SI (see Appendix E), features such as democracy,

democratic socialism, a class-based social order, common law, civilian-controlled militaries, unitary governance, a free press and open digital infrastructure, align predominantly with quadrants 3 and 4, of Welzel's World Cultural Map (figure 4.9).

4.4.3 Social demand, needs and value

Social innovation aims to drive both economic and social progress, rooted in values and moral imperatives (Logue, D. 2019). This study shifts the focus from mere social "goodness" to active stakeholder participation in SI processes and the equitable distribution of benefits, thereby generating shared value with tangible social and economic outcomes. Its objective is to move beyond CSR by directly addressing social problems, meeting unmet community needs and redistributing resources through stakeholder empowerment and reconfigured relationships. These challenges and needs differ regionally, shaped by diverse socioeconomic contexts, national system structures and prevailing ethical value frameworks and evolve over time in response to energy transition developments, which in turn may create new demands such as workforce upskilling and educational reform. Social needs refer to the problems, gaps, or challenges faced by individuals, groups, or communities that demand targeted solutions. They centre on what is missing or problematic, examples include limited access to affordable healthcare, social isolation among older adults, unemployment in marginalised communities, educational inequality and environmental degradation. Social value denotes the tangible and intangible benefits generated for communities, individuals, or the environment. It emphasises improvements in well-being, equity, access, empowerment and sustainability rather than financial profit alone. Phills Jr, J. et al. (2008), define social value as "the creation of benefits or reductions of costs for society through efforts to address social needs and problems in ways that go beyond the private gains and general benefits of market activity." Within the LeiM, addressing unmet social needs aligns primarily with levels 1–3, encompassing pollution

reduction, energy insecurity and energy poverty. Opportunities for social demand and value creation arise at levels 4–9, where interventions reshape social relations by enhancing socio-political capabilities and improving community access to resources. The rapid deployment of innovative technologies in the ET creates a widening skills gap among current and future workers, calling for stronger alignment between educational curricula and vocational training. Investors must recognise that older or less-educated employees may lose job opportunities if higher qualifications become a baseline requirement. Well-coordinated reskilling programs are essential to prevent long-term unemployment or underemployment. Simultaneously, large-scale renewable installations, such as wind farms, hydroelectric dams and solar parks, can displace communities and trigger ecological impacts that erode local livelihoods, e.g. farming and fishing. Every ETDP should therefore map its specific unmet social needs alongside its social value opportunities, even as recurring themes emerge across different initiatives. Embedding social-need assessment and value creation into the ETDP business case ensures projects remain economically viable and socially responsible. ETDPs are expected to generate employment growth and expand the tax base, strengthening public services, while also mitigating potential job losses in legacy energy sectors. Above all, Enhancing EI must remain the programme's guiding objective.

4.4.4 Process design

In the literature review several approaches in the many definitions of Social Innovation were observed with a variety of goals, objectives and target groups. To determine correctly the SI approach a comparing summary is shown in table 4.23. This framework depicts the SI environment that encompasses multiple SI approaches. Because an ETDP operates regionally, its SI activities centre on products or services that tackle specific social problems or unlock social value for defined community segments, rather

than on system-wide change. ETDPs do not generate social impact in isolation but depend on novel collaborative configurations among stakeholders. Due to the theoretical overall the ETDP methodology adopts a hybrid Universal–Managerial–Comparative approach.

Table 4.23

Summary of SI theoretical approaches.

Approach	Addressing	Goals	Target group	Aim/Objective	Reference
Universal	Policy effectiveness	Product/Services	Vulnerable groups & Society	New solutions; Products, services, models, markets, processes Social needs & improved capabilities in relationships; better use of resources and assets	Caulier-Grice, J. et al. (2012)
Systematic		System Change	Society	New solutions; Products, processes, programs	Westley (2008)
Pragmatic	Organisation's primary goal is Social Impact	Product/Services	A defined target group	Meeting a social need	Mulgan et al. (2007)
Managerial	Social problem	Problem; product/service/ situation	Society	New solutions for a social problem; more effective, efficient, sustainable, equitable	Phills (2008)
Critical	Unmet social needs	System Change	Society	Process of empowerment, bottom up transformation Social needs; redistribution of resources material/inmaterial	MaccCallum, D. et all. (2016)
Economic	Economic improvement	System Change	Society	Changes in; conceptual, processes, products, organisational shifts, financing, new relationships (stakeholders/territories	OECD (2010a)
Comperative	Commercial & technical innovation not applicable to the social economy	System Change	Society	New forms of cooperation & collaboration	Caulier-Grice, J. et al. (2010)

A growing consensus in social innovation scholarship and EU policy favours bottom-up engagement to foster community agency (MaccCallum, D. et al., 2016; Fernandez, 2021). Yet regulatory gaps impede community energy projects and citizen participation remains largely passive (Fernandez, R. 2021). To reconcile these challenges, this study proposes a participative-assisted SI environment whereby ETDP stakeholders support SI initiatives in alignment with the ETDP objectives. Building on Moulaert, F. et al.'s (2005), three-stage SI framework, problem and opportunity identification, transformation of social relation and community empowerment, this approach embeds community co-creation throughout the ETDP lifecycle. In the first stage, stakeholders collaboratively pinpoint social needs and value opportunities, reflecting design-thinking

principles that stress community involvement (Brown, T. & Wyatt, J., 2009) and Christiano, A. & Neimand's A. (2018), call to "join the community". The second stage reshapes collaborations among public authorities, investors and civil society to advance renewable energy inclusion while respecting ETDP stakeholder preferences. Finally, early and sustained community engagement bolsters socio-political capabilities and access to resources, laying the groundwork for enduring empowerment (Moulaert, F. et al., 2005). The socio-political capabilities will be improved by structurally involving the target community in both the ETDP and the SI processes or programs from the early start of the development. Socio-political capacity comprises the knowledge, skills, networks and institutional support that enable individuals and groups to participate in, influence and manage political and social processes (Watts, R. et al., 2003). Beyond individual competencies, community capability, rooted in collective resources such as resilience, sustainability and organised political power, empowers marginalised groups to solve shared challenges and shape policy (Dushkova, D. & Ivlieva, O. 2024; Kolers, A. 2023). The SI ecosystem domain, processes and social content are illustrated in figure 4.12. Effectively building these individual and collective capacities for SI demands coordinated partnerships between business and government, coupled with targeted training, education and workshops to engage and bind community members. Government and businesses also require robust socio-political capabilities. In their policy capacity framework, Wu, X. et al. (2015), conceptualise system-level socio-political capacity as the ability to secure and sustain political support for policy actions. Cairney, P. (2016) describe policymaker's policy acumen as the political knowledge and experience necessary for effective policy formulation. He argues that political knowledge derives from understanding institutions, networks, and framing, is important for translating evidence into policy. A nation's social and political context significantly shapes public and private actor's capacity to realise SI.

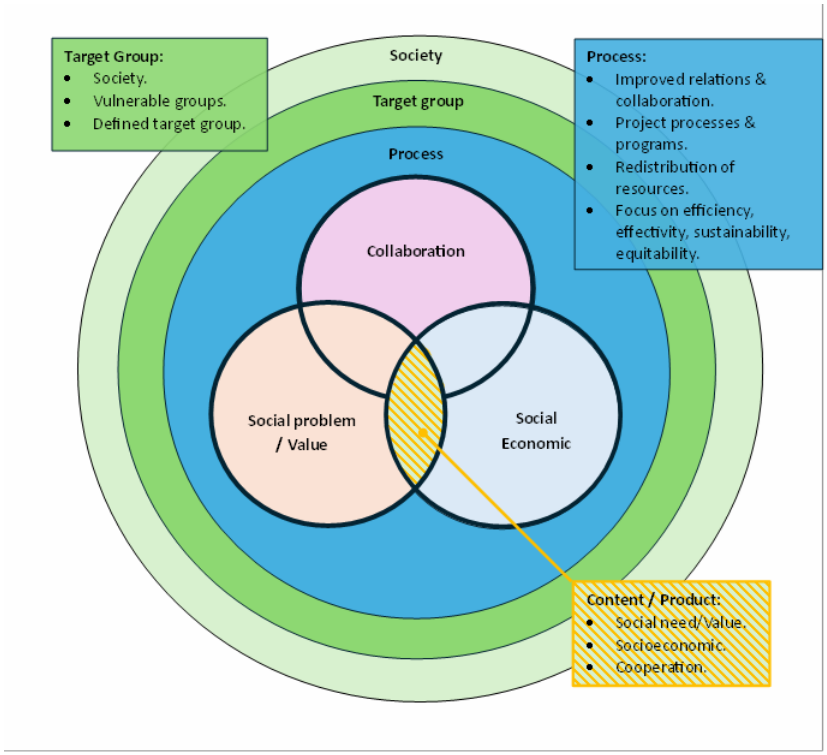


Figure. 4.12: *Social Innovation system environment (Author, 2025).*

Building on this, Woo, J. et al. (2015), argue that political capacity is rooted in socio-political relations, strong state–society linkages enable governments to make autonomous policy choices and enforce them decisively, relying on cultivated social and political trust across policy domains. Businesses operate in a politicised environment and thus require socio-political capabilities. This to manage risks, advocate policy change and build trust with customers, employees and communities by aligning with societal values. CSR and SI initiatives help forge that alignment. To strengthen these capabilities, firms should adopt a political lens on their operations, engage with divergent socio-political perspectives (Tan, J. & Handcock, T. 2024) and form partnerships within their industry or region around CSR/SI programs. Effective SI design must therefore encompass the socio-political capacities of communities, businesses and governments. Table 4.24 indicates the three SI design steps following Moulaert, F. et al.'s (2005), three-step framework which

corresponds with Logue's (2019) core SI properties, collectiveness, collective action and relationality, though Logue further stresses multidisciplinary and cross-sector interactions. Accordingly, stakeholder identification and analysis are added to step 2 of the ETDP SI design steps.

Table 4.24:
Summary of SI Design steps.

SI Design steps	Description	Observation
Step 1	**Identify Social Problems / Social Value opportunities**	Involve the community in the details
	Define SI Objectives; content/product	
	Identify target group Can make a change in behaviour Active participation Inspiring others to support/participate	Selected community
Step 2	**Changing social relations** Enhance Government participation Define and include project key stakeholders	Stakeholder analyses Alignment of SI objectives
Step 3	**Identify empowerment dimensions** Per stakeholder determine: Key socio-political capabilities Access to resources Ways to improve them	Focus on involving target group

4.4.5 Social resources

In the context of SI, access to resources refers to the ability of individuals, groups, or organisations to obtain and effectively use the materials, support and conditions needed to develop, implement and sustain innovative solutions to social challenges. An important resource in SI is Knowledge and Expertise, specifically access to relevant research, training, technical know-how and networks of expertise. This Includes both formal education, in line with the earlier discussed skills gap and informal knowledge-sharing communities. The apparent resource is Human Capital consisting of skilled or knowledgeable company personnel, volunteers and community members who can contribute time, labour and creativity. Human Capital is the foundation of the resource Social Capital which can be defined as networks, partnerships and relationships that provide support, legitimacy, or access to new opportunities. Social Capital is important for mobilising community support, building coalitions and scaling impact. (Murray, R.,

Caulier-grice, J. and Mulgan, G., 2010) (Phills Jr., J. A et al., 2008). A resource coming from the government is Institutional Support and Policy Environment. Government is needed to arrange supportive policies, a regulatory frameworks and legal recognition to enable Social Innovation. Part of this is supporting access to public programs and alignment with government priorities. These 4 social resources, Knowledge and Expertise, Human Capital, Social Capital and Institutional Support make stakeholder collaboration apparent for SI to succeed. Key to all SI programs are the Financial Resources, which commonly come from grants, public or private investors, crowdfunding, or donations. Funding may support operational budgets or consists of seed funding and long-term financial support programs. However, resources may also involve Physical Infrastructure like the access to needed facilities, e.g. office space, laboratory capacity and digital capacity like technology and communication platforms and IT infrastructure (Murray, R., Caulier-grice, J. & Mulgan, G., 2010).

Shared contribution of social resources

As traditional boundaries between sectors dissolve, non-profits, governments and businesses are increasingly blending funding sources and operational models to develop sustainable and at times profitable, Social Innovations (Phills Jr., J. A., et al., 2008). Observed by Phills Jr, et all. is that Social Value benefits go beyond financial profit, focusing instead on improving well-being, equity, access, empowerment and sustainability? The integration of private, public and philanthropic capital suggests a tension between an economical feasible business case with an inclination to profit maximisation and creation of tangible or intangible social value and/or cost to address social problems. In emerging energy markets, large-scale ETDPs often struggle to justify directing scarce capital toward social innovation (SI), making it essential to forge a joint ETDP–SI venture that aligns commercial viability with shared social objectives, clearly

outlining which resources serve both agendas and establishes risk-mitigation strategies for resource shortfalls. Core communal assets, knowledge and expertise to bridge skills gaps and human capital in both quality and quantity, must be co-invested by government, private backers and community actors, with institutional support and social capital (often channelled via CSR and non-profit intermediaries) underpinning SI efforts. Embedding community participation in resource-allocation decisions not only enhances socio-political capacities and access to resources but also strengthens cross-sector partnerships and social value creation (Moulaert, F. et al., 2005; Kanter, 1999 as cited in Logue, 2019).

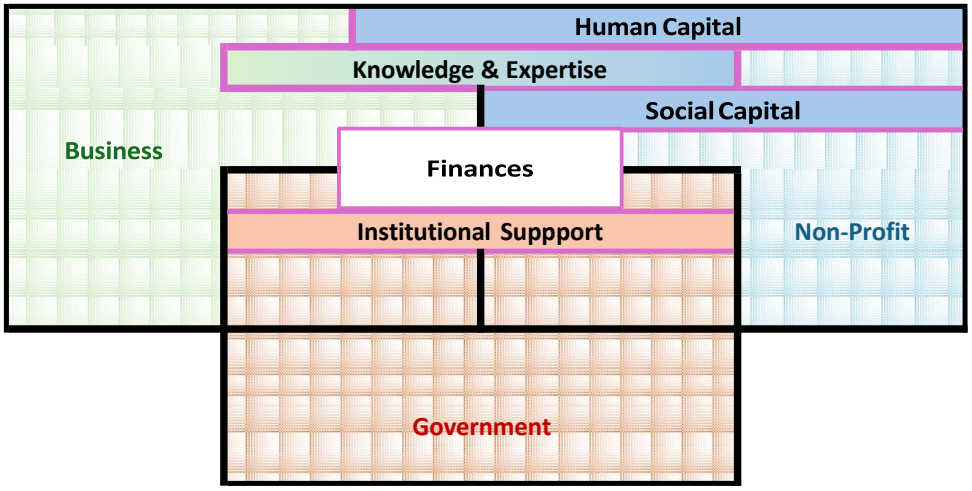


Figure. 4.13: *Fictional allocation of Social Innovation resources by key player within a cooperating business/SI project (Author, 2025).*

Generally, businesses contribute for their Corporate Social Responsibility (CSR) projects with knowledge and expertise and finances, to support social community programs in a wide variety of topics. Figure 4.13 shows how key players can contribute resources to a business/SI project collaboration, likely through a social enterprise entity. More on structuring a social enterprise collaboration in chapter V.

4.4.6 Outcome and Social Value

Social value refers to the broader impact of activities on the well-being of individuals and communities, beyond just financial or economic metrics. Social value is

intersubjective, it is not just individual, but is socially constructed through shared norms, cultural expectations and collective identities, yet personally experienced (Tsirogianni, S., 2014). This makes it difficult to define and measure. The LeiM does address measuring education, equity, inclusion, environmental sustainability and democratic participation, both on a holistic and on a ETDP level. Other specific value indicators in line with the SI or SE objectives of the program need to be designed. Examples are adding social value through local employment, knowledge transfer, generating business opportunities for SME's, etc. Related to ETDP various models are evolving. Renewable energy production can integrate social value by offering part of the generated energy at no or reduced cost to targeted communities. An approach seen is enabling small community enterprises to sell self-generated electricity from solar panels to the ETDP firms which uses it for hydrogen production. Hydrogen production projects demand large water volumes for electrolysis, in coastal areas often sourced via seawater desalination when fresh water scarce. Providing desalinated water at low or no cost to communities or small agricultural businesses represents another form of social value creation. Measuring social impact or social value creation is important to know if real progress is being made and second if the potential positive social impact is maximised (Kroeger and Weber, 2014, as cited in Logue, D., 2019, p. 24, chapter 6). The evolving relationship between business and community has gained strategic relevance, particularly in light of the increasing convergence between profit and not-for-profit sectors and the rise of hybrid entities such as SE. For these organisations, Social Impact Assessment (SIA) serves as a critical tool for evaluating the extent to which their social mission is being fulfilled. This growing interest in SIA reflects a broader shift toward accountability and impact-driven governance within the Social Economy (Grieco, C. et al., 2015). Emerson (2003, as cited in Logue, 2019, p. 29, chapter 6), advocates for using social management information and the development of a common set of metrics for

measuring value creation. Since all investments operate across economic, social and environmental domains, it is important to find value metrics in all these areas where value is being created. Measuring value creation in social science typically combines quantitative, qualitative and mixed-method approaches. Grieco, C. et al. (2014), observed that social impact is challenging, not the measurement itself, but the conversion of qualitative data into quantitative metrics. An understanding of how economic and social output can be integrated and measured together is crucial, especially for SE as they are both market orientated and social mission centred. Combining economic and social indicator reporting broadens market participation, facilitates equitable economic exchanges and promote local empowerment and well-being (Le Ber, Bansal, & Branzei, 2010, as sited in Grieco, C. et al., 2014, pg. 3). Furthermore, measuring unlocks new value and creates opportunities for innovation and growth that otherwise will be missed ((Porter, Hills, Pfitzer, Patscheke, & Hawkins, 2012, as sited in Grieco, C. et al., 2014, pg. 3). Grieco, C. et al. (2014), classify 76 different Social Impact Assessment frameworks into four macro-categories and found that 14.5% produced only retrospective quantitative measurements of social impact and the largest cluster (40.8%) applied retrospective qualitative measurements. The other two categories apply both type of measurements, whereby the category defined “Management” (18.4%) is applied in an ongoing time frame and often used for management control and certification. It is both holistic and detailed. The LeiM falls within this category as it is holistic and mend to be ongoing, be it at yearly interval. The LeiM needs to be complimented with SIA for the CSR/SI program, which needs to be (partly) detailed and ongoing and evaluated at shorter intervals. The Balance Scorecard Strategic Map (Kaplan, R. & Norton P., 2001) is a recommended management tool to combine indicators of different organisational aspects, at different levels within an organisation, i.e. Learning & Growth, Production, Customer Management, HRM,

Finances, etc. and aggregate them to one, or a few, indicators that measure the overall status of strategy implementation. Both qualitative and quantitative indices can be included. An approach is offered by Social Accounting and Audit systems. Where Social Accounting is a systematic process of measuring, reporting and verifying the social and environmental impacts of an organisation's operations with the purpose to promote transparency and accountability, Social Auditing is to evaluate how well an organisation complies with ethical and social standards. Unlike social accounting, which focuses on reporting, social auditing examines processes and outcomes, it verifies if organisations adhere to responsible business practices, align with ethical labour standards and CSR requirements (Emerick, D., 2024). Social Auditing requires social enterprises to document their activities in the value creation processes comprising of, documenting activities, developing action plans and measuring performance (Krátki, N. & Szabó, Z., 2018). Auditing may yield indicators for effectiveness of an organisation's value creation.

4.4.7 Business model & Funding

In social innovation (SI) contexts, business models serve as both diagnostic tools and strategic blueprints, often blending market-based revenues with public or philanthropic funding to sustainably serve underserved populations (Sharp, M. et al., 2023). Emerging governance structures, such as co-leadership, worker self-direction and fiscal sponsorship, enhance leadership diversity and operational resilience. Worker-ownership models, including ESOPs and cooperatives, promote democratic control and community wealth (Fraraccio, M. et al., 2024; Ackin, C. 2019). Hybrid structures that integrate equity-sharing and stakeholder participation are increasingly recommended for CSR/SI entities to ensure inclusive resource contributions and shared value creation (CO-OP CINCY, 2025).

Integration of private, public and philanthropic capital

Non-profit organizations typically finance operations and capital investments through a mix of internal funds, such as retained surpluses and external debt, with each choice shaping their capital structure and growth capacity (Calabrese, T. 2011). Designing hybrid funding frameworks that incorporate private investment poses challenges around balancing risk preferences and preserving non-profit tax incentives, while ensuring separate governance for SI and ETDP activities. Foster, W, Kim, P and Christiansen, b. (2009), propose ten archetypal funding models for non-profit organisations, distinguished by the dominant type of funder. The first group relies heavily on individual donations. The **Heartfelt Connector** mobilises broad public engagement around causes that transcend pre-existing identities, often through emotionally resonant, volunteer-driven events like volunteer-driven races, walks, or similar activities, to foster community engagement, amplify outreach and transform small individual gifts into substantial collective funding. The **Beneficiary Builder** model leverages long-term gratitude from service recipients, most notably in universities and hospitals, where service fees do not cover costs and alumni or patients provide supplemental donations. Donations typically represent a modest share of total revenue. The **Member Motivator** supports activities directly valued by its members, a common model in faith-based, environmental and cultural organisations and depends on individual donors who participate in the non-profit's core activities. The **Big Bettor** differs in its reliance on a small number of major donors, often anchored by a founder or philanthropist whose personal passion drives substantial investment in breakthrough solutions. These non-profits typically address problems that can be substantially advanced with a single, major infusion of capital. Three further models are rooted in government funding. The **Public Provider** delivers predefined state or federal programs and involves non-profits delivering government-defined social services, such as

housing, education, or human services, under contract or grant agreements with public agencies. Funding is distributed via reimbursement formulas or competitive request for proposals, with non-profits required to meet performance and reporting standards. Though government funds are primary, expanding Public Providers often diversify by pursuing additional federal, state and local grants to stabilise their funding base. The **Policy Innovator** develops novel service approaches and secures government adoption by demonstrating superior outcomes or efficiency. Unlike Public Providers, who rely on predefined government programs, Policy Innovators secure funding for alternative approaches through advocacy and demonstrated impact. They design novel programs beyond standard funding categories, use cost–benefit analysis and pilot data to persuade funders, depend on mixed government sources to scale innovations and strategically leverage policy windows to gain initial support. The **Beneficiary Broker** competes with peers to administer government-backed services, with beneficiaries free to select providers. They operate in sectors like housing, employment, health care and student loans, but unlike typical government-funded programs, they allow beneficiaries to choose their service provider freely. Corporate resources dominate the **Resource Recycler**, in which non-profits collect and redistribute in-kind donations such as food, medicines, or equipment that would otherwise be wasted from donating businesses. Finally, two hybrid models combine multiple funding streams. The **Market Maker** operates where market demand exists but for-profit provision is constrained or inappropriate, such as organ donation or patient support in healthcare. These non-profits earn most of their income through activity-based fees or donations. While Market Makers typically focus on health and disease, some also work in environmental protection, such as land conservation. The **Local Nationaliser** grows nationally by building federated networks of locally funded affiliates, often addressing issues such as education or youth development. Most of the money for programs

is raised locally, often from individual or corporate donations and special events. Very little of the money comes from government agencies or fees. Complementing these models, McCambridge, R. (2019), highlights a significant shift in philanthropic practice through the "mega-grant" model pioneered by the Edna McConnell Clark Foundation. Unlike traditional project grants, mega grants provide multi-year, unrestricted working capital, rigorous performance measurement and embedded capacity-building support. This approach reframes philanthropy as strategic investment, enabling non-profits to scale proven interventions, strengthen organisational infrastructure and attract co-investors. Beyond individual grantees, such funding fosters shared learning, field-building and long-term sustainability planning, signalling a broader transformation in the relationship between funders and non-profits. Together, these frameworks underscore both the diversity of non-profit funding strategies and the evolving expectations of modern philanthropy (Foster et al., 2009; McCambridge, R., 2019). The broader Implication for Philanthropy is a shift moving funders from check signing to an investment mindset, treating grantees like portfolio companies and applying venture-style diligence and milestone tracking. Exit planning and sustainability are prioritised, forcing both foundations and non-profits to articulate growth goals, long-term viability and transition strategies. A supportive and integrated form is Venture Philanthropy which offers catalytic funding paired with strategic support, including business advice, mentoring and performance oversight in targeted areas. The European Venture Philanthropy Association (EVPA) backed by the European Union to mobilise capital providers to drive large-scale social and environmental transformation through collaboration, expertise and enabling policies (Impact Europe, 2025).

Impact Investing

Recent years have seen a diversification of financing approaches in social projects, with impact investing emerging as a key model. This approach enables investors to pursue

both financial returns and measurable social or environmental outcomes, challenging the traditional dichotomy between profit and purpose (Blueorchard, 2025). Originating from development finance and microfinance, impact investing promotes financial inclusion and aligns with the "double" or "triple bottom line" framework, which evaluates economic, social and environmental performance (Miller, K., 2020). Unlike socially responsible investing (SRI) and ESG investing, which primarily screen companies based on conduct and governance, impact investing actively targets positive change through intentional capital allocation. Investment strategies span a spectrum from pure social impact to pure financial gain. At one end, philanthropy prioritises social value without financial return.

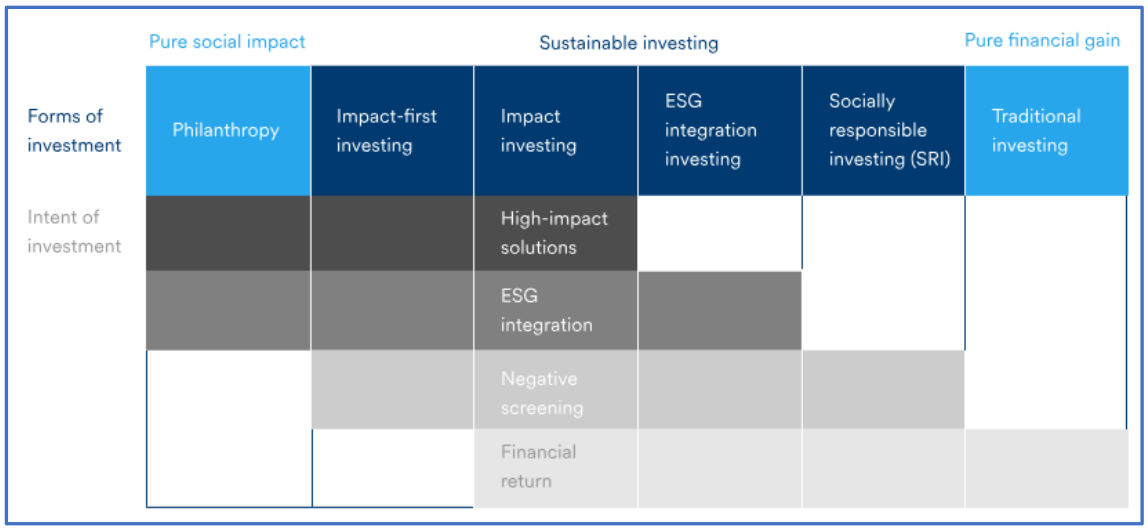


Figure. 4.14: *Differentiation of impact investing (Blueorchard, 2025).*

Impact-first investing follows, aiming for strong social outcomes with modest returns (figure 4.14). Impact investing balances both goals, targeting measurable impact and competitive profits, central to sustainable finance. ESG integration focuses on risk management and opportunity through environmental, social and governance factors. Socially responsible investing (SRI) avoids unethical sectors via negative screening. Traditional investing, at the opposite end, seeks financial return alone, reflecting varying priorities between profit and purpose.

Bridges Fund Management (2025) views social and environmental challenges as strategic opportunities for business growth, advocating a holistic approach to problem-solving. Their "outcomes partnerships" model aligns public and private actors around shared goals, a viable financing way for ETDPs. Meanwhile, the global impact investing market surpassed USD 1.5 trillion in assets under management in 2024, reflecting its growing maturity (GIIN, 2024). Most impact investors aim for risk-adjusted, market-rate returns, with reported outcomes consistently meeting expectations across financial and social/environmental dimensions.

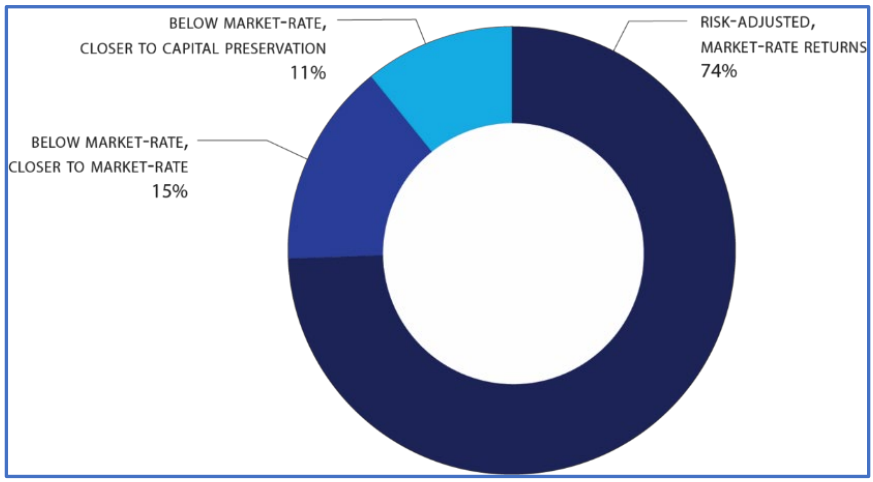


Figure. 4.15: *Financial return expectations of impact investors, 2024 (GIIN, 2024).*

Blending Philanthropic Capital with Government and Impact Investors

To maximise the scale and sustainability of social initiatives, organisations increasingly combine philanthropic contributions with government funding and impact investments. This blended finance approach leverages the unique strengths of each partner, grant flexibility, public mandate and market discipline, to create larger, more resilient capital pools (Glahn, D. et al., 2025). Six key structures and strategies that have proven effective in aligning diverse funding sources can be defined. **Pooled and co-investment funds** bring together foundations, government agencies and impact investors into a single

capital vehicle. Philanthropic partners often provide catalytic “first-loss” capital, which absorbs initial risks and reassures more risk-averse participants. Joint governance committees set investment criteria, approve disbursements and monitor performance. By sharing oversight and aligning on strategic priorities, stakeholders can deploy substantial resources to high-impact projects while maintaining rigorous accountability (GIIN, 2020) **Matching grants and challenge funds** incentivise government participation by pledging to match public contributions on a predetermined ratio, frequently one-to-one. These structures typically tie the release of matching funds to the achievement of specific social outcomes or performance milestones. Challenge fund competitions further stimulate innovation by inviting non-profit proposals and rewarding the most promising solutions with blended public and philanthropic support, thereby driving broader sector engagement and accountability (OECD, 2017). **Pay-for-success** (PFS) contracts and social impact bonds (SIBs) shift outcome risk away from public budgets by making investor returns contingent on achieving predefined social indicators. Philanthropic actors supply the upfront working capital that bridges the period between service delivery and government outcome payments. Impact investors contribute additional funds needed for scaling, all anchored by a shared outcomes framework and rigorous data-driven evaluation. This model promotes measurable impact and encourages efficient service delivery (Akinchan, J., 2019). **Tiered capital structures** layer financing tranches according to risk and return preferences. Philanthropy typically occupies the junior “first-loss” tranche, agreeing to absorb initial setbacks. Government agencies assume the mezzanine tranche, while private investors subscribe to the senior tranche with the most predictable risk-return profile. This hierarchy aligns incentives and clarifies loss allocation, making the overall vehicle more attractive to commercial investors and enabling scale without diminishing philanthropic leverage Miller, C., 2003). **Public-private partnerships** (PPP) formalise collaboration

among non-profits, government entities and private investors to design, fund and manage social infrastructure projects. Memoranda of understanding establish clear roles, responsibilities and funding commitments, while independent evaluators track progress against shared social indicators. PPPs blend the public sector's regulatory authority with private sector efficiency and philanthropic agility, delivering services at scale and ensuring long-term viability through shared stewardship (UNDP, 2022). **Dedicated impact funds** pool capital from foundations, development finance institutions, pension funds and other investors into a professionally managed vehicle. Fund managers underwrite deals, conduct due diligence and monitor portfolio performance according to established environmental, social and governance (ESG) criteria. By offering a spectrum of instruments, grants, concessional loans and market-rate equity, these vehicles match diverse investor return expectations and channel significant, coordinated resources into SE. Blended finance requires alignment of objectives and clear governance structures. By convening stakeholders early to draft term sheets that define capital commitments, risk sharing and exit timelines, organisations can build trust and adaptively manage blended vehicles as they scale (Sida, 2013).

4.5 Conclusion; Inclusive Capitalism

Inclusive capitalism, or stakeholder capitalism, is a policy movement aimed at reducing income and wealth inequality by ensuring that all stakeholders, workers, communities, shareholders and the environment, share equitably in economic value creation. Advocated by the in 2019 founded Council for Inclusive Capitalism (CfIC), the CfIC promotes measurable actions that embed social justice and environmental stewardship into capitalism, aligning its Framework for Inclusive Capitalism with the UN Sustainable Development Goals. Its commitment to human dignity and sustainability reflects a long-term vision that balances profit with ecological and social health. Key

initiatives include the Just Transition Framework for equitable decarbonisation, the Pension Fund Coalition for transparency in retirement schemes and the Embankment Project to mobilise private capital for inclusive, sustainable infrastructure developments (CfIC, 2025). The Levelized Energy Inclusion Model (LeiM) defines, quantifies and benchmarks global Energy Inclusion by integrating UN SDGs and other indicators, aligning with CfIC's core principles and operationalising Inclusive Capitalism by leveraging SI. **Inclusive capitalism**, incorporates **Social Economy** (Murray, R., et al., 2010, discussed in chapter 4.1) and are both the strategic long term goals, albeit scoped to the communities within the socio-economic influence of the ETDP and reflecting its CSR/SI goals and project objectives. Social Economy is driven by values, missions and ethical considerations. Chapter V discusses critical arguments around the LeiM and the reasoned link with SI. It applies this framework to two early-stage ETDP case studies in Brazil and Namibia, benchmarking them against global and regional indicators and identifies implementation flaws and bottlenecks in operationalising the LeiM–SI concept.

CHAPTER V

DISCUSSION

5.1 Definition and benchmarking Energy Inclusion

The Levelized Energy Inclusion Model is first off all an assessment tool to define a region's global EI position, to assists in setting goals to improve that position and to guide in which areas of the LeiM to achieve this. While the selected indicators are grounded in reputable sources and demonstrate temporal consistency, it is important to acknowledge the bias potential inherent in the applied scoring methodology. Nevertheless, given that this methodology is uniformly applied across countries, the comparative benchmarking remains sound. Further research into the scoring approach and relation with reality may enhance its analytical depth. Energy Inclusion (EI) holds diverse meanings by different groups and throughout the literature a single or all-encompassing definition of EI was not encountered. Although definitions of EI frequently overlap, individual researchers tend to emphasise particular thematic dimensions they deem most significant, emphases that may diverge from those prioritised by others. Examples are energy availability for heating versus housing infrastructure, or the differences and overlap found in Energy Justice, Energy Democracy, Power decentralisation and Environmental Justice. By structuring the definitions into a two-tier, nine-level model, EI becomes more operationally applicable, facilitating both project-level implementation as well as the formulation of policies. This aligns with Hypothesis H2. The proposed two-tier model first emphasises the foundational requirements for achieving access to (renewable) energy for communities. While many EI components, such as the hygiene factors, are shaped by policy frameworks, their implementation can be significantly enhanced during the implementation of ETDPs. This localised amplification opportunity contrasts with the broader systemic change objectives

pursued by governments, such as the World Economic Forum (WEF), within their overarching Energy Transition framework. These frameworks present challenges to effectively and practically reach targeted local communities. Despite the two tier model, the LeiM show the indicator results in a continuum, not linear. This becomes evident in the 2024 LeiM analyses and reflected in the conducted survey. By allocating 42% of the total score to environment and pollution themes, 39% to justice and democracy themes and 16% to direct energy-related indicators (energy burden, energy poverty and physical energy provision), the LeiM framework has a greater emphasis on democratic governance processes. A discernible trend emerges in the LeiM Energy Inclusion scores for Brazil, Namibia and, albeit to a lesser extent, the LATAM, West & Central Africa and East Asia regions. In these cases, scores for Environmental and Pollution Reduction (LeiM 1) are notably lower, while Energy Democracy (LeiM 5) receives comparatively high ratings. The European Union stands as an exception, scoring higher on LeiM 1. This pattern suggests that elevated scores in Energy Democracy can significantly enhance overall EI performance, even when foundational Hygiene Factors are not fully realised, challenging the assumed sequential importance of the nine LeiM levels. Brazil, with an EI score of 58.3, falls below the global average of 62.8, primarily due to modest performance in LeiM 1 and a markedly low score in LeiM 3 (Energy Poverty). However, Brazil performs considerably better in LeiM 2 (Physical Energy Insecurity) and LeiM 5 (Energy Democracy), surpassing even the EU in the latter. Namibia, while scoring below the global average, ranks slightly above the West and Central Africa region and also demonstrates strong performance in Energy Democracy. These findings indicate that countries such as Brazil and Namibia face challenges in fully achieving Hygiene Factor benchmarks, yet their progress in Energy Democracy contributes meaningfully to their overall EI scores. Democracies have in general better society orientated laws, a better justice system and

enforcement capacity. This implies that EI scores higher in democracies because of the maturity in democratic processes and not necessarily because of physical energy supply, which some stakeholders may view as the core of EI, with the remaining 81% of themes seen as complementary. Given the direct relationship between energy and socioeconomic development, the LeiM framework is intrinsically linked to Social Innovation, wherein democratic processes also serve as a key enabling factor.

5.1.1 Survey results

A limitation of the survey sample is its small size. Nevertheless, the responses reflect a reasonable diversity across industry sectors, management roles and age groups, offering meaningful insights into stakeholder perspectives. Most participants are from the private sector, with fewer from government and none from the non-profit domain. All respondents, except one, are male. The survey highlights prioritised sorting of physical energy supply (figure 3.4, Q3 & Q4), followed by equitable distribution (Q11 & Q12). The implication is discussed in chapter V. The EI Framework consists of two tiers: Hygiene Factors and Purpose Factors. It has a sequence of importance with environmental protection and energy infrastructure the foundational elements and which are prerequisites for achieving broader socioeconomic benefits through EI. Since respondents rated item importance without prior knowledge of the framework, their rankings reflect a divergent order from its intended progression. More on implications and advices in chapter V.

5.2 Anchoring EI through SI in a ETDP

Corporate Social Responsibility (CSR) is a strategic, self-regulating framework that aligns ethical accountability with commercial objectives, aiming to enhance economic, social, and environmental outcomes (Fernando, J., 2025). Empirical evidence indicates CSR initiatives contribute to brand differentiation, higher sales even when products are comparable, and improved employee retention (Johnson Z. et al., 2019a). Under rising

geopolitical and market pressures, CSR has evolved from mere compliance toward a proactive commitment to exceed ethical, legal, and commercial norms (Kulatharayil, 2024). Conceptually, CSR comprises four interrelated dimensions, Environmental, Ethical, Philanthropic, and Economic Responsibility, which together position responsible business as an engine for systemic social change (Stobierski, T., 2023). These four interrelated dimensions correspond with the philosophy of the Social Economy as discussed in chapter IV. The concepts of Inclusive Capitalism, or stakeholder capitalism, reduce income and wealth inequality by ensuring that workers, communities, shareholders, and the environment all share equitably in economic value creation incorporates the Social Economy and aligns with the CSR objectives. All three approaches emphasise equitable value distribution, the integration of social and environmental objectives with financial performance and a strategic, long-term commitment to sustainable development underpinned by stakeholder engagement. Existing literature underscores the imperative for businesses to move beyond orthodox CSR programs by embedding SI into their policies and practices. For ETDPs, the LeiM's strong democratic orientation makes it the instrument to integrated CSR and SI initiatives. The literature review together with the analyses of SI in chapter V reveal many conceptual similarities with EI. The EI levels within the LeiM framework, namely Energy Justice/Equity, Energy Democracy, Equitable Distribution, and Distributive Justice, correspond closely with core SI principles such as equality, inclusion, and participatory governance. The dimension of Power Decentralisation aligns with SI concepts of empowerment and cross-sector collaboration. Given their shared objective of fostering socioeconomic development, the LeiM framework is intrinsically connected to SI, wherein democratic processes function as a critical enabling mechanism for inclusive and social value creating outcomes. This supports Hypothesis H3, which posits that SI contributes to EI, and as demonstrated

hereafter in paragraph 5.3, can be imbedded in CSR initiatives. However an important observation concerns the ambiguity regarding whether the primary objective is Social Innovation (SI) or Energy Inclusion (EI). The overarching aim should be to cultivate a Social Innovation ecosystem oriented toward SI goals, within which Social Entrepreneurship (SE) can flourish. Concurrently, clearly defined EI targets must be established to advance Energy Democracy and promote Equitable Distribution. Despite the positive note from the literature of a CSR/SI opportunity, I still anticipate, considering my philosophical position of Critical Realism, that most companies will be hesitant to go this far beyond CSR, as such a program increases cost, is complex to plan and manage and risk are difficult to identify and mitigate. This research aims to reduce prevailing hesitancy by identifying and addressing key challenges and, more importantly, identifying avenues for further research.

Social Entrepreneurship (SE) is an objective of and supported by, the social (CSR/SI) program. Both terms, SE and SI, are ambiguous encountered in this research thesis because they overlap in both objectives, goals and stakeholders. The primary goal is to create and foster a SI ecosystem to create opportunities for SE. The effort to merge commercial and social structures, processes and governance increases complexity and may require different corporate legal models to facilitate funding and taxes. (Battilana & Lee, 2014, as cited in Logue, 2019, p. 8; Powell & Sandholtz, 2012, as cited in Logue, 2019, p. 8). Moreover, because the commercial revenue and the social value is not achieved in a single transition. Commercial investment is relative high, commercial customers and social beneficiaries are different and the differentiated (Coupled) hybrid organisation can create resource allocation challenges, especially when financial sustainability is strained (Santos et al., 2015, as cited in Logue, 2019, p. 10, chapter 6). To be able to achieve a SI ecosystem and foster SE, a social enterprise needs to be established. The CSR/SI Partnership

Committee (the former EIC) comprising of the foremost stakeholders, i.e. ETDP, government and community agent, are responsible and serve as a steering board of the social enterprise. The social enterprise will have an executive management team that runs the day to day business. The business model for this social enterprise needs a hybrid ownership structure, to be defined collaboratively with relevant stakeholders in accordance with the national juridical framework. One of the objectives of the CSR/SI social enterprise is creating an SI ecosystem by changing the social relations among the broader stakeholders. This is done through learning, capacity building, participation, etc. and elaborated in the hereafter discussion on the third research question. Responsible for communication, the social enterprise follows up on EI opportunities supporting SE by coordinating both social and financial resources. The CSR/SI social enterprise's legal entity requires resources like human capital, office space, etc., which can be offered by the collaborating partners, but it also require startup capital. Next to a startup capital, the business budget for a multiple year working capital needs to keep the social enterprise operating and should include an investment fund.

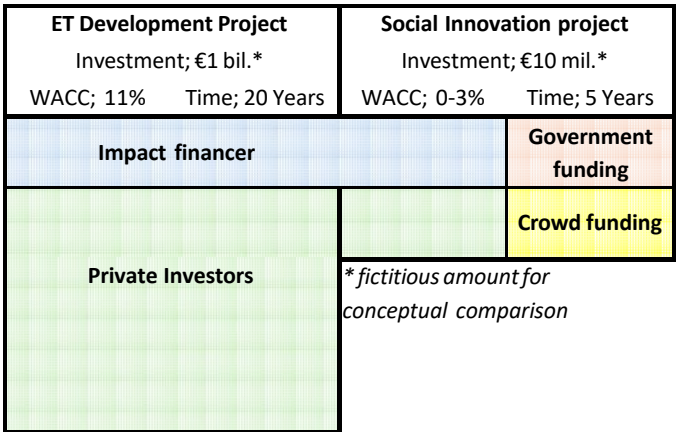


Figure. 5.1: *Conceptual financing approach for various funding institutions (Author,*

This to fund individuals and SME's through microfinance, microcredits, micro-insurance and micro-leasing to foster economic advancement in economically deprived

communities through trade opportunities (Mair et al., 2012, as cited in Logue, D., 2019, pg. 32, chapter 3). As sector boundaries blur, non-profits, governments and businesses increasingly blend funding sources and operational models to create sustainable or even profitable social innovations (Phills Jr. et al., 2008). It is recommended to apply a Blended Finance approach covering ETDP and the social enterprise and conceptually shown in figure 5.1. Impact investing organisations could boost their financial returns by also investing in the industrial project under commercial terms, increases their average rate of return on their total investment. By combining public and private equity funding, this model would support both the realisation of the industrial project and the implementation of the CSR/SI project. Blended Finance helps to de-risk investments in social programs, expand available funding through multiple funding sources and enhance the private company's ability to fulfil and amplify its CSR commitments. The SI project can also consider Innovative funding models such as carbon credit financing that are gaining traction as tools for businesses to offset unavoidable emissions and meet sustainability targets. Operating through voluntary certified markets, each credit represents one ton of CO_2 offset and supports nature restoration. Examples include a Kenyan mangrove regeneration project generating tradable credits (Medeleanu et al., 2024) and DGB Group's large-scale reforestation initiatives linking carbon mitigation with biodiversity, wildlife protection and community development (DGB Group, 2025). As previously noted and confirmed through informal discussions with NGO finance professionals, private equity investors are likely to remain cautious about entering complex multi-stakeholder financing structures, given the divergent objectives and elevated risk profiles. Nonetheless, recent literature report on new trends in blended social–private funding indicating a move into novel financing models.

System context of countries vary and the type of systems of a country do shape policymaking in social and economic spheres. Understanding how different governmental authority systems influence SI is essential for assessing their impact on social dynamics and the creation of shared social value, needed to design and plan SI. The scoring framework reveals that from the nine distinct governance and social systems the most supportive system combinations include democracy, democratic socialism, class system, common law, civilian-controlled military, unitary governance, free press, open digital infrastructure and a secular culture. They align with Exceptionism and Subjectivism in quadrant 3 and 4 of the Inglehart and Welzel's Cultural Map (WVS, 2005), figure 4.9. The for comparing countries of Brazil, Namibia and South Africa, fall respectively in quadrant 5, 1 and 5 of the Inglehart and Welzel's Cultural Map and score for the system context 35, 42 and 38 respectively (Appendix E). All countries examined operate within multicultural contexts. Brazil stands out as the only country with a common law system, whereas the others follow mixed legal systems. Namibia scores higher under the assumption of a more pronounced patronage/clientelism dynamic, a pattern frequently observed in parts of Africa. While similar tendencies exist in South Africa, its prevailing class-based structure is considered the dominant system. Brazil's placement in quadrant 5 of the Inglehart and Welzel's Cultural Map reflects the coexistence of a robust democratic framework and a predominantly Catholic population, producing a combination of secular and traditional religious values. Namibia being more rural orientated and less economically developed is positioned in quadrant 1, having stronger traditional and survival values. In Namibia the emphasis of SI design needs to be on common community and family values and less on democratic processes. Important to note is that systems are not static, which is illustrated by longstanding democracies such as those in Europe and the United States that show a recent shifts toward the (far) right, underscoring the limitations of the simplified scoring

framework, of high, medium, low, which remain inherently subjective and dependent on the evaluator's perspective. Moreover, the relative significance of different systems within a country varies and numerous subtleties may influence the scoring interpretation. These observations highlight the necessity of a nuanced analysis for effective SI design, with the scoring methodology serving as a discussion tool.

The **process design** for the ETDP consortium is to focus its SI efforts on targeted products and services that address specific social challenges or generate value for defined community segments rather than on overall systemic change. The ETDP consortium needs to rely on innovative stakeholder collaboration to generate social impact and hence is to be guided by a hybrid Universal–Managerial–Comparative Social Innovation approach, applying a participative-assisted SI environment in which ETDP stakeholders actively support initiatives aligned with the agreed CSR/SI program's objectives. The program objectives aim to empower all stakeholders through restructuring relationships. Although generalised, these recommendations are the guidelines for all CSR/SI stakeholders. Effective SI design must encompass the socio-political capacities of communities, businesses and governments. Businesses need socio-political capabilities to manage risks, influence policy and build trust by aligning with societal values. Strengthening these capabilities involves adopting a political lens, engaging diverse perspectives and forming strategic partnerships around CSR and social innovation initiatives. Moulaert, F. et al.'s (2005) three-stage SI framework of, comprising, problem and opportunity identification, transformation of social relations and community empowerment, serves as the foundation for establishing the SI program. The approach embeds a collaborative process of community co-creation across all phases of the ETDP lifecycle, described under research question 3.

Social value outcome refers to the non-financial benefits that enhance well-being, equity, access, empowerment and sustainability for individuals, communities, or the environment. It emerges most strongly at LeiM levels 4–9, where interventions transform social relations and strengthen socio-political capacities and resource access. The LeiM indicators are often holistic and although there are ETD Project related indicators, these are mainly in support of creating a SI ecosystem, not measuring actual social value added or its impact. Monitoring social value is desired to know real progress, to maximise the potential social impact (Kroeger and Weber, 2014, as cited in Logue, D., 2019, p. 24, chapter 6), and importantly demonstrate and communicate this to gain community support in the CSR/SI projects. Additionally, combining economic and social indicator reporting broadens market participation, facilitates equitable economic exchanges and promote local empowerment and well-being (Le Ber, Bansal, & Branzei, 2010, as sited in Grieco, C. et al., 2014, pg. 3). The business model, hybrid in both ownership and financing, needs to assess its performance across economic, social and environmental domains to understand where value is being created. Emerson (2003, as cited in Logue, 2019, p. 29, chapter 6), advocates therefore for improved social management information and the development of a common set of metrics or a shared language for measuring value creation. The LeiM is a first initiative to establish a common set of metrics within the ET domain, impacting all key socioeconomic development issues. To be able to monitor and consolidate a wider range of qualitative and quantitative indices across several social, economic and environmental domains, an existing tool from the business management theory, the Balance Scorecard Strategy Map (Kaplan, R. & Norton P., 2001), will certainly increase transparency of progress and assist in decision making. The need for a common set of metrics as advocated by Emerson's is likely only partially obtainable due to the large variation of the type of social values and the complexity in how value added is perceived.

A strategic mapping framework for hybrid social enterprises on the basis of the Balance Scorecard Strategy Map is a condition for any hybrid key performance indicator system. Further research is recommended to develop a scorecard framework within the SI domain, thereby incorporating a standardised set of social indicators.

SI depends on four **key resource types**, namely social capital for community mobilisation and legitimacy, institutional support and policy frameworks to enable and legitimise initiatives and financial resources, from grants, investors, or donations, to fund and sustain programs. Physical infrastructure, such as facilities and digital capacity, to support operations are normally assigned to financial resources. The resource typology offers a multidimensional framework to understand what drives SI and how each domain plays a distinct role. Being outside the scope of this research, it is valuable to examine how digital social capital, such as online communities and online platform networks, can assist in determining how communities perceive social value created by SI initiatives. This is an important issue in scoring and evaluating LeiM level 9, Distributive Justice.

A **Social Economy** is characterised by distributed networks, blurred boundaries between production and consumption and a shift toward collaboration, care and sustained interaction rather than transactional exchange (Murray, R., et al., 2010). In a Social Economy system composed there are six key interfaces between the four sub-economies. When analysing the number and type of resource exchanged between the sub-economies it is observed that the majority of exchanges is received by the Grant economy, predominantly from the Household economy in all resource types. Both the Market and Household economies show a higher number of finance resource interfaces (giving), while the State economy lacks herein behind. This relativity analyses suggests a position of a CSR/SI project inside a Social Economy towards the lower-middle part of figure 4.2, between the Household and Grant Economy. This may be perceived as inequitable by the

stakeholders of the Social Economy and may hamper collaboration and success of SI objectives. It underscores the need to emphasis on institutional support and financial incentives from government, alongside the private investment and input of knowledge and expertise from the private sector (ETDP developer). This does not include the quantification of financial resources and if this is considered, it needs to be offset by the quantification of the social resources, which are difficult to quantify. A twostep approach of first addressing the perceived input of the stakeholders and second, considering the quantification of the social resources, simplifies the cooperation process.

Projecting **Forsyth's Ethics Position** on **Inglehart and Welzel's World Cultural map** (figure 4.9) learns that more democratic orientated countries correspond predominantly with Secular-Rational values and Exceptionism/Subjectivism (figure 4.11), where Exceptionists balance moral rules with contextual exceptions and Subjectivism diverges from traditional and survival values, to elevate individual autonomy and diversity. Identifying a consistent rational overlap between countries and value quadrants proves challenging, as the current classification relies on subjective three-point scoring derived from interpretive readings of theoretical definitions, rather than on validated numerical analysis. This limitation is inherent to the method. Moreover, discrepancies with forthcoming survey data are likely, given that the dominant psychological–ethical orientations within nations may span any position across the two axes of Welzel's World Cultural Map. Theory predicts an influence of psychology and system on EI LeiM level 9 scoring. Psychology not being an exact science the argued relationship from the theory requires further research to determine to what extend a correlation exist and which factors influence that scoring, e.g. system reality, population demography. Both theorist having globally conducted surveys which make the LeiM level 9 benchmarkable across nations. These surveys are not all recent publicly accessible, while survey results may change over

time with changing system reality and socioeconomic circumstances. Therefore LeiM level 9 scoring is more relevant at ETDP level and needs to serve as an evaluation of increasing communities when SI initiatives are reproduced and scaled up. Benchmarking among ETDP's, around the world, national or regional may develop, while surveys need to be periodically conducted. A further interesting question is to what extend values and norms related to EI can be influenced by training, education, communication at EDTP level.

5.3 Plan and implement an SI project.

The third applied research question, is how to plan, implement and monitor EI objectives of the SI project throughout the life cycle of an ETDP, i.e. the Blueprint. The implementation guidelines are interwoven with the LeiM and follows the 3 steps SI design of table 4.26. A six stage approach is presented, which has an intended sequence, however, in practise stages may be executed concurrently.

1 - Establishing an investigative CSR/SI partnership committee.

In line with LeiM level 6, an Energy Inclusion Coalition (EIC) needs to be formed with government to open dialog and identify shared objectives for a CSR/SI initiative. The EIC's first task is to ensure legitimate, fit-for-purpose community representation that aligns with SI aims in the neighbouring community. The EIC is led by the ETDP business and includes government representatives and community actors/representatives. The EIC needs to evolve to a **CSR/SI partnership committee** (CSP) and requires a formal agreement among the stakeholders and a juridical entity to manage resources while its core responsibilities are to steer SI planning, commission and oversee studies, evaluate progress, coordinate finance with the ETDP and operationalise SI activities. It is essential to define clear roles, decision rights and reporting lines between the CSP and the main SI/SE project, provide transparent budgeting with a fiduciary mechanism for managing SI and SE funds. The CSP needs to establish robust procedures for adaptive management, continuous

monitoring and independent evaluation. Partnership negotiation should move away from zero sum bargaining toward a co-creative, value maximisation approach that seeks to expand collective benefits rather than simply divide them. Applying a Collaborative Advantage framework, partners jointly explore collaborative mechanisms that unlock additional value and encourage ambitious, iterative ideation. This framework's four pillars, fundamentals, relationship dynamics, structure and set up and ongoing management, must be deliberately developed and sustained to ensure resilient, high impact collaboration (Stibbe et al., 2020). The four pillars need to serve as an analytical lens to assess partnership design, performance and the influence of legal form and community representation on SI outcomes. Thereby the CSP need to treat the SI/SE project team as distinct but interconnected governance layers. A Collaborative Advantage framework corresponds with Stakeholder Analyses, addressed in step 3.

2 - SI/SE project definition and defining SI/SE objectives

The SI/SE project definition relates to the type of energy transition business opportunities, including production, distribution, resource needs, technical context and employment potential. The goal is to identify how SE and innovation in the local community can be supported. A key step is evaluating the project and region according the systematic framework of this research and summarised in chapter VI.

3 - Changing social relations

Moulaert et al. (2005), identify the alignment of SI objectives with a stakeholder analysis as a critical design element. This process provides insight into how existing social relations may need to evolve throughout the implementation of the SI project. A stakeholder analysis identifies and assesses key actors, such as community groups, NGOs and individuals, who can influence the outcomes of a SI project. It evaluates their motivations, interests and potential impact, helping to prioritise engagement strategies.

This process supports effective communication, negotiation and relationship-building to gain support, reduce resistance and co-create solutions. Crucially, it facilitates alignment with SI goals to foster commitment, strengthen partnerships and promote stakeholder ownership. While an in-depth exploration of stakeholder analysis literature within the social innovation (SI) context falls outside the scope of this research, tailored stakeholder analysis models, derived from relevant theoretical frameworks, are provided in Appendix D to support the SI project's analytical approach.

4 - Identifying empowerment dimensions

Empowerment involves fostering active community participation, collective action and cross-community networking to promote shared goals and decision-making. It also includes improving access to essential resources, such as healthcare, education and social welfare, to enhance equity and quality of life, especially for marginalised groups (Dushkova, D. & Ivlieva, O. 2024). To support SI objectives, sociopolitical capacity skills must be identified, both generally and in relation to SE and need to be developed through training, education, workshops and coaching, focused on community participation, collective decision-making, leadership and SME development. A level-based approach may be applied, tailored to varying roles, education and professional backgrounds within the community. The overarching aim is to build individual and collective capacity for self-reliance and sustainable development. For the three stakeholders, Community, Business, Government four empowerment tool matrixes are developed that are shown in Appendix H. The first matrix, titled Learning, Education & Training, outlines the overarching objectives for each stakeholder, identifies relevant empowerment domains and specifies the specific educational or training topics to be addressed. The second matrix, Capacity Building, serves as a preparatory stage for the third matrix, Participation, Collective Action and Networking and outlines the type of tools to be employed, i.e. training, education and

communication, to support stakeholder engagement and development. The Participation, Collective Action and Networking tool matrix give the guidelines and key goals for collaborative management and establishing the CSP and SI/SE executive management teams. The last two tool matrices, Integration of Local Knowledge and Values and Access to Resources and Services, provide successively guidance for fostering collaboration and alignment and commitment and outcome, within a CSR/SI project. Within the ETDP, the Levelized Energy Inclusion Model (LeiM) serves as one of the principal instruments for outcome assessment anchoring the LeiM within the project.

5 – Guide & Sustain; The six stages of social innovation

Social Innovation typically unfolds through six progressive stages (Murray's, R., et al., 2010). Identifying root causes and setting goals, generating and refining ideas, testing solutions through pilots, embedding successful models into practice, scaling through networks and demand and ultimately driving systemic change in institutions and societal norms. Seelos, C. and Mair, J. (2012), propose six actionable recommendations to guide and sustain social innovation (SI).

- Treat innovation as ongoing: Link activities to real outcomes and invest time, money and support based on evidence.
- View innovation as an independent variable: Track ripple effects and assess value creation.
- Map innovation stages and analyse across levels: Individuals generate ideas, groups evaluate them, leadership formalises them and broader context influences all stages.
- Manage hidden dynamics: Address the organisation's cognitive, cultural and political barriers. Design interventions.

- Learn over time: Use longitudinal insights to build innovation capacity through ongoing learning.
- Adapt to context: Tailor approaches to local cultures and geographies.

These guidelines assume the existence of a functioning social innovation (SI) organisation with a defined authority structure, allocated resources and clear responsibilities. However, the division between a steering CSP and an executing SI management team, comprising possibly community volunteers, NGOs and government staff, can complicate the practical application of the six steps. This complexity is further heightened by the guideline's ambiguity, as they address both internal organisational dynamics and the external environment. Therefore these guidelines and the implicit responsibilities, need to be carefully considered when selecting a SI/SE legal entity to govern the executing SI management team within the SI stakeholder ecosystem (figure 4.12).

6 – Communication

In SI, effective communication design is vital for fostering engagement, clarity and impact. It enhances visibility, supports ideation and co-creation, mediates stakeholder interaction and facilitates the prototyping and dissemination of solutions (Melo, A. & Neves, M., 2022). Operational effectiveness depends on clearly conveying project benefits and fostering collaborative advantage. Three key communication methods support this process (Transform, 2020):

- Regular team meetings to ensure alignment, progress sharing and issue resolution.
- Cross-functional workshops to bring diverse stakeholders together to identify needs, opportunities and constraints.

- Digital collaboration tools maintain cohesion and engagement in distributed or hybrid environments.

These methods are essential within the Empowerment Tools framework, particularly for Capacity Building, Participation, Collective Action & Networking and Integration of Local Knowledge and Values.

CHAPTER VI

SUMMARY, IMPLICATIONS AND RECOMMENDATIONS

6.1 Summary & Implications

This research adopted an abdicative approach, delving deeper into existing literature, but remained within the existing theoretical framework of Energy Inclusion and Social Innovation. Of the four hypotheses proposed, two are demonstrably most aligned with the research objectives. Hypothesis H2, advocating for the decoupling of Energy Inclusion (EI) measurement from the governmental Energy Transition (ET) framework and the adoption of a Two-Factor Multi-Continuum EI Sliding Scale, is accepted. In addition, Hypothesis H3 is also validated, as the findings indicate that Social Innovation (SI) plays a substantive role in advancing EI by integrating it into CSR initiatives at the project level.

Survey

The survey conducted to gauge the level of agreement, comprehension and consistency around the LeiM topics, showed only two LeiM levels of the Hygiene Factor ranked in the top five of the perceived order of importance. The majority of responses come from the private sector, who need to take the lead to move beyond CSR and get a SI and EI initiative starting. All respondents agree that private investors should support and invest in SI, while 3 respondents did not agree with government support for SI and 2 of the 16 respondents, both from RSA, did not believe a formal public-private SI collaboration will be successful. Consistent with the literature's absence of a uniform definition of EI, it appears that respondents may not have fully grasped the LeiM terminology and definitions, nor the underlying concepts of SI. Without a proper understanding of the LeiM terminology and its definitions, nor the underlying concepts of SI, it is indeed difficult to align stakeholders for a CSR/SI collaboration.

The survey tells us that proper information and a communication campaign is required before a collaboration and EIC can commence.

Levelized Energy Inclusion Method

Broome, A. and Quirk, J. (2015) observe that key indicators require to both 'neutralise' and 'universalise' a range of overlapping normative values within the economic, political, social and market domains. It involves three forms of comparative assessments, i.e. the quality of conduct, the quality of design and the quality of outcomes. The LeiM methodology establishes an international normative standard for EI by addressing the quality of design with a overlapping framework based on the literature and with data from international governance institutions. The quality of outcomes of the indicators relies on this quality of design, where the quality of conduct rests with the nations upholding their responsibilities related to the international indicators. Such quality of conduct is also expected from the public-private partners using the LeiM. The LeiM functions as a global benchmarking model that operates at both national and local levels. It enables international actors to assess and influence country-level EI performance, while also serving as a practical tool for local project teams and community stakeholders to monitor progress, refine strategies and align initiatives with internationally standardised EI standards. The observation that Energy Democracy does improve the EI score without having maximised the Hygiene Factors, raises the two questions. Do more democratic orientated countries an advantage to leverage higher EI scores just through their system and is it needed to introduce a weighing factor? The ultimate EI is found in Power Decentralisation, Equitable Distribution and Distribute Justice, which opens the door to SI and socioeconomic development. These are also influencing the Purpose Factors although they are (for now) more local and practical orientated. Government participation here is important to remain with Broome's, A. and Quirk's, J. (2015), requirements of being both

‘neutral’ and ‘universal’. Further, LeiM 7, Energy Burden is, not correlated to Energy Democracy, keeping the balance in the Purpose Factor domain. The observed prominence of democratic processes substantiates the classification of the LeiM framework as a Multi-Continuum model, characterised by multiple overlapping level indicators that each contribute independently to the overall level of Energy Inclusion. Monitoring the trend over time and empirical observations during ETDP application, will need to determine if a weighing factor will bring focus on addressing the Hygiene Factors.

Social Innovation

Social value denotes the tangible and intangible benefits generated for communities, individuals, or the environment. Measuring social impact or social value creation is important to know if real progress is being made and if the potential positive social impact is maximised. This is challenging because of the conversion of qualitative data into quantitative metrics. The Balance Scorecard Strategic Map (Kaplan, R. & Norton P., 2001), is a recommended management tool to combine qualitative and quantitative data in one metrics framework. Inclusive capitalism seeks to align economic value creation with social justice and environmental stewardship, guided by the UN SDGs. The LeiM operationalises this vision by integrating SI into ETDPs. Together with the Social Economy framework (Murray, R. et al., 2010), these approaches provide long-term, value-driven strategies tailored to local socio-economic contexts. With this the relationship between business and community is becoming strategically important due to the growing convergence of profit and non-profit sectors and the emergence of hybrid models like SE’s. The Balance Scorecard Strategic Map (Kaplan, R. & Norton P., 2001) is a proven method used to evaluate strategic progress in organisations. Few literature papers were found on integrating the Balance Score Card in Social enterprises, but no applied research was encountered with regards to use of the Balance Score Card Strategic Map. Syrjä, P. et al.

(2014) observed that measuring a social value creation is not as straightforward as it is for a common service or production value chain. Mamabolo, A. & Myres, K. (2019), highlight the importance of performance measurement in social enterprises, noting the lack of consensus on suitable tools, particularly in emerging markets. To address this, they developed an adapted balanced scorecard tailored for enterprises without established measurement frameworks. Further applied research to assist LeiM implementation is recommended.

6.2 LeiM-SI Analyses Framework Summary

Table 6.1

LeiM-SI Systematic framework analyses

Systematic framework analyses	Brazil	South Africa	Namibia	World
Overal EI LeiM score	**58.3**	**52.3**	**52.8**	**62.8**
System context score	**35**	**38**	**42**	**-**
SI socioeconomic analyses				
- Ratio of Rural vs Urban population	0.14	0.46	0.85	0.76
- Access to electricity, urban (% of urban population)	100	87.1	74.8	97.64
- Access to electricity, rural (% of rural population)	97.3	93.4	33.2	83.89
- Industry value added (GDP) / Services value added (GDP)	0.39	0.40	0.49	0.44
- GDP (current US$)	1,952	407	13	101,771
- Services, value added (% of GDP)	58.09	62.26	55.47	61.76
- Services, value added (US$)	1,134	253	7.0	62,854
- Labor force % of Population	50.6%	42.0%	37.0%	44.6%
- Total Unemployment (% of labour force)	9.23	28.83	19.77	5.27
- Self-employed, total (% of total employment)	32.13	28.99	39.00	48.10
- Vulnerable employment, total (% of total employment)	27.74	24.23	32.28	44.92
Inglehart and Welzel's World Cultural map; Quadrant	**5**	**5**	**1**	**5**
EI Allignment Score	2.44	2.44	**2.21**	2.44

LeiM score

Brazil's EI score of 58.3 lies below the global average of 62.8, driven by weaker performance in Environmental Protection (LeiM 1) and high Energy Poverty (LeiM 3), yet bolstered by stronger results in Physical Energy Insecurity (LeiM 2) and Energy Democracy (LeiM 5). Namibia also falls short of the world average but ranks slightly above the West and Central Africa region, showing similarly strong Energy Democracy scores. These patterns indicate that gains in Energy Democracy can significantly elevate overall

inclusion levels despite lagging foundational hygiene factors. Improvement opportunities in both countries are most evident within the Purpose Factors, where democratic collaboration at the ETDP level plays a pivotal role. At the localised ETDP level, targeted progress in LeiM 1 (Environmental and Pollution Reduction) and LeiM 2 (Physical Energy Insecurity) may also benefit communities.

System context

Brazil, Namibia and South Africa have a respective context score of 35, 42 and 38. All countries examined operate within multicultural contexts. Brazil uniquely adheres to a common law system, while Namibia and South Africa employ mixed legal systems. Namibia scores higher under the assumption of a more pronounced patronage/clientelism dynamic, a pattern frequently observed in parts of Africa. While similar tendencies exist in South Africa, its prevailing class-based structure is considered the dominant system. This imply that Brazil has a more favourite system for SI, followed by South Africa and last being Namibia.

Social Innovation; socioeconomic

Analysing the socioeconomic context of the three countries shows Brazil's population being predominantly urban, with a rural/urban ratio of 0.14 against 0.76 globally. Electricity access in Brazil is nearly universal, 100% in urban areas and 97.3% in rural areas. This is contrast with Namibia where 74.8% of the urban population have access to electricity and the rural population 33.2%. This is explained by a low Physical Energy Insecurity score of 38.7, half of that of Brazil (78.2). For South Africa the urban and rural electricity access is respectively 87.1% and 93.4%. South Africa has a Physical Energy Insecurity score of 70.5%. Where a low Physical Energy Insecurity score in Namibia corresponds with lower percentages of electricity access, for South Africa this does not seem to be the case. South Africa scores 70.5 for LeiM 2. This because RSA scores much

higher on the access to clean fuels and technologies for cooking than Namibia, while fixed broadband and telephone subscriptions are for both RSA and Namibia low, about 16% of world average. The higher use of clean fuels, like LPG, is reflected in a low average yearly electricity consumption per household, 7% of world average. Currently RSA has a electricity generation capacity problem and implemented load scheduling, whereby city areas only have electricity at certain hours in a day. This shows there is a coherence in the LeiM and serves as an analysing tool. Where high baseline infrastructure metrics suggest a strong platform for advancing EI specific in the Purpose Factors, it also shows the opportunity for clean fuels to advance the overall EI score. Despite having a well-developed and growing services sector that supports social entrepreneurship, Brazil's services contribution to GDP lags behind the global (0.44) averages. Widespread mobile

Internet penetration, reflected in high mobile-subscription rates relative to fixed broadband, creates fertile ground for technology-driven SI (Appendix D). A large active labour force (50.6% participation) and moderate unemployment (9.28%) underpin stable consumer demand and public finances, while a 32% self-employment rate, 27.7% of which is vulnerable employment, highlights the need for both entrepreneurial innovation and the need to strengthen formal work opportunities. Concluding, the EI levels being similar, Brazil, because of a higher GDP, seems to have the better SI environment, followed by RSA. The general conclusion is in line with average EI alignment scores of the nations (appendix F), as all, except Namibia, are centrally positioned in the Inglehart and Welzel's World Cultural map in quadrant 5.

6.3 Recommendations for Future Research

Introducing a universal indicator methodology for Energy Inclusion is a critical first step, however ensuring its ongoing relevance and integration into ETDPs presents a distinct

challenge. Several applied research priorities must be addressed to strengthen the link between the LeiM framework and its practical implementation. These are outlined below.

- Business Management tools to be used with SI/EI projects and reinforcing the LeiM implementation guidelines:
  - SI/EI integrated Stakeholder analyses and management.
  - Balance Score Card, inclusive of the Strategy Map including SI/EI.
  - Social Impact Assessment and social value creation methods applied to an ETDP or related CSR/SI/SE program.
- Applied or empirical research of an actual ETDP to evaluate the SI processes and contribute to replication of projects.
- Research on using a hybrid financing model for a social enterprise organisation in line with a CSR/SI objective as discussed in this research.

6.4 Conclusion

This study proposes a non-financial business framework that integrates SI to advance EI. It enables collaborative partnerships among public, private and community actors and introduces benchmarkable performance indicators to assess and monitor EI and SI outcomes across diverse geographic and socioeconomic contexts. By offering an inclusive, measurable and adaptable foundation for both developed and developing regions, the framework aligns social equity with sustainable energy development. The gap between private investors and EI further underscores the need to embed inclusion objectives from the earliest stages of project planning and investment decision-making in the energy transition.

APPENDIX A

THEMATIC MATRIX FRAMEWORK

	Energy Inclusion		Social Innovation	
	Definition	Bench-marking	Outcome	Design
Global Reality				
Definition of reality				x
Global benchmarking				x
Environment; Pollution Reduction	x	x		x
Polution reduction	x	x	P	
Policies	x	x	G	
Monitoring	x	x	P	
Air & Ozon	x	x		
Water quality	x	x		
Waste water	x	x		
Soil	x	x		
Solid waste	x	x		
Noise	x	x		
Enforcement	x	x	G	
Instruments	x	x	G	
Reporting	x	x	P	x
Physical Energy Insecurity	x	x		
Housing infrastructure	x	x	G+P	
Electricity infrastructure	x	x	G	
Energy Poverty	x	x		
Measuring Access to Electricity	x	x	G	
Capacity	x	x		
Availability	x	x		
Reliability	x	x		
Health & Safety	x	x		
Measuring Access to Energy	x	x	G+P	
Cooking & Heating	x	x		
Energy Justice/Equity	x	x	G	x
Procedural justice	x	x		
Recognitional justice	x	x		
Distributive justice	x	x		
Environmental/Climate Justice	x	x	G	
Information sharing	x	x		x
Seeking legal rights	x	x		x
Participating in decision-making	x	x		x
Energy Democracy	x	x	G+P	x
Power Decentralisation	x	x		
Community ownership and control	x	x	G+P+C	x
Community power model legislation	x	x	G	
Renovating renewable heating systems	x	x	G	
Local authorities as energy transition managers	x	x	G	
Smart Grids	x	x	G+C	
Energy Burden	x	x		
Equitable Distribution	x	x		
Distributive Justice	x	x		

Table A1: *Thematic matrix framework constructed during the main literature research;* ***Energy Inclusion****. (P= Private, G=Government, C=Community)*

	Social Innovation	
	Outcome	Design
System context		x
Political Systems		
Economic systems		
Legal and Judicial Systems		
Governance and Administrative Systems		
Technological and Cyber Systems		
Social Systems		
Security and Military Systems		
Media and Information Systems & Subsystems		
Cultural and Religious Systems		
Ethics and Values context		x
Inglehart-Welzel Global Cultural Map		
Ethics Position Theory		
Social demand		x
Social needs and Value	x	x
Process Design		x
Social Innovation system environment		x
Socio-political capabilities		x
Scial resources	x	x
Shared contribution	x	x
Social value	x	x
Funding Models		x
Business Models		x
Social Enteprise	x	x
CSR		x
Inclusive Capatalism		x
Social economy	x	x
Change Management		x

Table A.2

Thematic matrix framework constructed during the main research; ***Social Innovation****.*

APPENDIX B

SURVEY QUESTIONNAIRE

- **Dear participant,**

  Thank you for your participation in my PhD research on Energy Inclusion (EI) and Social Innovation (SI). Your participation is very important to me and has a significant contribution to a Just Energy Transition. In my research I define Energy Inclusion and develop an EI global comparison model at country and project level, I also develop an Social Innovation business model to foster social entrepreneurship within the Energy Transition domain.
  The collected data will be analysed anonymously and your participation is completely voluntary!
  If you have any questions or comments please do contact me; Cornelis Hulst at cornelis@ssbm.ch
  The questionnaire takes 10 to 15 minutes to complete.
  Thank you very much!

- ---

1. **In which country do your reside?**

   -- Please choose --

- ---

2. **In which sector are you working?**

   This information makes statistical comparison of the survey information possible. You can only give one answer.

   - ☐ Private Business
   - ☐ Government
   - ☐ Education/Knowledge
   - ☐ None of the above

- ---

3. **What is your function?**

   This information makes statistical comparison of the survey information possible.
   You can only give one answer.

   - ☐ Management
   - ☐ Line Staff / Employee
   - ☐ Independent contractor
   - ☐ Teaching/Research
   - ☐ Student
   - ☐ n/a

- ---

4. **Please indicate your gender?**

This information makes statistical comparison of the survey information possible. You can give more than one answer.

- ☐ Male
- ☐ Female
- ☐ Non-binary
- ☐ Third gender
- ☐ Prefer not to say

---

5. **What is your age range?**

This information makes statistical comparison of the survey information possible. You can only give one answer.

- ☐ 25
- ☐ 25 – 50
- ☐ 50 –

Energy Inclusion; Key Topics

6. **Please indicate to what extend you find an Energy inclusion topic important.**

1 being of low importance, 5 being of high importance.

Energy Inclusion is a broad concept containing different topics that are all contributing to an overall Just Energy Inclusion level.
Below is a breakdown of these key topics.

- ❖ Environmental protection
- ❖ Pollution control & reduction
- ❖ Household energy infrastructure
- ❖ Reliability & capacity of electricity supply
- ❖ Fairness in environmental juridical processes/outcomes
- ❖ Recognition of minority and indigenous communities
- ❖ Democracy & people political representation
- ❖ Community decision power in the energy system
- ❖ Community ownership in the energy system
- ❖ Affordable energy prices for all
- ❖ Fair distribution of environmental cost and benefits
- ❖ Equal exposure to environmental hazards
- ❖ Social benefits; Education, employment, health
- ❖ Fairness in energy inclusion; equity in possibility to use energy according need by all

---

Social Innovation; Value Drivers

7. The Business Sector!

Please indicate to what extend you find a Value Driver important.
1 being of low importance, 5 being of high importance.

Value drivers in social innovation vary by sector, i.e. business, government, and community, but they often overlap.
Social innovation aims to create solutions to social challenges that are more effective, efficient, sustainable, or just than existing alternatives.
Below is a breakdown of value drivers related to the business sector.

- Going beyond Corporate Social Responsibility (CSR)
- Creation of new markets by addressing community social needs
- To attract and retain talent by working in a purpose driven organisation
- License to operate: community having trust in regulatory affairs and firm's reputation
- Having access to impact investment to be able to deliver both financial & social returns
- A long-term profitability objective, thereby reducing system risk resulting in sustainable business

---

8. The Government Sector!

Please indicate to what extend you find a Value Driver important.
1 being of low importance, 5 being of high importance.

Value drivers in social innovation vary by sector, i.e. business, government, and community, but they often overlap.
Social innovation aims to create solutions to social challenges that are more effective, efficient, sustainable, or just than existing alternatives.
Below is a breakdown of value drivers related to the government sector.

- Improve policy effectiveness with community co-design to enhance public service delivery
- Reduce spending in health, social care, etc. through community-driven innovations
- Strengthen trust & democratic participation in processes through citizens engagement
- Enabling effective partnerships with NGOs & private actors by fostering cross-sector collaboration
- Apply adaptive governance to create agility and responsiveness in policy making & implementation

---

9. The Community!

Please indicate to what extend you find a Value Driver important.
1 being of low importance, 5 being of high importance.

Value drivers in social innovation vary by sector, i.e. business, government, and community, but they often overlap.
Social innovation aims to create solutions to social challenges that are more effective, efficient, sustainable, or just than existing alternatives.
Below is a breakdown of value drivers related to the community.

- Enable the use of community's own knowledge and resources to address local challenges
- Foster trust, cooperation, and stronger networks within and between communities
- Build community resilience in the face of crises; e.g., climate change, economic shocks
- To include marginalised people in problem-solving and the benefits from the outcomes
- Successful grassroots innovations need to influence policies for up scaling the social impact

---

10. Reporting in Social & Energy Aspects

Please rate the importance of the below issues.

- Social & Governance (ESG) reporting in annual company reports.
- Companies applying a Triple Bottom Line framework measuring next to financial performance, social & environmental impacts.
- Governments & private companies to share publicly information on environmental pollution levels, incidents and mitigating efforts.

---

11. Do you feel investors in Energy Transition Projects should support and invest in Social Innovation programs of the neighbouring community?

- ☐ Yes
- ☐ No

12. Do you feel government should contribute jointly with the investor to such Social Innovation program?

- ☐ yes
- ☐ no

13. Do you believe a structured formal collaboration between private investor, government and the community does make a Social Innovation program successful?

- ☐ yes
- ☐ no

You have completed the questionnaire, thank you very much!

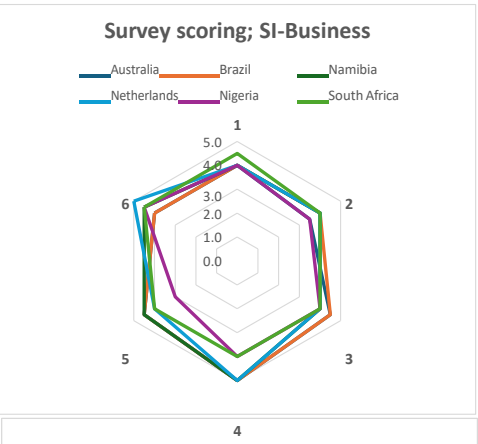
APPENDIX C

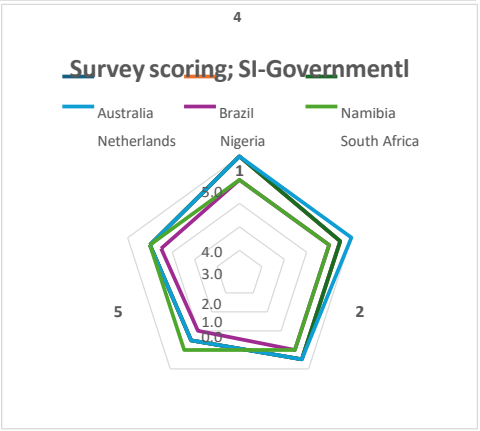
ENERGY INCLUSION SURVEY RESULTS

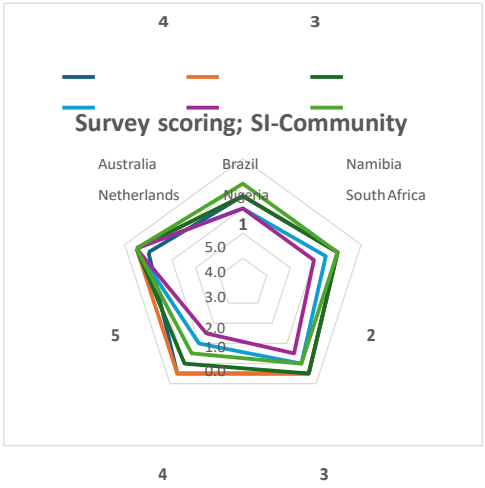
Social Innovation; Value Drivers - Business	
1	v Going beyond Corporate Social Responsibility (CSR)
2	v Creation of new markets by addressing community social needs
3	v To attract and retain talent by working in a purpose driven organisation
4	v License to operate: community having trust in regulatory affairs and
5	v Having access to impact investment to be able to deliver both financial & social returns
6	v A long-term profitability objective, thereby reducing system risk resulting in sustainable business

Social Innovation; Value Drivers - Government	
1	v Improve policy effectiveness with community co-design to enhance public service delivery
2	v Reduce spending in health, social care, etc. through community-driven innovations
3	v Strengthen trust & democratic participation in processes through citizens engagement
4	v Enabling effective partnerships with NGOs & private actors by fostering cross-sector collaboration
5	v Apply adaptive governance to create agility and responsiveness in policy making & implementation

Social Innovation; Value Drivers - Community	
1	v Enable the use of community's own knowledge and resources to address local challenges
2	v Foster trust, cooperation, and stronger networks within and between communities
3	v Build community resilience in the face of crises; e.g., climate change, economic shocks
4	v To include marginalised people in problem-solving and the benefits from the outcomes
5	v Successful grassroots innovators need to influence policies for up scaling the social impact







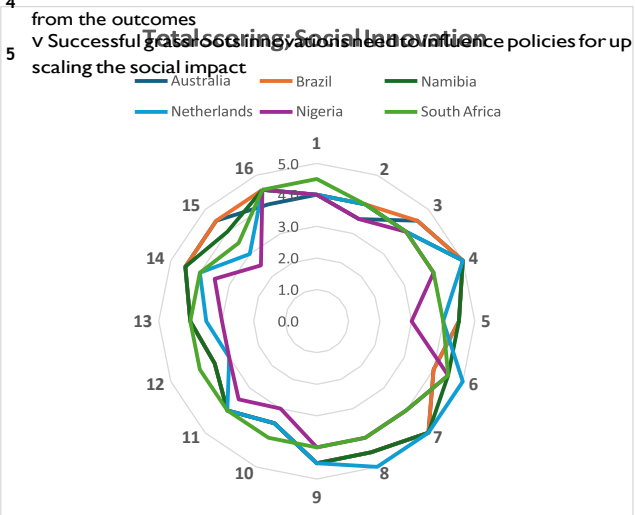


Figure C1: *Scoring on SI value drivers per stakeholder.*

Reporting in Social & Energy Aspects	
1	v Social & Governance (ESG) reporting in annual company reports.
2	v Companies applying a Triple Bottom Line framework measuring next to financial performance, social & environmental impacts.
3	v Governments & private companies to share publicly information on environmental pollution levels, incidents and mitigating efforts.

Country	1	2	3	Avrg
Australia	4,5	4,0	4,5	**4,33**
Brazil	4,5	4,5	5,0	**4,67**
Namibia	5,0	5,0	5,0	**5,00**
Netherlands	4,5	4,5	4,5	**4,50**
Nigeria	4,5	4,5	4,5	**4,50**
South Africa	4,0	3,5	4,5	**4,00**
Avearge	**4,5**	**4,3**	**4,7**	**4,50**

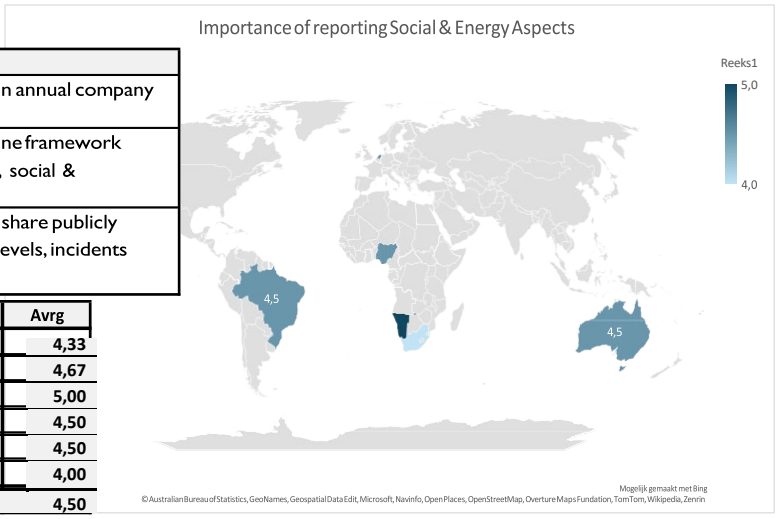


Figure C2: *Scoring on the importance of reporting social & energy aspect.*

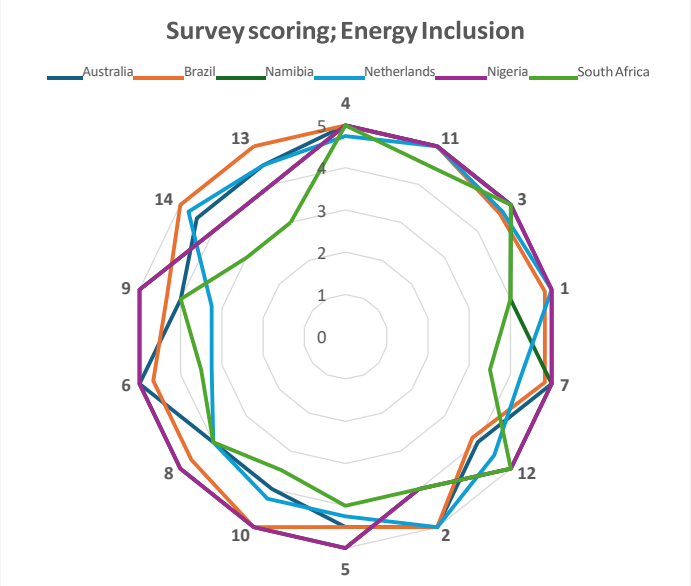


Figure C3: *Question 6-EI scores.*

APPENDIX D

SOCIOECONOMIC CONTEXT TABLES

Table D1: *Selected demographic and economic data - Brazil, the LATAM region, world.*

2022	Brazil	LATAM & Carribian	World
General			
Population, total	210,306,415	653,104,771	7,989,981,520
Land area (sq. km)	8,358,140	20,042,088	129,718,826
Population density (people per sq. km of land area)	25.16	32.59	61.59
Urban population (% of total population)	87.56	81.56	56.81
Rural population (% of total population)	12.45	18.44	43.19
Share Rural vs Urban population	0.14	0.23	0.76
Economy			
GDP (current US$)	1.95E+12	6.34E+12	1.02E+14
Industry (including construction), value added (% of GDP)	22.82	31.83	27.22
Services, value added (% of GDP)	58.09	64.42	61.76
GDP per capita (current US$)	9,281	9,715	12,737
Industry (including construction), value added GDP per capita	2,118	3,092	3,467
Industry value added (GDP) / Services value added (GDP)	0.39	0.49	0.44
GNI, Atlas method (current US$)	1.78E+12	5.82E+12	1.03E+14
Level of Internationalisation (current US$)	-175,272,497,504	-526,138,550,760	902,013,070,930
Foreign direct investment, net inflows (BoP, current US$)	74,606,361,830	243,610,967,681	1,876,747,586,471
Level of Internationalisation inflow(+) / outflow (-)	-249,878,859,334	-769,749,518,441	-974,734,515,540
Levofint. % of GNI	-9.87%	-9.04%	0.88%
Tax revenue (% of GDP)	14.73	14.30	14.34
Risk premium on lending (lending rate minus treasury bill rate, %)	26.14	..	..

Table D2: *Selected infrastructure & employment data- Brazil, the LATAM region, world.*

2022	Brazil	LATAM & Carribian	World
IT Infrastructure			
Fixed broadband subscriptions (per 100 people)	21.53	17.70	18.43
Fixed telephone subscriptions (per 100 people)	13.00	13.50	11.00
Mobile cellular subscriptions (per 100 people)	98.89	110.10	108.10
Share Mobile vs. Fixed communication	2.86	3.53	3.67
Mobile cellular subscriptions (per 100 people) Popul. 15+	79	70	69
Employment			
Labor force % of Population	50.6%	47.9%	44.6%
Labor force, female (% of total labor force)	43.40	41.71	39.70
Total Unemployment (% of labour force) (modeled ILO estimate)	9.23	6.89	5.27
Vulnerable employment, total (% of total employment) (modeled ILO estimate)	27.74	32.89	44.92
Employment in agriculture, total (% of total employment) (modeled ILO estimate)	8.65	13.60	26.41
Employment in services (% of total employment) (modeled ILO estimate)	70.78	65.51	49.71
Self-employed, total (% of total employment) (modeled ILO estimate)	32.13	36.94	48.10
Education			
School enrollment, primary (% gross)	103.97	104.77	101.75
School enrollment, secondary (% gross)	106.03	96.94	77.58

Table D3: *Selected energy data for Brazil, the LATAM regionand the world.*

2022	Brazil	LATAM & Carribian	World
Energy			
Access to electricity (% of population)	100.00	98.58	91.28
Access to electricity, urban (% of urban population)	100.00	99.63	97.64
Access to electricity, rural (% of rural population)	97.30	96.80	83.89
Share of pupulation with access to energy; rural vs urban	0.97	0.97	0.65
Total Primary Energy Consumption (TWh)	3732	8019	168708
Energy intensity level of primary energy (MJ/$2017 PPP GDP) -(2021)	3.96	3.35	4.52
Electricity Generation (TWh)	677	1,390	28,843
Industry (including construction), value added GDP vs. Energy Consumption - US$/MWh	119,351	251,847	164,211
Access to clean fuels and technologies for cooking, rural (% of rural population)	83.10	64.68	54.43
Access to clean fuels and technologies for cooking, urban (% of urban population)	98.90	94.99	88.90
Share of pupulation with access to clean fuels and technology; rural vs urban	0.84	0.68	0.61

APPENDIX E

MAIN GOVERNING SYSTEMS - SI IMPACT SCORING

Main system	Subsystems		State control	Societal Inclusion	Impact on SI	Summary score	
Political Systems	Democracy		1	1	1	3	
	Authoritarianism		3	3	3	9	
	Hybrid regimes		2	2	2	6	
Economic systems	Capitalist system	Laissez-Faire Capitalism	1	2	2	5	[1]
		Regulated Capitalism	2	1	1	4	
		Crony Capitalism	3	3	3	9	[2]
	Socialist system	Democratic Socialism	1	1	1	3	
		State Socialism	3	1	3	7	[3]
	Mixed economy		2	1	2	5	[4]
	Infromal economy		1	1	2	4	
Social systems	Class system		1	2	1	4	[5]
	Caste system		1	3	3	7	[6]
	Welfare system		2	1	3	6	[7]
	Patronage/Clientelism		3	3	2	8	
Legal/Juridical systems	Common law system		1	1	1	3	
	Civil law system		1	1	1	3	
	Religious law system		3	2	3	8	
	Mixed legal system		2	2	2	6	
Security/Military systems	Civilian-controlled system		1	1	1	3	
	Military-led system		3	3	3	9	
	Paramilitary/Security forces		3	3	3	9	
Governance/ Administrative systems	Unitary system		3	1	1	5	[8]
	Federal system		2	2	1	5	[8]
	Confederation		1	2	2	5	
Media & Information systems	Free press system		1	1	1	3	
	Censored media system		3	3	3	9	
	State-controlled media		3	3	3	9	
Technology/Cyber systems	Open digital system		1	1	1	3	
	Restricted cyber system		3	3	3	9	
	Surveilance state system		3	3	3	9	
Cultural/Religious systems	Secular system		1	1	1	3	
	Religious system		3	2	2	7	[9]
	Multicultural system		2	2	2	6	[9]

[1] Societal inclusion is in this system not fostered through government policies
[2] Cronies take over the controlling role of a capitalistic system
[3] Societal inclusion is achieved through job creation by the state
[4] The ambiguity of governments may reflect on SI policies
[5] Social mobility is observed despite collectiveness in class consciousness
[6] Low social mobility hampering social value creation
[7] SI is hampered by the poverty trap
[8] As with a democratic political system, it governs the whole society.
[9] In a religious system inclusion may be hampered for those with different opinions to selected topics.

State control	
1	Low
2	Average
3	High

Social Inclusion	
1	High
2	Average
3	Low

Impact on SI	
1	Positive
2	Average
3	Negative

Minimum score; most positive impact	30
Maximum score; most negative impact	71

Table E1

Main system	Subsystems		Brazil score	Namibia score	RSA score
Political Systems	Democracy		3	3	3
	Authoritarianism				
	Hybrid regimes				
Economic systems	Capitalist system	Laissez-Faire Capitalism			
		Regulated Capitalism			
		Crony Capitalism			
	Socialist system	Democratic Socialism			
		State Socialism			
	Mixed economy		5	5	5
	Infromal economy				
Social systems	Class system		4		4
	Caste system				
	Welfare system				
	Patronage/Clientelism			8	
Legal/ Juridical systems	Common law system		3		
	Civil law system				
	Religious law system				
	Mixed legal system			6	6
Security/ Military systems	Civilian-controlled system		3	3	3
	Military-led system				
	Paramilitary/Security forces				
Governance/ Administrative systems	Unitary system			5	
	Federal system		5		5
	Confederation				
Media & Information systems	Free press system		3	3	3
	Censored media system				
	State-controlled media				
Technology/ Cyber systems	Open digital system		3	3	3
	Restricted cyber system				
	Surveilance state system				
Cultural/Religious systems	Secular system				
	Religious system				
	Multicultural system		6	6	6
			35	**42**	**38**

Table E2: *Governing system scoring, Brazil, Namibia, Republic of South Africa..*

APPENDIX F

REGIONAL ETHICAL AND CULTURAL VALUES - SI IMPACT SCORING

SI characteristics	1 Absolutists: Traditional Values Alignment	Score	Survival Values Alignment	Score	Avrg	Avrg Qdrt.	Qdrt. 5
Collaboration	Customary collaboration via kinship ties; elder-led councils preserve harmony	2	Pragmatic cooperation for mutual aid, resource pooling under scarcity	3	2.5	2.21	2.36
Protection/ Security	Safeguarding through sacred obligations, communal rites and duty to kin	3	Urgent focus on basic needs, emergency protocols ensure community safety	3	3		
Democracy	Consensus-driven decision-making under elder authority and longstanding norms	1	Rapid consensus-building, emergent leadership structures for crisis response	2	1.33		
			Centralized crisis leadership with limited stakeholder input	1			
Equality	Role-based fairness grounded in duty, honor and collective responsibility	2	Equitable sharing of subsistence rights, maintains cohesion under threat	2	2		
SI characteristics	**2 Situationists: Secular-Rational Values Alignment**	**Score**	**Survival Values Alignment**	**Score**	**Avrg**	**Qdrt.**	
Collaboration	Formal, rule-based partnerships and evidence-driven networks	3	Pragmatic cooperation for mutual aid, resource pooling under scarcity	3	3	2.52	
Protection/ Security	Institutional safeguards, legal frameworks, and rational risk-management protocols	3	Urgent focus on basic needs, emergency protocols ensure community safety	3	3		
Democracy	Procedural participation, rule of law, and accountability mechanisms	3	Rapid consensus-building, emergent leadership structures for crisis response	2	1.75		
	Elder-mediated consensus limits broad participation	1	Centralized crisis leadership with limited stakeholder input	1			
Equality	Legal equality, anti-discrimination statutes, and equal-opportunity norms	3	Equitable sharing of subsistence rights, maintains cohesion under threat	2	2.33		
	Role-based duties uphold hierarchy while ensuring group fairness	2					
SI characteristics	**3 Exceptionists: Traditional Values Alignment**	**Score**	**Self-Expression Values Alignment**	**Score**	**Avrg**	**Avrg Qdrt.**	
Collaboration	Kinship ties and elder-led councils preserve communal harmony	2	Open networks and peer-driven co-creation harness creativity	3	2.5	2.38	
Protection/ Security	Sacred obligations and communal rites enforce collective safety	3	Emphasis on emotional safe spaces and identity security	2	2.5		
Democracy	Elder-mediated consensus limits broad participation	1	Direct participatory governance amplifies individual voice	3	2		
Equality	Role-based duties uphold hierarchy while ensuring group fairness	2	Equal recognition of diverse identities fosters equity	3	2.5		
SI characteristics	**3 Subjectivists: Secular-Rational Values Alignment**	**Score**	**Self-Expression Values Alignment**	**Score**	**Avrg**	**Qdrt.**	
Collaboration	Formal, rule-based partnerships and evidence-driven networks	3	Open networks and peer-driven co-creation harness creativity	3	3	2.63	
Protection/ Security	Institutional safeguards, legal frameworks, and rational risk-management protocols	3	Emphasis on emotional safe spaces and identity security	2	2.5		
Democracy	Procedural participation, rule of law, and accountability mechanisms	3	Direct participatory governance amplifies individual voice	3	2.33		
	Elder-mediated consensus limits broad participation	1					
Equality	Legal equality, anti-discrimination statutes, and equal-opportunity norms	3	Equal recognition of diverse identities fosters equity	3	2.67		
	Role-based duties uphold hierarchy while ensuring group fairness	2					

Table F1

Region	Quadrant Inglehart & Welzel	EI allignment Score
Brazil	5	**2.44**
Namibia	1	**2.21**
Rep. South Africa	5	**2.44**
LATAM & Carribian	1 & 2	**2.37**
W&C Africa	1	**2.21**
East Asia & Pacific	5	**2.44**
EU	4	**2.63**
World	All	**2.44**

APPENDIX G

SI STAKEHOLDER ANALYSING MODELS

Stakeholder Identification

Identifying the key players influencing SI through assessing interests, motivationsand potential impact.

Table F1: *stakeholder identification and mapping.*

Stakeholder	Interest factors				Influence factors			
	Legitimacy	Knowledge & Attitude		Potential Impact	Power	Predictability	Urgency	Value exchange
		Ignorant	Aware					
Local Government Officials								
Project Sponsors / Investors								
Community Leaders								
Target Community								
National Government Agencies								
Media Outlets								
Large Corporations								
Local Residents / Beneficiaries								
NGOs / Nonprofits								
Academics / Researchers								
General Public								
Peripheral Businesses								

High	*Opposing*	*High*	*High*	*Consistent*	*High*	*Intangible*
Medium	*Supportive*	*Medium*	*Medium*	*Changing*	*Medium*	*Tangible*
Low / Not		*Low / Not*	*Low*		*Low*	*(Assets)*

Stakeholder Mapping

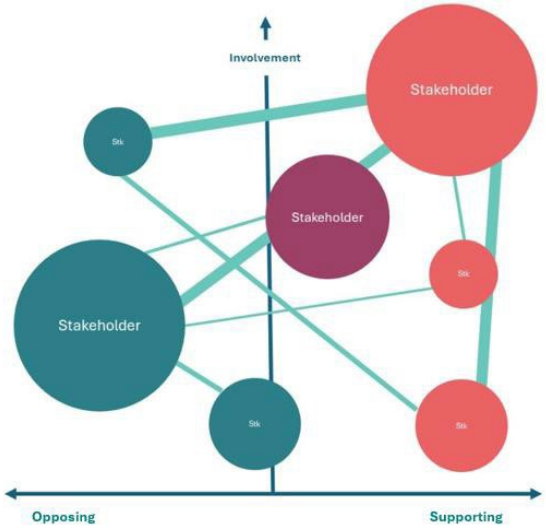


Figure F2: Stakeholder Relationship Network (Adapted from simply stakeholders, 2025).

Figure F3: Stakeholder Knowledge Base model (Djizmedjian M., 2025).

Figure F4: Power - Interest Grid (Djizmedjian M., 2025).

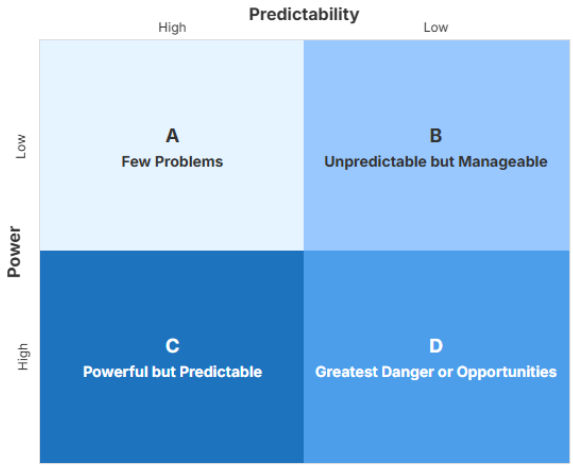


Figure F5: Power – Predictability Matrix (Djizmedjian M., 2025).

- **Dormant:** Have power but lack legitimacy and urgency; influence remains inactive.
- **Discretionary:** Legitimate but not urgent or powerful; often philanthropic recipients.
- **Demanding:** Urgent but lack legitimacy and power; concerns are rarely prioritised.
- **Dominant:** Hold power and legitimacy; formally recognised and influential.
- **Dangerous:** Urgent and powerful but illegitimate; may pose risks through coercive tactics.
- **Dependent:** Legitimate and urgent but powerless; rely on others to advocate.
- **Definitive:** Possess all three attributes; most influential and central to decision-making.

Criteria	Power	Legitimacy	Urgency	Class
Dormant	High			Low salience
Discretionary		High		
Demanding			High	
Dominant	High	High		Expectant
Dangerous	High		High	
Dependent		High	High	
Definitive	High	High	High	High salience

Figure F6: Stakeholder categorisation according Power, Legitimacy and Urgency (Mitchell R. et al., 1997).

APPENDIX H

SI EMPOWERMENT TOOL MATRIXES

<table>
<tr><td rowspan="6">Learning, education, training</td><td colspan="3">Skills, knowledge & Educational opportunities</td></tr>
<tr><td>Community</td><td>Business</td><td>Government</td></tr>
<tr><td>Providing relevant skills, knowledge, and educational opportunities to community members enabling them to improve their livelihoods, make informed decisions and participate in SI projects.</td><td>Providing relevant knowledge on the key SI topics to key people with the business to successfully collaborate with SI Stakeholders.</td><td>Providing specific knowledge on related SI project to key people within government agencies to understand and apply cross sector collaboration on the different topics and give informed feedback to policy makers.</td></tr>
<tr><td>Collaborative & Interpersonal
- Communication
- Active listening
- Conflict resolution
- Negotiating
- Teamwork
- Feedback & adapting
- Equity and diversity awareness

Leadership
- Mobilising collective action
- Decision making
- Prioritising
- Change management

Innovation
- Generating user centred solutions
- Technical subjects
- Entrepreneurship

Business
- Planning, executing, managing
- Finances
- Digital literacy</td><td>Participation and Collaboration
- Community Engagement Approaches
- Facilitation Techniques
- Conflict Management
- Advocacy and Policy Influence
- Sustainable Development Goals (SDGs)
- Cultural and Ethical Considerations

Social context & Issues
- Community assets & Needs
- Stakeholder mapping & analyses

Innovation
- SI concepts
- SI Design
- Prototyping & Scaling</td><td>Cross-Sector and Stakeholder Engagement
- Governance models; shared ownership &
- Stakeholder mapping & analyses
- Citizen Engagement Tools
* Deliberative democracy
* Participatory budgeting
* Digital consultation platforms

Policy, Governance, and Regulation
- Multi-Level Governance
- Public Procurement for Innovation (PPI)
- Impact Measurement and Evaluation

Social Innovation Fundamentals

Equity, Ethics, and Inclusion</td></tr>
</table>

<table>
<tr><td rowspan="3">Capacity building</td><td colspan="3">Managing resources & collective decision making</td></tr>
<tr><td>Community</td><td>Business</td><td>Government</td></tr>
<tr><td>Enhance the ability of the target community to manage resources, make collective decisions, and adapt to challenges.</td><td colspan="2">Support in providing skills and knowledge to the target community, stimulate practical learning, report and disseminate SI project information, lead in PR & communication, and foster local expertise in sustainability, resource efficiency, circular economy, productivity, efficiency and access to the market.</td></tr>
<tr><td>Training, education
- Courses
- Workshops
- Internships
- Coaching</td><td colspan="2">Training, education
- Courses
- Workshops
Communication
- PR & Commincation plan
- Focus on contribution of local expertise & participation
- Community information days</td></tr>
</table>

Participation, collective action & Networking	**Community collaborative decision-making**		
	Community	**Business**	**Government**
	Engaging community members in decision-making processes collaboration in addressing common challenges.	Support forming community committees and foster target community collective problem-solving, networking, information exchange, and advocacy.	
	Collaborative management - Representative in the SCR/SI partnership committee - Representative in SI project management executive team(s) - Forming community management committees - Setting up community participation structure		**Goals** III Sounding of SI objectives & Social problems and social value IV Alignment of SI objectives and goals Determine roll and responsibilities

Local knowledge & values integration	**Integration local knowledge & values**		
	Community	**Business**	**Government**
	Integrating local knowledge, cultural practises, and traditional values, into community strategies to ensure the community's cultural and sustainable relevancy.		
	Collaboration and alignment - Local aspects to be included in objectives, goals and monitoring of SCR/SI project outcomes. - Adhering to, and realigning of, relevant environmental, financial, education, policies. - Aiming the improvement of welfare and quality of life of the community.		

Access to resources & services	**Access to resources & services**		
	Community	**Business**	**Government**
	Improvement of community infrastructure and access to essential services like education, social welfare, healthcare, and information. Including infrastructure related to the objectives the SI program, i.e. energy, water, distribution, etc.		
	Commitment & Outcome - Understanding the key infrastructure requirements needed to achieve the SI objectives and goals. - Demonstration or pilot projects related to SI entrepreneurship/project, - Improvement of infrastructure, services, access to community resources, and community knowledge,		

Environment; Pollution Reduction - Policies	Brazil	RSA	Namibie	LATAM & Carribian	W&C Africa	East Asia & Pacific*	EU	World
Total number of policy instruments	14	33	6	10.0	6.8	16.5	47.2	21.8
Total number of policy instruments; **air polution**	6	14	1	3.2	1.8	1.3	12.5	6.7
Total number of policy instruments; **water pollution**	0	4	0	0.8	0.4	2.7	5.2	2.4
Total number of policy instruments; **soil pollution**	0	1	0	0.4	0.6	0.0	2.3	1.0
Total number of policy instruments; **solid waste**	0	5	1	0.7	0.4	2.7	10.9	4.4
Total number of policy instruments; **ozone**	0	0	0	0.2	0.0	1.3	2.4	1.0
Total number of policy instruments; **noise**	2	3	0	0.8	0.3	3.5	5.3	2.3
Total number of policy instruments; **fresh water**	0	4	0	0.5	0.0	1.6	3.9	1.5
Total number of policy instruments; **renewable energy**	0	1	0	0.6	0.1	0.3	3.7	1.8
Total number of policy instruments; **chemical management**	1	2	0	0.4	0.1	1.8	7.0	2.7
Total number of policy instruments; **circular economy**	3	5	2	2.0	1.3	2.2	10.9	5.6
Total number of policy instruments relating to mitigation	6	18	3	4.4	3.0	1.9	22.9	11.5
Total number of policy instruments relating to adaption	0	0	0	0.3	0.0	1.2	1.6	0.8
Environment; Pollution Reduction - Air Quality	**Brazil**	**RSA**	**Namibie**	**LATAM & Carribian**	**W&C Africa**	**East Asia & Pacific***	**EU**	**World**
Is there an government operated AQ monitoring system?	Yes	Yes	No	65%	20%	91%	100%	64%
Is AQ information publicly accessible?	Yes	Yes	No	41%	16%	82%	100%	55%
Is Physical AQ Data shared?	Yes	Yes	No	41%	4%	45%	100%	46%
Are monitoring station specific coordinates given?	No	Yes	No	29%	8%	45%	100%	46%
Is AQ data timely shared (Timely fine scale)?	Yes	Yes	No	35%	16%	73%	100%	53%
Is data programmatic accessible?	No	Yes	No	15%	4%	0%	100%	28%
EPI Air Quality score	36.2	20.3	27.3	48.7	33.7	27.6	57.3	42.3
Environment; Pollution Reduction - Water Quality	**Brazil**	**RSA**	**Namibie**	**LATAM & Carribian**	**W&C Africa**	**East Asia & Pacific***	**EU**	**World**
Ambient Water Quality*	68.2%	70.7%	63.0%	58.9%	46,5%**	20,2%**	56.7%	56.0%
Proportion of population using safely managed drinking water services								
Safely managed services	87.3%	0.0%	0.0%	75.2%	16.6%	39.4%	96.9%	72.9%
Basic services	12.3%	94.5%	86.0%	22.4%	59.5%	53.0%	2.4%	18.3%
Proportion of population using safely managed sanitation services								
Safely managed services	49.6%	71.7%	0.0%	49.1%	9.4%	40.0%	86.4%	56.6%
Basic services	41.3%	5.9%	35.8%	40.3%	26.0%	39.2%	7.4%	24.2%
Environment; Pollution Reduction - Soil & Waste	**Brazil**	**RSA**	**Namibie**	**LATAM & Carribian**	**W&C Africa**	**East Asia & Pacific***	**EU**	**World**
Soil polution								
Heavy Metals (Lead)	61.2%	52.2%	37.7%	53.1%	34.2%	48.0%	80.4%	53.0%
Solid waste								
Waste Management	26.2%	34.5%	30.5%	25.7%	29.0%	39.6%	54.8%	34.8%
Environment; Pollution Reduction - Enforcement instrument	**Brazil**	**RSA**	**Namibie**	**LATAM & Carribian**	**W&C Africa**	**East Asia & Pacific***	**EU**	**World**
WJP Rule of Law Index	0.50	0.56	61.00	0.52	0.42	0.50	0.73	0.55
Taxes and fees	10	25	5	7.3	6.1	16.8	31.7	16.9
Environmentally beneficial subsidies and payments	2	5	0	4.5	0.1	2.3	18.9	7.8
Tradable permits and offsets	0	1	1	3.0	0.0	1.0	2.5	1.3
Voluntary approaches	0	0	0	3.0	0.0	0.0	6.3	0.9

Physical Energy Insecurity indicators	Brazil	RSA	Namibie	LATAM & Carribian	W&C Africa	East Asia & Pacific*	EU	World
Fixed broadband subscriptions (per 100 people)	21.53	3.12	3.29	17.70	0.40	0.90	38.68	18.43
Fixed telephone subscriptions (per 100 people)	13.00	2.10	2.97	13.50	0.50	0.60	35.52	11.00
Access to electricity (% of population)	100.00	86.50	56.20	98.58	55.59	48.74	100.00	91.28
Access to electricity, urban (% of urban population)	100.00	87.10	74.80	99.63	86.80	99.81	100.00	97.64
Access to electricity, rural (% of rural population)	97.30	93.40	33.20	96.80	25.36	96.56	99.99	83.89
Electricity Generation (TWh) vs. Total Energy Consumption (TWh) - %	0.18	0.18	0.05	0.17	0.11	0.19	0.17	0.17
Ratio GDP per Capita / rural populatio nwith access to electricity	9,031	6,093	1,444	9,404	451	1,572	37,947	*10,685*
Access to clean fuels and technologies for cooking, rural (% of rural population)	83.10	71.40	13.50	64.68	6.75	72.36	100.00	54.43
Access to clean fuels and technologies for cooking, urban (% of urban population)	98.90	96.00	71.00	94.99	42.19	93.96	100.00	88.90
Physical Energy Insecurity indicators	**Brazil**	**RSA**	**Namibie**	**LATAM & Carribian**	**W&C Africa**	**East Asia & Pacific***	**EU**	**World**
Fixed broadband subscriptions (per 100 people)	21.53	3.12	3.29	17.70	0.40	0.90	38.68	18.43
Fixed telephone subscriptions (per 100 people)	13.00	2.10	2.97	13.50	0.50	0.60	35.52	11.00
Access to electricity (% of population)	100.00	86.50	56.20	98.58	55.59	48.74	100.00	91.28
Access to electricity, urban (% of urban population)	100.00	87.10	74.80	99.63	86.80	99.81	100.00	97.64
Access to electricity, rural (% of rural population)	97.30	93.40	33.20	96.80	25.36	96.56	99.99	83.89
Electricity Generation (TWh) vs. Total Energy Consumption (TWh) - %	0.18	0.18	0.05	0.17	0.11	0.19	0.17	0.17
GDP per Capita x Rural/Urban population ($.% rural)	1,319	3,023	3,711	2,196	1,840	2,667	12,339	*9,682*
Access to clean fuels and technologies for cooking, rural (% of rural population)	83.10	71.40	13.50	64.68	6.75	72.36	100.00	54.43
Access to clean fuels and technologies for cooking, urban (% of urban population)	98.90	96.00	71.00	94.99	42.19	93.96	100.00	88.90
Energy Poverty	**Brazil**	**RSA**	**Namibie**	**LATAM & Carribian**	**W&C Africa**	**East Asia & Pacific***	**EU**	**World**
Average yearly elec. consumption per household connection (KW)	767	413	5	1,544	1,514	3,162	5,043	5,780
Percentage of renewable electricity for households	89%	13%	96%	62%	-	25%	38%	30%
Average yearly gas consumption per household	1,483	489	-	1,918	1,975	2,090	8,275	7,131
Percentage of renewable gas consumed	-	-	-	-	-	-	-	-
Procedural justice	**Brazil**	**RSA**	**Namibie**	**LATAM & Carribian**	**W&C Africa**	**East Asia & Pacific***	**EU**	**World**
Corruption Perception Index; Transparency International.	34	41	49	39.7	32.5	39.2	64	*43*
Government Effectiveness	-0.55	-0.26	0.03	-0.19	-0.88	0.19	0.95	-0.04
Regulatory Quality	-0.30	-0.22	-0.06	-0.10	-0.8	0.06	1.08	-0.03
Political stability & Absence of Violence	-0.41	-0.67	0.54	0.26	-0.77	0.06	0.63	-0.07
Recognitional justice	**Brazil**	**RSA**	**Namibie**	**LATAM & Carribian**	**W&C Africa**	**East Asia & Pacific***	**EU**	**World**
Voice & Accountability	0.38	0.74	0.58	0.23	-0.59	0.60	1.12	-0.03
2024 SDG Gender Index	68.2	67.5	58.0	65.8	49.4	67.3	81.1	66.1
Vulnerable employment, female vs. male (on total employment)	0.59	0.93	1.41	0.71	0.86	1.04	0.60	0.67
Environmental/Climate justice	**Brazil**	**RSA**	**Namibie**	**LATAM & Carribian**	**W&C Africa**	**East Asia & Pacific***	**EU**	**World**
Total Unemployment (% of labour force) (modeled ILO estimate)	9.2	28.8	19.8	6.9	3.7	7.6	6.1	5.3
Wittgenstein Projection: % total population with Upper Secondary ed.	0.28	0.28	0.18	0.20	0.12	0.18	0.39	0.22
Wittgenstein Projection: % total population with Post Secondary ed.	0.10	0.04	0.06	0.13	0.02	0.15	0.24	0.12
(Wittg. Pr.) % of Lower Secundary ed. of total Low., Post & Upper ed.	0.42	0.88	1.08	0.58	0.50	0.42	0.24	0.50
Total Energy Consumption vs. GHG (Kg/Twh)	127	290	182	156	218	204	180	220
CO2/GHG vs Value added (% of GDP) - (Kg / US$)	1.1	4.0	1.2	0.6	1.0	5.7	0.7	1.4
Subjective Well-being - UN SDG score *(10 best score)*	6.55	5.08	5.06	6.29	4.56	5.68	6.56	5.61
Energy Democracy	**Brazil**	**RSA**	**Namibie**	**LATAM & Carribian**	**W&C Africa**	**East Asia & Pacific***	**EU**	**World**
GSoD; Representation	0.72	0.66	0.61	0.49	0.31	0.47	0.7	0.5
GSoD; Rights	0.56	0.61	0.56	0.48	0.38	0.46	0.7	0.51
GSoD; Rule of Law	0.56	0.53	0.6	0.47	0.34	0.47	0.64	0.48
GSoD; Participation	0.87	0.68	0.6	0.52	0.51	0.48	0.65	0.54
UN-SDG 4; Inclusive and equitable quality education for all.	90	72	88	87	42	84	95	74

Energy Burden	Brazil	RSA	Namibie	LATAM & Carribian	W&C Africa	East Asia & Pacific*	EU	World
Residential electricity rates; 2023-2025 average - US$/kWh	$0.160	$0.184	$0.136	$0.182	$0.148	$0.120	$0.267	$0.157
Business electricity rates; 2023-2025 average - US$/kWh	$0.129	$0.090	-	$0.192	$0.153	$0.141	$0.228	$0.156
Energy cost per capita vs. Households final consumption per capita	0.44	0.98	0.28	0.31	0.44	0.52	0.43	0.18
Distributive Justice	**Brazil**	**RSA**	**Namibie**	**LATAM & Carribian**	**W&C Africa**	**East Asia & Pacific**	**EU**	**World**
Collaboration	2.75	2.75	2.50	2.75	2.50	2.75	3.00	2.75
Protection/Security	2.75	2.75	3.00	3.00	3.00	2.75	2.50	2.75
Democracy	1.85	1.85	1.33	1.54	1.33	1.85	2.33	1.85
Equality	2.38	2.38	2.00	2.17	2.00	2.38	2.67	2.38
Average	2.43	2.43	2.21	2.37	2.21	2.43	2.63	2.43

Level of Energy Inclusion			2024	Brazil	RSA	Namibie	LATAM & Carribian	W&C Africa	East Asia & Pacific	EU	World
	Hygiene to	1	Environment; Pollution Reduction	44.3	62.0	26.4	46.5	25.2	42.0	83.7	46.9
		2	Physical Energy Insecurity	78.2	70.5	38.7	78.3	38.0	65.2	100.0	79.6
		3	Energy Poverty	44.0	25.0	44.0	44.0	25.0	31.0	68.8	62.5
		4	Energy Justice/Equity	50.8	51.1	39.1	50.3	38.1	51.7	79.4	49.1
	Purpose Fac	5	Energy Democracy	72.2	64.0	65.0	56.6	39.2	54.4	72.8	57.6
		6	Power Decentralisation								
		7	Energy Burden	50.0	25.0	100.0	62.5	75.0	62.5	37.5	75.0
		8	Equitable Distribution								
		9	Distributive Justice	68.8	68.8	56.3	68.8	56.3	68.8	75.0	68.6
			Total LeiM level*	**58.3**	**52.3**	**52.8**	**58.1**	**42.4**	**53.7**	**73.9**	**62.8**

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