Technology
Arts Sciences
TH Köln

UNIVERSIDAD AUTÓNOMA DE SAN LUIS POTOSÍ
FACULTADES DE CIENCIAS QUÍMICAS, INGENIERÍA Y MEDICINA
PROGRAMAS MULTIDISCIPLINARIOS DE POSGRADO EN CIENCIAS AMBIENTALES
AND
TH KÖLN - UNIVERSITY OF APPLIED SCIENCES
INSTITUTE FOR TECHNOLOGY AND RESOURCES MANAGEMENT IN THE TROPICS AND SUBTROPICS

Comparative study of renewable energy policies between Ecuador and Germany. Shifting from FITs to Auctions

THESIS TO OBTAIN THE DEGREE OF
MAESTRÍA EN CIENCIAS AMBIENTALES
DEGREE AWARDED BY UNIVERSIDAD AUTÓNOMA DE SAN LUIS POTOSÍ
AND
MASTER OF SCIENCE
NATURAL RESOURCES MANAGEMENT AND DEVELOPMENT
DEGREE AWARDED BY TH KÖLN – UNIVERSITY OF APPLIED SCIENCES

PRESENTS:

Víctor Mauricio Barriga Albuja

CO-DIRECTOR OF THESIS ITT
Prof. Dr. Johannes Hamhaber
CO-DIRECTOR OF THESIS PMPCA
Dra. Anuschka van ’t Hooft
ASSESSOR:
Dr. Juan Leonardo Espinoza

COLOGNE, GERMANY 21st of August 2018

Technology
Arts Sciences
TH Köln

PROYECTO REALIZADO EN:

ITT

INSTITUTE FOR TECHNOLOGY AND RESOURCES MANAGEMENT IN THE TROPICS AND SUBTROPICS

TH KÖLN - UNIVERSITY OF APPLIED SCIENCES

CON EL APOYO DE:

CONSEJO NACIONAL DE CIENCIA Y TECNOLOGÍA (CONACYT)

LA MAESTRÍA EN CIENCIAS AMBIENTALES RECIBE APOYO A TRAVÉS DEL PROGRAMA NACIONAL DE POSGRADOS (PNPC - CONACYT)

Technology
Arts Sciences
TH Köln

Erklärung / *Declaración*

Víctor Mauricio Barriga Albuja:

Matrikel-Nr. / *N° de matricula*: **11117389 (TH Köln), 269391 (UASLP)**

Ich versichere wahrheitsgemäß, dass ich die vorliegende Masterarbeit selbstständig verfasst und keine anderen als die von mir angegebenen Quellen und Hilfsmittel benutzt habe. Alle Stellen, die wörtlich oder sinngemäß aus veröffentlichten und nicht veröffentlichten Schriften entnommen sind, sind als solche kenntlich gemacht.
Aseguro que yo redacté la presente tesis de maestría independientemente y no usé referencias ni medios auxiliares a parte de los indicados. Todas las partes, que están referidas a escritos o a textos publicados o no publicados son reconocidas como tales.

Die Arbeit ist in gleicher oder ähnlicher Form noch nicht als Prüfungsarbeit eingereicht worden.
Hasta la fecha, un trabajo como éste o similar no ha sido entregado como trabajo de tesis.

Köln, den 21. August, 2018

Unterschrift / *Firma*: ____________

Ich erkläre mich mit einer späteren Veröffentlichung meiner Masterarbeit sowohl auszugsweise, als auch Gesamtwerk in der Institutsreihe oder zu Darstellungszwecken im Rahmen der Öffentlichkeitsarbeit des Institutes einverstanden.
Estoy de acuerdo con una publicación posterior de mi tesis de maestría en forma completa o parcial por las instituciones con la intención de exponerlos en el contexto del trabajo investigación de las mismas.

Unterschrift / Firma: ____________

Abstract

Policy measures are essential tools for the transition from fossil fuels to renewable energy sources in the electricity generation. Feed-in tariffs (FITs) are the most used policy for support of renewable technologies globally. Nevertheless, Ecuador phased-out FITs in 2016 and adopted auctions in 2015. Ecuador's implementation of auctions reflects an approach with little relation to practices in other countries and without a technology-specific design. On the other hand, Germany demonstrates a long trajectory in policy-making with vast experience in FITs. Moreover, in 2017 Germany adopted auctions as the official policy to support renewable projects with a scope larger than 750 kW. However, FITs are still in use and complement auctions.

This thesis analyses and compares the country-specific contexts where these policies are implemented through the lens of a multi-level perspective framework. As a result, the most important success factors in Germany have been identified: long-term planning, institutional continuity, legislative stability and principally an actively participating society, which is environmentally aware. Obstacles for the transition in Ecuador are institutional discontinuity, legislative inconsistency, the lack of long-term planning and absence of society as actors of the transition. Due to Germany's pioneering role plus the successful growth of renewable sources during the last twenty years, their policy implementations appear desirable to adopt in other contexts. Therefore, a prospective transferability of the auction policy from Germany to Ecuador is additionally analyzed.

Key Words: Feed-in tariff, auctions, energy transition, Ecuador, Germany

Resumen

Las políticas energéticas son herramientas esenciales para la transición desde energías fósiles hacia fuentes de energía renovables en la generación eléctrica. Las tarifas reguladas son la política más utilizada para apoyar las tecnologías renovables a nivel mundial. Sin embargo, Ecuador eliminó la tarifa regulada en 2016 y adoptó las subastas en 2015. La implementación de subastas en Ecuador muestra poca relación con las prácticas en otros países y sin un diseño específico por tipo de tecnología. Por otro lado, Alemania demuestra una larga trayectoria en la elaboración de políticas, con una vasta experiencia en la tarifa regulada. Adicionalmente, en 2017 Alemania adoptó las subastas como la política oficial para desarrollar proyectos renovables con una capacidad mayor a 750 kW. Sin embargo, la tarifa regulada todavía está en uso y complementa a las subastas.

Esta tesis analiza y compara los contextos específicos de cada país en los que se implementan estas políticas a través de un marco de perspectiva multinivel (multi-level perspective). Como resultado, se han identificado los factores de éxito más importantes en Alemania: la planificación a largo plazo, la continuidad institucional, la estabilidad legislativa y, sobre todo, una sociedad activamente participativa y que es ambientalmente consciente. Los obstáculos para la transición en Ecuador son: la discontinuidad institucional, la inconsistencia legislativa, la falta de planificación a largo plazo y la ausencia de la sociedad como actor de la transición energética. Debido al papel pionero de Alemania, más el desarrollo exitoso de las fuentes renovables durante los últimos veinte años, parece conveniente adoptar sus implementaciones de políticas en otros contextos. Por lo tanto, se analiza adicionalmente la posible transferibilidad de la política de subastas de Alemania a Ecuador.

Palabras claves: Tarifa regulada, subasta, transición energética, Ecuador, Alemania

Acknowledgements

I would like to thank specially to my supervisors and advisor, Prof. Dr. Johannes Hamhaber, Dra. Anuschka van ’t Hooft and Dr. Juan Leonardo Espinoza. Their guidance and expertise have greatly contributed to my learning process during the elaboration of this thesis and to acquire important skills for my future professional life.

Also, I would like to express my gratitude to the Mexican CONACyT for the scholarship awarded to me for the last twenty-four months, without it, this experience would not be possible.

Without a doubt, in every step in life there are people who make our days brighter and give us strength and hope when needed. People who we admire and who inspire us. Without them, my journey in every new experience I have embraced would not be the same. To my family, to my friends, to Janine, I would like to say thanks. Your support, your care and above all, your love, are reasons to make me feel alive.

To the experts, who have generously contributed with their time and knowledge as a critical input for this thesis, in Ecuador: Alfredo Mena, Andrés Sarzosa, Sandra Reed and Juan Leonardo Espinoza. And in Germany: Volker Stelzer, Sascha Samadi, Peter Stratmann and Mario Ragwitz. Your contribution is profoundly appreciated and has meant a great source of valuable information. Thanks!

To the professors and staff at the PMPCA and ITT for their support and the opportunity that was given to me two years ago to start a new cycle and to be part of this experience.

To my colleagues and new friends, for new opportunities after our studies and the great experiences to come.

CHEERS!

Table of contents

Figures

Tables

Abbreviations

ARCH	Regulation and Hydrocarbon control Agency
ARCONEL	Regulation and Electricity Control Agency
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
BMWi	Federal Ministry of Economics and Technology
CAQDAS	Computer Assisted Qualitative Data Analysis
CELEC	Electrical Corporation of Ecuador
CENACE	National Operator of Electricity
CIE	Corporation for the energy research
CME	Energy Matrix Change
CO2	Carbon Dioxide
CONELEC	National Electricity Council
DSM	Demand Side Management Scenario
EEG	Renewable Energy Sources Act
EU	European Union
FIT	Feed-in tariff
GWh	Gigawatt hour of energy
HAB	Highest accepted bid
IDB	Inter-American Development Bank
INECEL	Ecuadorian Electrification Institute
INER	National Institute of Energy Efficiency and Renewable Energy
J	Joule
LOSPEE	Organic Law of The Public Service of Electrical Energy
LRB	Lowest rejected bid
MEER	Ministry of Electricity and Renewable Energy
MLP	Multi-level Perspective
MW	Megawatt
MWh	Megawatt hour of energy
NCRE	Non-conventional renewable energy
NGO	Non-governmental Organization
PLANEE	National Plan of Energy Efficiency
PV	Photovoltaic
R&D	Research and development
REF	Reference Scenario
SENPLADES	National Secretariat of Planning and Development
TOE	Tone of oil equivalent
UK	United Kingdom
USD	United States Dollar

1 Introduction

Energy in general and electricity in particular have become a determinant factor for the development of humanity. Energy is recognized as vital for human well-being and has established profound societal changes every time the sources used to produce it changed. Looking back, the shift from fire, wood and food to fossil fuels (Brücher, 2009) might be the most important one in terms of its consequences to life on Earth.

The exact contribution of fossil fuels to global climate change is a current topic of research and debate. Nevertheless, it is well recognized as one of its major causes (NASA, 2018). Climate change is known to be the most important threat to the natural world, world peace and, ultimately, human life (UNFCCC, 2015; UNFCCC, 2017).

Within this context, there is also a general acknowledgement that a large number of the population globally lack access to electricity. Additionally, the billions that do have access still remain dependant of fossil fuels. These facts are translated on political and environmental issues. Furthermore, the energy system is complex and difficult to manage, as it involves numerous actors and is deeply rooted in societal structures. This has led to the conclusion that the current energy system is unsustainable and incapable of dealing with its limitations (Hass et al., 2008). These characteristics coincide with what Rotmans and Loorbach (2009) have called a persistent problem.

In face of this problem, the necessity for change becomes extensively apparent. This change might include: a rethinking and reestablishing of per capita energy levels to provide adequate human quality of life, a significant increase in energy efficiency, or an increase in low-carbon energy supplies like renewable energies and proper regulatory policy-making (Hass et al., 2008).

The last two measures, namely increased renewable energy sources and proper regulatory policy-making, are at the center of the current thesis. In particular, two policy instruments are studied that are broadly used in numerous countries to promote renewable sources in electricity generation: feed-in tariffs (FITs) and auctions. The focus of interest is placed on comparing the implementation of these policies within the contexts of two countries, Ecuador and Germany. These two countries have been selected because Germany is a world leader in renewable energies utilization and policy-making, while Ecuador is a country that is willing to promote these technologies but lacks experience in the policy-making and therefore in its implementation. Both countries have different backgrounds for the implementation of auctions as a newly adopted policy instrument to partially replace FITs. Based on the similarities and differences of the contexts, the implementation of auctions is analyzed as a possible learning process or policy transfer from one country to another.

Overall, achieving the proposed changes constitutes a long-term process with deep restructuring of societal systems (Rotmans and Loorbach, 2009). This process includes the exploration of new values, alongside periods of uncertainty, fear and turmoil (Geels and Schot, 2010). This is called a socio-technical transition, in this specific case an energy transition. This is discussed in Section 2.1 along with the Multi-level Perspective (MLP) framework we used to analyze and describe the transition in a three-level approach.

The theory behind a policy transfer is explored in Section 2.2. Here, the definitions of policy transfer, the reasons for pursuing such a process, as well as the considerations for a successful outcome are detailed. Additionally, the extent to which a transfer can be realized, prospective steps and the utilization of a framework to evaluate the transferability and applicability of a policy are explored. This is based on the studies of policy transfers realized by Dolowitz and Marsh (1996), Dolowitz (2003) and the policy evaluation framework proposed by Williams et al. (2014).

The description of the data required and the methods utilized to process these are addressed in Section 3. A central part of this thesis has been the interviews to experts in Ecuador and Germany, which have been processed in order to contribute to the understanding of the context. First, a total of eight interviews, four in each country of study, were conducted. These constitute an important source of educated, expert opinion and knowledge on the topics related to FIT and auctions. These were semi-structured interviews, as defined and classified by Jamshed (2014), Fylan (2005) and Longhurst (2003). Second, the transcriptions of these interviews have been processed and analyzed by means of a qualitative content analysis, based on the concepts and definitions from Graneheim et al. (2017) and Bengtsson (2016). The content analysis was performed with the aid of Software, what is known in the literature as Computer Assisted Qualitative Data Analysis (CAQDAS), specifically utilizing MAXQDA. Third, a definition of codes to categorize the information from the interviews was realized based on Gibbs (2008), Silver and Lewins (2014) and Miles, et al. (2014).

Finally, to build an understanding of the relevant aspects for the development of policy measures that support renewable electricity, Section 4 describes the technical status of renewable energy sectors, as well as the political organization and legislative contexts for Ecuador and Germany.

For a general understanding, Figure 1 illustrates this thesis' line of argument. The energy system constitutes a persistent problem that requires a change, which is a long-term process identified as a socio-technical transition. Specifically this transition is an energy transition toward the utilization of renewable sources for electricity generation aimed at replacing fossil fuels. As an instrument to influence this transition process, energy policies that are effective in one country can be learned from or transferred to another. This is the case of Ecuador, where FITs have been phased-out and auctions are being applied. The implementation experience from Germany can be useful and transferred to Ecuador for the implementation of this policy measure.

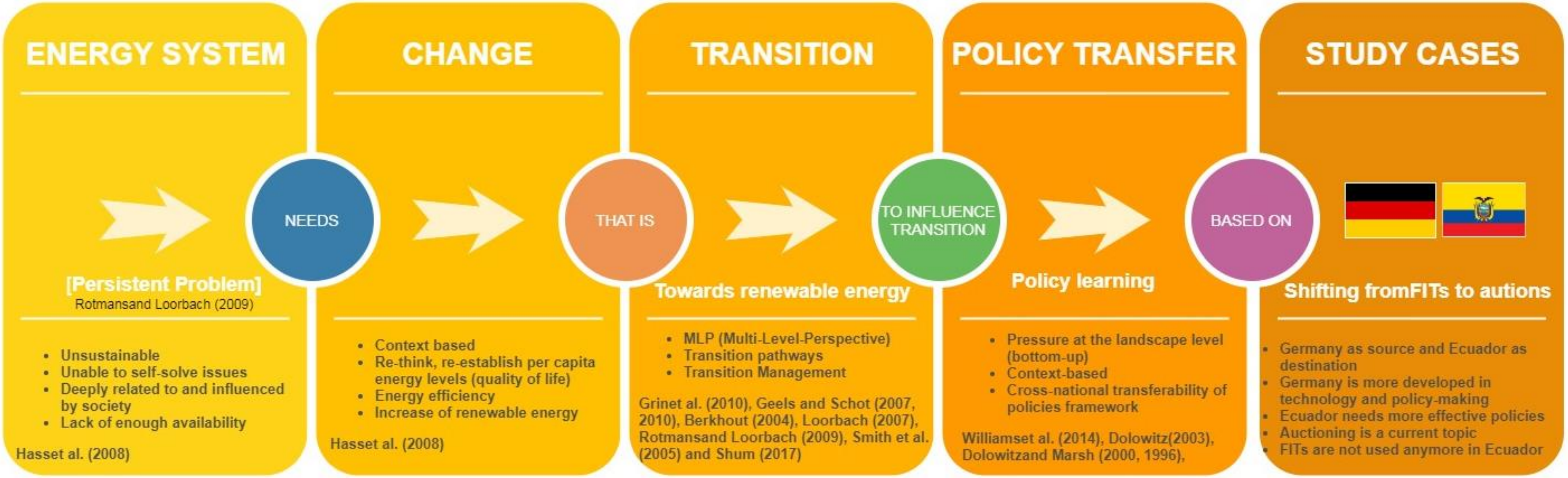


Figure 1: Description of the current research
Source: own elaboration

1.1 Justification

The selection of Ecuador and Germany as cases of study has been determined in regards of the different processes and stages in their development of renewable energies in the electricity sector. These differences depict Germany as having desirable characteristics for an energy transition. The analysis of both country´s contexts by means of the theoretical framework described in Section 2 allows for such different cases to be comparable. This is achieved by the visualization of the same contextual factors (e.g. environmental, economic, social; etc.) at two different levels: one country specific (landscape) that influences the particular policy implementation, and the other sector specific (regime). At the second are evaluated the necessary characteristics of the policies that need to be met for success, independent of the country.

Despite the commencement of a transition to renewable energy in Ecuador, it can be observed that the Strategic Institutional Plan of the Ministry of Electricity and Renewable Energy (MEER, 2014) does not count with enough specific plans and programs to support non-conventional renewable energies (NCRE). Also, even though there exist long-term objectives and indicators on the electricity sector, these do not exist for NCRE (MEER, 2014). On the other hand, Germany represents a success on the road to renewable energies, having included since 1991 the first German Act on Supplying Electricity from Renewables law (Stromeinspeisegesetz, StrEG) and other policies such as the Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz, EEG). Later, it additionally made improvements to existing laws, subsidies, tax exemptions, corporate financing schemes, etc. (Bechberger and Reiche, 2004).

Both countries have adopted in recent years auctions with different implementations. Germany has already conducted several, respects differentiated regulations per renewable technology, and holds high realization rates, especially for solar PV (photovoltaic) (Morris, 2017; Enkhardt, 2018). In Ecuador the auctions are called ‘public-private’ associations and are intended to replace the phased-out FIT. These have been designed with no specific implementations for different technologies (Comité Interinstitucional de Asociaciones Público Privadas, 2017). This is perceived as a major drawback for the impulse of renewable sources due to the lack of consideration of the specific characteristics and requirements of each specific source. For this reason, the auction implementation in Germany could be transferred to Ecuador.

1.2 Objectives

General objective

- Compare the renewable energy policies in Ecuador and Germany when shifting from FITs to auctions.

Specific objectives

I. Determine the current paths and stages at which Germany and Ecuador are in their transition to renewable energies within the electricity sector.
II. Evaluate the context suitability in Ecuador for FIT and Auction policies in renewable energies in the electricity sector.
III. Evaluate the context suitability in Germany for FIT and Auction policies in renewable energies in the electricity sector.
IV. Determine specific improvement and development measures in Ecuador that can be transferred from Germany.

1.3 Scope of Thesis

This thesis is focused on the electricity sector and its generation by means of renewable resources. Furthermore, the analysis of policy measures to promote these technologies has been limited to FITs and auctions. The implementation of these measures is compared between Germany and Ecuador considering the specific contexts in each country by introducing an MLP framework. These contexts are differentiated at two levels: a macro (landscape) and a meso (regime). Here, only the specific contexts defined in Section 3.3.4 are considered. Furthermore, the context selection is based on the codes used to categorize the information transcribed from interviews realized to experts.

Additionally, the regime level described in the MLP framework considers the existence of other sources like fossil fuels (which constitutes the regime), nuclear and large-scale hydro; nevertheless they are not the focus of research. Furthermore, the discussion at the regime level has been limited to the technical context.

2 Referential framework

2.1 Transition theory

Rotmans and Loorbach (2009) discuss what persistent problems are and how they affect society. As the authors explain these problems are complex, difficult to manage, involve a variety of actors and are deeply rooted in societal structures. Moreover, as more of these persistent problems appear, their symptoms become more visible. Furthermore, these problems depict failures in the system, which cannot be solved with current policies or market-related measures. Rotmans and Loorbach (2009) extend the definition of persistent problems as the superlative of the term “wicked problems” as defined by Rittel and Webber (1973: 160). As the central topic of this research the energy problem is considered a good example of what persistent problems are.

Countering these system failures requires restructuring our societal systems (Rotmans and Loorbach, 2009) and part of that constitutes the exploration of new values, alongside periods of uncertainty, fear and turmoil (Geels and Schot, 2010). This is what a transition constitutes and the concept has already been studied for decades in different disciplines, such as economics, sociology, political science, technology studies, or system sciences (Rotmans and Loorbach, 2009).

Transitions describe a strong lace and changes within structures and practices profoundly related to society and culture, which makes of them very complex phenomena (Geels and Schot, 2010). The structural changes carried out are radical and the result of a coevolution of “economic, cultural, technological, ecological, and institutional developments at different scale levels” (Rotmans and Loorbach, 2009: 185). Additionally, transition determines sudden changes with consequences beyond economy and that result in nonlinear changes, for instance the creation of new institutions (Shum, 2017).

Research on transitions has expanded to different areas of interest, such as “regime transformation, technological revolutions, technological transitions, system innovation and transition management” (Geels and Schot, 2007: 399). The focus of this thesis will be technological transitions from a socio-technical perspective.

2.1.1 Socio-technical transition theory

Analyzed from a socio-technical perspective, technological transitions come from a well-informed analysis of social studies of technology. This effort includes much more substantial context and background in comparison to the sole concept of ‘technology’, adding the “economic, social, cultural and institutional connotations of particular technological configurations” (Berkhout et al., 2004).

In this thesis a socio-technical approach will be applied as presented by Geels and Schot (2010). This perspective is based on a “contextual understanding of technology” (Geels and Schot, 2010: 12). Context in technological development is enriched by the interlacing of heterogeneous elements, due to necessity of knowledge building, social networking, resource mobilization, market adaptation and regulatory frameworks. Indeed, Berkhout et al. (2004) point out the importance of relating the context of the transformations to the transformation processes themselves as a preliminary requirement for analysis in the transition management and the steering of changes.

Furthermore, it can be added that technological advances and regimes need to be better understood since there are continuous questions about the effects of technology beyond the point of production and consumption. Here, policy-making and social groups show a historical effort in the arena of either controlling the effects of new technologies or pursuing their expansion while praising their important social benefits (Berkhout et al., 2004).

In this thesis a socio-technical approach will be applied as presented by Geels and Schot (2010). This perspective is based on a “contextual understanding of technology” (Geels and Schot, 2010: 12). Context in technological development is enriched by the interlacing of heterogeneous elements, due to necessity of knowledge building, social networking, resource mobilization, market adaptation and regulatory frameworks. Indeed, Berkhout et al. (2004) point out the importance of relating the context of the transformations to the transformation processes themselves as a preliminary requirement for analysis in the transition management and the steering of changes.

Furthermore, as Berkhout et al. (2004) explain, it is exemplified by the history of technology that there exists an active process of structuring of technology and its social context, idea firmly reinforced by Geels and Schot (2010), who perceive a marked connection between technological and social aspects, illustrated by the continuous interest towards applications and effects of technology. Moreover, an increasing pursue of social control over technology is seen in industrial societies; methods by which public entities and civil society have aimed to understand and manipulate technological changes have varied in time but have always been present (Berkhout et al., 2004).

If the energy problem is reconsidered with this background the need for a transition becomes more apparent. Part of the transition requirements identified by Haas et al. (2008) include: rethinking and reestablishing per capita energy levels to provide adequate human quality of life, significant increase in energy efficiency, increase in low-carbon energy supplies like renewable energies and proper regulatory policy-making.

By focusing on the policy-making, socio-technical transitions are aiming for a sustainable development and sustainable energy systems (Berkhout et al., 2004; Smith et al., 2005; Loorbach, 2007; Rotmans and Loorbach, 2009; Geels and Schot, 2010; Grin et al., 2010), which might contribute to comply with the COP 21 conference from 2015 treaty to limit temperature rise to 1.5 °C. This process involves indisputably the deployment of renewable energies that still rely on policy and regulatory instruments to grow in supply and demand. Some of these instruments are: capital policies, installation subsidies, feed-in tariff, auctioning; etc (Shum, 2017).

Furthermore, these socio-technical transitions can be described and analyzed by means of the MLP framework. Geels and Schot (2010) explain that MLP is based on several theoretical traditions synthesized from evolutionary theory. MLP conceptualizes transitions as a combination of processes. These interact at three levels, where they influence and interfere with one another. The three levels are: “innovative practices (niche experiments), structure (the regime), and long-term, exogenous trends (the landscape)” (Geels and Schot, 2010). These levels are functional and not spatial, therefore they can be used to depict the functional relationships existing between actors and structures. In these levels, higher levels imply more aggregated components and relationships. Furthermore, in this aggregation, slower dynamics between the actors are generated. Finally, within this setting, transitions are only achievable when the dynamics of the system gains mutual reinforcement in a particular direction.

Grin et al. (2010) contribute to the understanding of MLP applied to transitions with the following statements: it constitutes a process theory in which transitions are reached and gained by diverse groups in society; during the transition process, actors can change interests and even identity; the specific timing of events determines the type of transition pathway can be followed; MLP is layered by nature, likewise are the system descriptions provided by it and is based on event sequences; MLP is a general approach that can be applied to different case-studies because of its versatile character.

At the micro-level are found the niches, protected environments, or as named by Rip and Kemp (1998) ‘experimental settings’ where the usual norms and practices that reign in the current technological do not apply, indeed regime changes are expected when the new norms applied in the niche become more widely applied in the regime as their influence grows, reaching a point where the regime can be completely transformed (Berkhout et al., 2004). At this level though, it is also analyzed whether niche innovations are disruptive or collaborative with landscape developments in pursue of change. Landscape developments that strengthen the regime are no drivers of transition, the ones that create impulses and opportunities for change are the disruptive developments. From the niche side, they can have competitive relationships to the regime if they compete for replacing it, or a symbiotic relationship when they help to improve performance or solve existing problems (Geels and Schot, 2007).

At the meso-level are the regimes, which provide the space where actors related with a technology can interact. They are the "rule-set or grammar embedded in a complex of engineering practices, production process technologies, product characteristics, skills and procedures, ways of handling relevant artifacts and persons, ways of defining problems; all of them embedded in institutions and infrastructures" (Shum, 2017: 1384). A regime comprehends "a conglomerate of structure (institutional and physical setting), culture (prevailing perspective), and practices (rules, routines, and habits)" Rotmans and Loorbach (2009: 185). Smith et al. (2005) add that regimes are relatively stable configurations of the cited components that together establish normal development and use of the technologies. This determines strong convictions of technological practices and how to improve them.

The landscape forms the macro-level of the model and describes the exogenous aspects of the environment and the large-scale context of material factors in society, for instance organization and disposition of energy infrastructure, industry, transportation infrastructure, etc; but also heterogeneous factors like macro-economy, emigration, political turmoil, cultural values, armed conflicts; etc. (Shum, 2017).

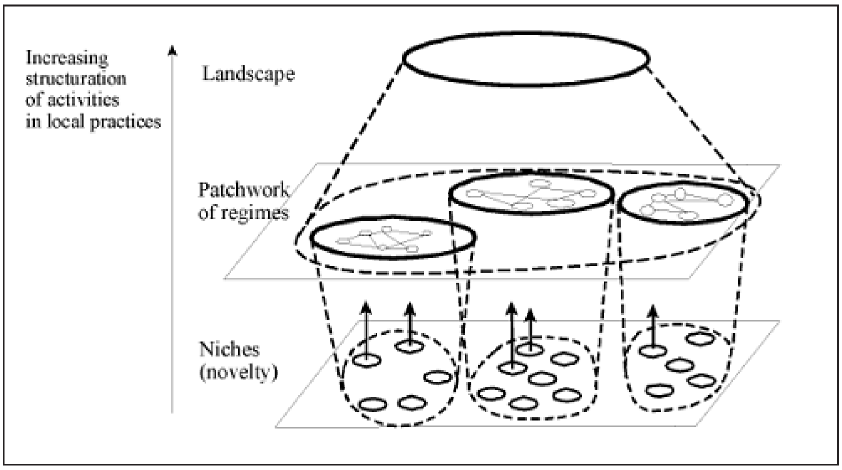


Figure 2: MLP Levels in a nested hierarchy
Source: Geels (2002: 1261)

Figure 2 shows the structure and relation of the three levels in the MLP, with various niches and various technological regimes existing and being influenced by the same technological landscape in a hierarchical relationship.

An important factor to add to the relationship between these three levels is the timing of interactions, which can produce different outcomes (Geels and Schot, 2007). Also, time-wise there is a sequence of four phases in a transition: (i) the pre-development phase, where changes occur in the background but are not apparent; (ii) the take-off phase, where the structural changes begin to occur; (iii) the acceleration phase, where changes are finally apparent; (iv) the stabilization phase, where new equilibrium is accomplished (Geels and Schot, 2010).

One key contribution of the socio-technical regime is precisely the resistance to change, providing a lock-in of the current socio-technical system, what is translated to a certain level of stability. It is important to remember that in this regime diverse groups of society participate and interact according to cognitive, regulative and normative rules. These rules allow for interaction and innovation in an incremental fashion, guiding to more or less predictable trajectories. This process happens for both, technology and for other trajectories, such as science, culture, market economy; etc. All these trajectories then interact thanks to the action of social groups, influencing one another. Sometimes changes in one trajectory are so strong that they create great tension in the system. These are moments of opportunity for transitions to occur (Geels and Schot, 2010).

The benefit of MLP is that it provides a historical view of each trajectory and therefore the possibility to analyze it independently and in conjunction with other trajectories. Moreover the MLP focuses on the dynamic processes created by the interaction of trajectories and actors, tensions and ‘windows of opportunity’ for a transition to occur (Geels and Schot, 2010).

In Figure 3 are shown the six factors influencing the trajectory and which compose the ‘social’ factor of the socio-technical regime. These are: socio-cultural, policy, science, technology, production networks/industry structures and user practices and markets.

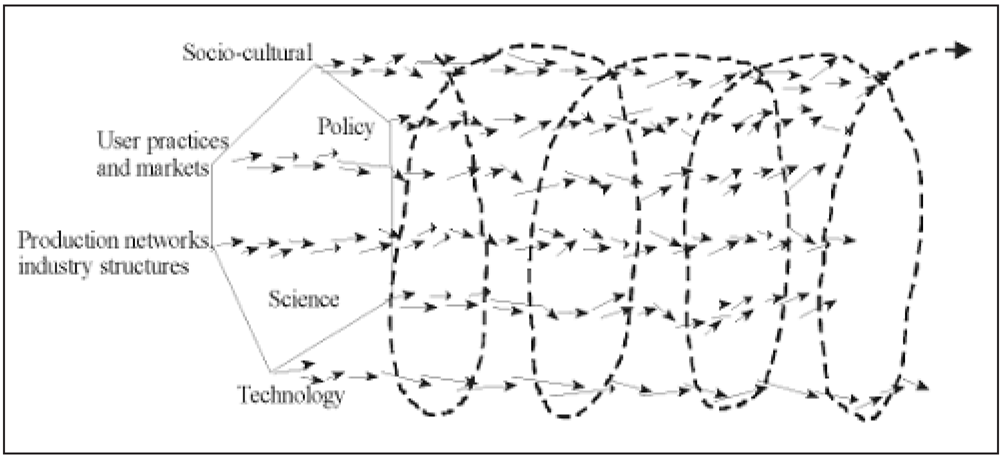


Figure 3: Co-evolution of trajectories in a socio-technical regime

Source: Geels and Schot (2010: 21)

2.1.2 Transition pathways

Transition pathways are one of the important possibilities of transition theory and its versatility. Through the existence of pathways, there is the capability of providing narrative explanations of the transition outcomes.

In this explanatory analysis of regime change, two dimensions are considered: resource availability (internal and external) and coordination of the resources deployment (high and low). This can be observed in Figure 4. The resources dimension describes whether the system response to steering mechanisms is dependable on internal or external resources. On the other hand, the deployment dimension describes if the regime change is planned at the regime level and if the transition is intended or unintended in regards to historical processes (Berkhout, 2004).

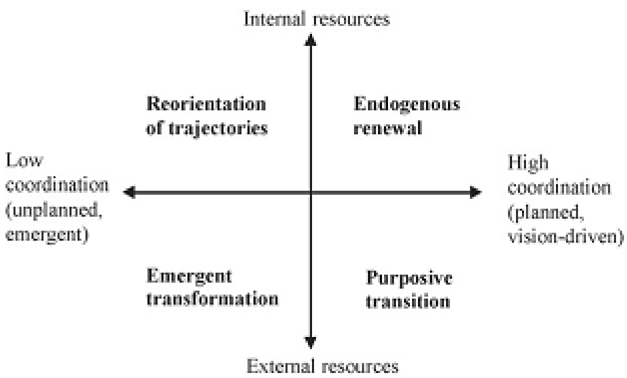


Figure 4: Transition pathways

Source: Geels and Schot (2007:401)

The four transitions originally proposed by Berkhout (2004) are explained in Table 1.

Table 1: Typology of transition pathways
Source: Own elaboration based on Geels and Schot (2007:401)

Endogenous renewal	Reorientation of trajectories
Regime actors react with conscious efforts to pressures	They start with a shock inside or outside the current regime
They use internal regime resources	Regime actors react by using internal resources
Emergent transformation	**Purposive transitions**
Uncoordinated efforts or pressures from outside the regime	Intended, coordinated process
Generally carried out by small firms	Come from outside the regime

It is important to note that the transition pathways as originally proposed provide only four types. Geels and Schot (2007) suggest that this might require an extension and more understanding as to be able to describe more possible outcomes from transitions and also more complex combination of dimensions.

2.1.3 Transition management

This transition management `theoretical framework is very much developed in the Netherlands and has been a mechanism to deal with transition processes in complex societal systems that seek new governance strategies towards long-term sustainable development. Additionally this framework intends to shape governance processes that intend societal innovation (Loorbach, 2007).

It has been defined as a cyclical process with no fixed order. As shown in Figure 5 it denotes four steps and each step might correspond to different governance types, which involve different actors and instruments (Loorbach, 2007):

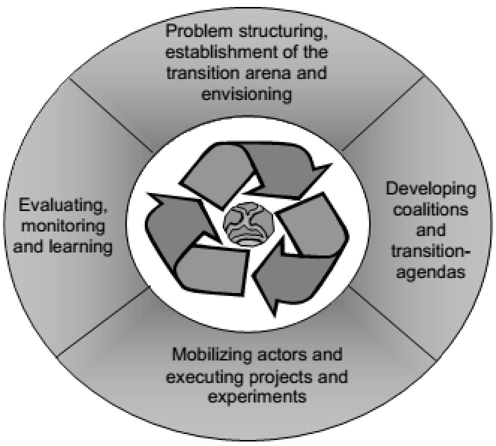


Figure 5: Transition management cycle
Source: Loorbach (2007:5)

These four steps are described as follows: (i) define the problem of interest and establish the transition arena; (ii) define the transition agenda and the possible transition paths based on sustainable development; (iii) define and experiment transition approaches, mobilize the resources necessary for transition; (iv) evaluate and monitor the transition experiments to provide adjustments to the approach.

2.2 Cross-national transferability of policies

2.2.1 Policy transfer overview

A policy transfer as defined by Dolowitz and Marsh (1996: 344), and cited by Williams et al. (2014) is “a process in which knowledge about policies, administrative arrangements, institutions etc. in one time and/or place is used in the development of policies, administrative arrangements and institutions in another time and/or place”. It is the base for this research, as the authors focus on filling the gap between selecting policies to transfer from a reference country and then appraising the actual feasibility and transferability of those policies into another country.

To define transferability and applicability Williams et al. (2014), who base their definition on Wang et al. (2006) are cited:

- Transferability (generalisability) “criteria refer to whether the intervention can achieve the same outcomes in the local setting (goal/objective versus need). Attributes of transferability include the: magnitude of issues in the local setting; magnitude of the reach or coverage; the cost-effectiveness of the intervention, and target population characteristics”.
- Applicability (feasibility) “assessment refers to whether it is possible to provide the intervention in the local setting (contextualizing factors). Attributes of feasibility include: the political climate/leverage; political barriers; social acceptability; locally tailored intervention; available essential resources and identified organization(s) to provide intervention; organizational expertise, and capacity”.

As Dolowitz (2003) explains, in policy-making the most important thing is to learn lessons, and two things a policy-maker can learn are, that the international arena provides interesting political systems which work as experimental subjects in policy innovation, but also, that it is possible to adopt the work done in those places in the political system of choice.

In the academic world this subject has been present for some time, Dolowitz and Marsh (1996) and Dussauge Laguna (2013) provide an extensive literature review on policy transfer documentation, areas of application, actors, concerns, and case studies. Rose (1991) also explores this subject, and he elucidates that countries have common problems, therefore policy makers at different geographical scales can learn from how other countries counter similar problems. As a result, being in an academic manner or not, it can be accepted that policy transfer is a practice with a long history, attracting the profound attention and interest from scholars and governments in many countries. An interesting case is the UK, where the government, the National Audit Office and the Cabinet Office already launched official documentation with emphasis on the policy transfer tool for policy-making by 2003 (Dolowitz, 2003).

Dolowitz (2003) explores extensively the reasons and applications of policy learning with a strong focus on the context analysis (also highlighted by Feenstra and Bunzeck (2015) and Williams et al. (2014)) but also with other considerations. These views of context importance are highly appraised in the current thesis and have been considered in the stages of development of the same. In Table 2 a summary of these ideas is presented.

Reasons why policy transfers occur
Justify actions taken or decision already made
Solve real problems in policy
Need to comply with international standards or memberships. Such as country members of the EU (Coercive process). It can range from voluntary, semi-voluntary, semi-coercive to coercive processes.
Special considerations
How, where are policy models searched?
How much of the source policy information collected can/should be transferred?
Are the targeted problems the same/similar to the problems solved by the source policy?
Understanding of the social/political context of source and destination of policies
Policy transfer is simple in concept but hard to be successful

Table 2: Reasons and considerations for policy transfer
Source: Own elaboration based on Dolowitz (2003)

2.2.2 Extent to which policy transfers can be executed and how

Whether a policy transfer is coercive or voluntary, there exist forms in which policies can be adopted. Based on Rose (1991, 1993, 2005), Williams et al. (2014) present five policy transfer modes recognizing the extent to which they are adopted.

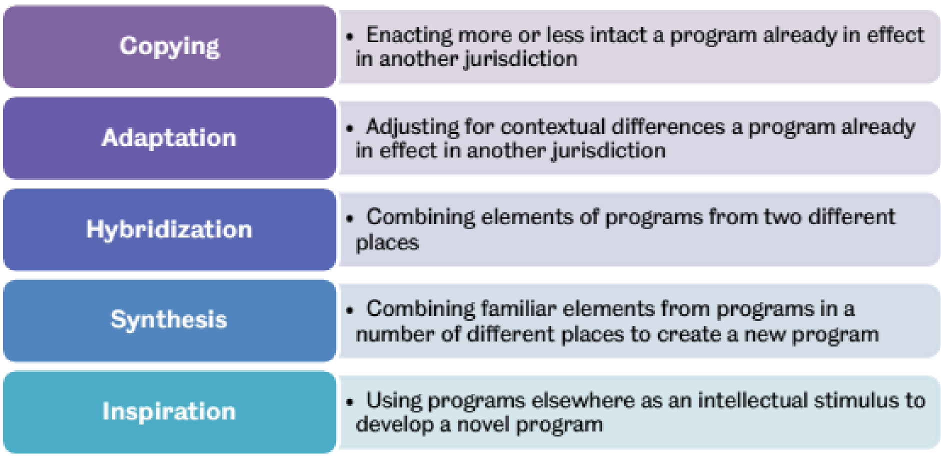


Figure 6: Policy transfer modes
Source: Williams et al. (2014:7)

The choice made about the transfer mode is going to depend broadly on the context of the destination country, which can influence greatly in the success or failure of the transfer. After this initial selection a certain order of steps should be followed, that will allow for context acknowledgement and reconsideration of the transfer mode chosen, but more importantly, to evaluate if the source policy should be adopted or not. Also, in this stage it is necessary to consider the concepts of transferability and applicability of policies previously described.

A process of ten steps for policy transfer is proposed by Williams et al. (2014) based on Rose (2005):

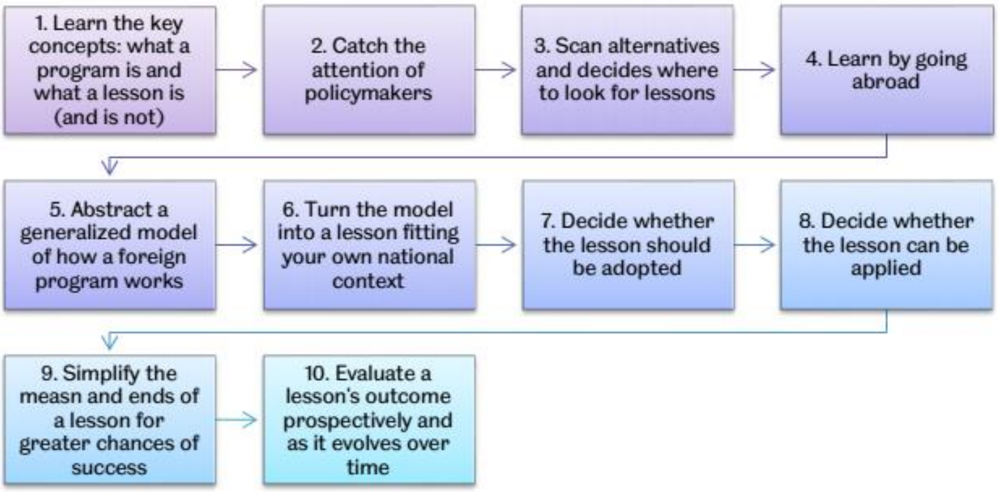


Figure 7: Steps for policy transfer
Source: Williams et al. (2014:8)

The integration of policymakers in the initial process and the learning step by going abroad contribute to the context understanding in the source and destination countries and consequently in the success of the transfer.

2.2.3 Considerations for a successful policy transfer

As mentioned before, policy transfer is a complex process in which success is not easy to achieve. Williams et al. (2014:9) cite six hypothesis presented by Rose (1993) regarding the complexities that affect transfers and their possible success:

- “Programs with single goals are more transferable than programs with multiple goals.
- The simpler the problem the more likely transfer will occur.
- The more direct the relationship between the problem and the ‘solution’ is perceived to be the more likely it is to be transferred.
- The fewer the perceived side-effects of a policy the greater the possibility of transfer.
- The more information agents have about how a program operates in another location the easier it is to transfer.
- The more easily outcomes can be predicted the simpler a program is to transfer.”

Additionally, Williams et al. (2014) present some success factors for policy transfer as perceived from literature:

- Using more examples for policy transfer than just one is better.
- Literal copying of policies is more likely to fail.

- Change agents and other strong domestic agents in the policy-making are useful to achieve goals.

The authors extend the analysis with a categorization of constraint factors or ‘obstacles’ in the transfer process. ‘Cognitive obstacles’ are related to information collection, especially regarding the policy problem definition, search for policy options, interaction with policy actors and the selection process from different alternatives. ‘Environmental obstacles’ are structural and belong to the context: socio-economic, political; etc. ‘Technical constraints’ during implementation refer to financial resources management, project planning and adoption of an appropriate theory for the development of the policy.

Finally, three types of failing transfers are presented, taken by Williams et al. (2014) from Dolowitz and Marsh (2000):

- An ‘uninformed transfer’ results when the destination country of the policy does not have enough knowledge about the adopted policy.
- An ‘incomplete transfer’ is the outcome of not importing all the key features of the policy which make it successful in the source country.
- An iInappropriate transfer’ is the result of an incompatibility of the social, political, cultural and economic contexts between the source and destination countries.

2.2.4 Prospective policy evaluation framework

In the current thesis, the adoption of a transition theory model is intended to provide a better understanding of the transition process and therefore to acknowledge and avoid the three cases of failing transfers, specially the ‘inappropriate transfer’, due to the great effort that is given to understand the countries’ contexts. Furthermore, the context analysis is intrinsically incorporated by means of the applicability and transferability assessments; concepts previously introduced and that correspond to what is called by Williams et al. (2014) as the evaluation of prospective policies framework.

This evaluation is based on a broader analysis and literature review conducted by Buffet et al (2007, 2011). In this thesis, the framework developed by Williams et al. (2014) has been modified according the needs of this study while maintaining its purpose, which is to evaluate the transferability and the applicability of the policies.

The transferability or ‘generalisability’ responds to questions focused on whether the policy of interest can achieve similar results in the destination country (Williams et al., 2014). For the case of the two policy instruments studied this is highly visible and is discussed in more detail in Section 6.1.

On the other hand, Table 3 shows the parameters considered when evaluating the applicability. These are used in section 6.2 and are applied to the contexts in Ecuador and Germany based on the most important requirements and characteristics of the policies analyzed in Table 19 and Table 20.

Table 3: Framework for evaluating applicability of policy initiatives

Construct	Factors/criteria (may be given different relevance/weight)	Questions to ask
Applicability (feasibility) and enforceability in local context	Political acceptability	Does the objective of the measure match with political priorities? What are the government's indicators for success of the measure? Is there political opposition in the current climate?
Can it work for us?	Social acceptability	Will the target population be interested in the intervention?
	Impact on other affected interest groups / stakeholders: winners and losers	Does the measure contradict the interests of any important stakeholders / interest groups? (trade unions, etc..)
	Existing institutional / policy infrastructure	Is the measure's potential impact contradicting/ cancelling out /overlapping with existing policies? Is the institutional and legislative infrastructure in place?
	Available resources	Financial, human resources, training required? Administrative/enforcement capacity in place?
	Other local barriers and implementation risks (structural constrains)	Risk of deformities in implementation due to other structural/cultural constraining factors, inefficient institutions, immaturity of the economic/financial system, political volatility.

Source: Williams et al. (2014)

In a wider scope, this framework provides a good first approach and background, to narrow down the number of prospective policies in a selection process for transferability. In this framework, the context is the main differentiator for a selection and requires a more extended and "rigorous empirical testing" (Williams et al., 2014: 24). Therefore, this is not a definitive step in the decision-making of policy transferability.

2.3 Own approach

In this research the MLP is used as a general framework to compare and analyze the implementation of two instruments of policy-making that execute pressure at the regime level to steer an energy transition from fossil fuels to renewable sources: FITs as an initial, former measure and auctions as a new approach for an already existing renewable energy sector.

For the implementation of these policies it is possible that Ecuador learns from the experience in Germany. To evaluate the feasibility of this learning or transfer of policies, are considered the general recommendations for successful policy transfers from Williams et al. (2014) and Dolowitz (2003).

As many recommendations from these authors as possible were used to amplify the understanding of transferability and context building. However, it is acknowledged that broader expert and stakeholder inclusion is a requirement to integrate a more complete view and accurate appraisal, especially for the for transferability and applicability evaluation framework of policies presented by Williams et al. (2014), which in this thesis has been simplified.

The fore mentioned recommendations consider profoundly the importance of the context in which policies perform, which is supported by the MLP framework. Together they consider the interaction of different actors from different regimes for a total system outcome and also the specific country variables, which shape the process of transferability of policies and a transition.

From the general framework of the MLP, transition pathways and transition management presented previously, and based on Grin et al. (2010), Geels and Schot (2007, 2010), Berkhout (2004), Loorbach (2007), Rotmans and Loorbach (2009), Smith et al. (2005) and Shum (2017), here is taken only the MLP framework itself. Additionally, the factors influencing the trajectory of the transition shown in Figure 3, in Section 2.1.1 have been replaced with the contexts evaluated in this thesis, which are: economic, environmental, geographic, legislative, political, social and technical.

Based on the literature, it is perceived that a rather fully planned transition in the energy sector is not the case in Ecuador; therefore a ‘transition management’ does not apply (in Germany the opposite is true). Additionally, for the complexity of the contexts it is assumed that the specific typology provided by the ‘transition pathways’ does not describe accurately the process in Ecuador. Nevertheless, the narrative resource utilized in this proposal will be of much help to analyze and describe the implementation of FIT and auction in the energy transition.

3 Methods

3.1 Data needs

To evaluate the national contexts of Ecuador and Germany in the scope of FIT and auctions' requirements it was necessary to acquire the following information:

Table 4: Summary of data needs and methods

Data needed	Method	Section of thesis
1. Country facts and characteristics of the development of renewable energies in Ecuador and Germany	Literature review	4. Case studies
2. Basic theory and implementation guidelines of FIT and auctions	Literature review	4. Case studies
3. Theory and guidelines for interviews and qualitative content analysis	Literature review	3. Methods
4. Experts' feedback of country context (Ecuador and Germany) and development of FITs and auctions	Semi-structured interviews (includes transcription)	5. Results
5. Code definition	Qualitative data analysis. Based on a mixed approach: literature review, previous knowledge (from literature reviews) and trial against interview analysis	5. Results
6. Experts' feedback analysis and code assignment	Computer assisted qualitative data analysis (CAQDAS) with MAXQDA	5. Results

Source: own elaboration

The process started with a literature review of the countries of study to understand their general context and the facts surrounding the renewable energy development. This general idea was complemented with further literature review about the specific policies of interest in this thesis: FITs and auctions. These first two steps combined already provided a big picture of the status of renewables in each country and how the FITs and auctions have been useful in the promotion of the renewables. However, for a deeper and more complemented background, a series of interviews were conducted with experts of different areas of the renewables in each country.

The interviews were transcribed to make use of the great potential of content analysis and combine this information with what was retrieved from the previous literature reviews to produce the context evaluation. In this sense, the literature provided the theory and the framework to understand what FITs and auctions require contextually and what are common guidelines for success. The interviews provided more empirical contextual characteristics from each country that complemented with the countries' fact sheets to provide the inputs for a context suitability evaluation and comparison between the two countries to determine what exists and what may exist for a good development of the policies.

Content analysis requires the generation of codes that help to identify the information needed (in this case the context). In this thesis, the code definition was based on a mixed approach which considered previous knowledge acquired from the literature reviews, pre-existing ideas and an exercise of proving them against the transcriptions by means of the software analysis. The details on the content analysis definition, code definition and generation are found in the next section.

3.2 Data acquisition: Interviews

3.2.1 Concept and typology

Interviews are one way of retrieving information from another person orally, in a conversational manner (Longhurst, 2003; Fylan, 2005) and they are the most used method for collecting data in qualitative researches (Jamshed, 2014; DiCicco-Bloom and Crabtree, 2006). Here, an interviewer asks the questions and can direct the interview in different ways, determining one of the different types of interview. These types are: structured, semi-structured and unstructured (Longhurst, 2003; Jamshed, 2014).

Structured interviews follow a specific order in the questions asked and the list of questions is predetermined and standardized. The complete opposite case are the unstructured interviews, which are more likely directed by the interviewee and not the interviewer. Furthermore, these resemble a conversation or oral history (Longhurst, 2003).

In the middle of these two are the semi-structured interviews. While still having a list of predetermined questions, they allow enough flexibility to accept open responses from the interviewees and receive more in-depth understanding that allows responding to complex research questions (Longhurst, 2003; Jamshed, 2014; Fylan 2005). Fylan (2005) adds that in these, the interviewer has a good understanding of what he or she wants to learn about, therefore there exists a set of questions and some level of structure, however, the conversation can vary greatly between participants. Within this variation Fylan (2005) recommends that more level of structure should exist when a coding frame is part of the methodology.

In general, it is accepted that semi-structured interviews vary in length between 30 min to more than 60 min and recording of the conversations is recognized as an effective method of retrieving more data (Jamshed, 2014). Another important characteristic is that in semi-structured interviews, the only source of data for the qualitative study is the interview itself, while an unstructured interview, for example, is usually complemented with other methods, such as observation (DiCicco-Bloom and Crabtree, 2006).

Semi-structured interviews have served different areas of study, such as geography (Longhurst, 2003), psychology (Fylan, 2005), ethnography (Jamshed, 2014) and health-care (Jamshed, 2014; DiCicco-Bloom and Crabtree, 2006) to give a few examples. Nevertheless, contemporarily this method has been more and more widely used in topics related to the energy transition (Kooijman-van Dijk and Clancy, 2010; Seiwald, 2014; Bouly De Lesdain, 2015; Steinbacher, 2015; Facchinetti et al., 2016; Sovacool, 2017; Shabdin and Padfield, 2017; David and Schönborn, 2018; Li and Pye, 2018; Olson-Hazboun, 2018; von Wirth et al., 2018). This has given enough confidence to use this method for data acquisition and the following qualitative content analysis of the current topic of research.

3.2.2 Semi-structured interviews and the current approach

The key source of information for this thesis was the realization of semi-structured interviews to experts from different areas of the renewable energy development and policies from the countries of study. They have provided valuable knowledge and facts about the contextual characteristics surrounding the FIT and auction policy measures to support the renewable energies in each country. A total of eight interviews, four in each country were carried out in a period of eleven months and were based on the questionnaires found in the Appendix.

The decision of interviewing experts was based on the quality and quantity of knowledge that can be acquired about a topic in relatively short period of time. Expert knowledge and opinion is loaded not only of many years of studies but experience in the field and decision-making, therefore it certainly shapes the future of the energy transition. Their information definitely counts and should be considered when understanding how and why complex processes as the energy transition are influenced. Additionally, the vast amount of information obtained in such a short time has the potential of being analyzed, described and interpreted by means of analytical tools to be better understood and purposely utilized.

The interviews were based on a pre-defined set of questions but with the openness to accept additional information that the experts would share. For the reason that the contexts may be seen with different levels of importance depending on the area of work of the experts, their selection followed the intention of covering varied and complementary fields of work in the renewable energies. In this manner, for the case of Ecuador, experts from the third sector, government, legal and education were selected. Similarly in Germany, despite the fact that three out of four interviews comprised experts from research institutions, their focuses are different. The fourth participant represents a governmental institution. The complete list of experts and the details of the interviews is show in the table below:

Table 5: Detail of experts interviewed

Name of expert	Position	Institution	Sector	Country/ Language	Date	Mode/Aprox. Duration hhmm
Alfredo Mena	Executive director	Corporation for the energy research (CIE)	(Non-governmental Organization) NGO	Ecuador/ Spanish	07 August 2017	Personal/01h36
Andres Sarzosa	Policy and energy efficiency specialist	Ministry of Electricity and Renewable Energy (MEER)	Government	Ecuador/ Spanish	08 August 2017	Personal/01h15
Juan Leonardo Espinoza	Professor	University of Cuenca	Education	Ecuador/ Spanish	18 August 2017	Telephone/01h25
Sandra Reed	Partner of the firm	Pérez Bustamante & Ponce	Legal	Ecuador/ Spanish	30 August 2017	Personal/0h33
Volker Stelzer	Scientific assistant	KIT ITAS	Research (systematic sustainability assessment and sustainable energy supply)	Germany/ English	20 March 2018	Telephone/00h45
Sascha Samadi	Scientific assistant	Wuppertal Institut	Research (future energy and mobility structures)	Germany/ English	27 April 2018	Personal/00h46
Peter Stratmann	Head of unit	Bundesnetz-agentur	Government (Renewable Energies)	Germany/ English	17 May 2018	Personal/01h10
Mario Ragwitz	Deputy of the Institute	ISI Fraunhofer	Research (Energy Policy and Energy Markets)	Germany/ English	21 July 2018	Telephone/00h31

Source: own elaboration

The chosen method to analyze and interpret the information collected from the semi-structure interviews was the qualitative content analysis, considered under the modality of the Computer assisted qualitative data analysis (CAQDAS).

The reasons why qualitative content analysis was selected for this research are: on the one hand transcriptions of the semi-structured interviews realized to experts were generated and later analyzed in a way that differences and similarities were appraised, revealing different patterns in regards of the specific topics of renewable energies, policies and development. Therefore interpretation was a major requirement and some level of objectivity needed to be added in this sense, despite acknowledging pre-defined ideas about the topic. The coding capacity of the qualitative content analysis perfectly covered this requirement.

On the other hand, the purpose of this research is to generate in-depth understanding and consequentially to provide a detailed description of the contextual similarities and differences of the FITs and auctions as policy measures between two very different countries. This lead to a comparison of the contextual factors of these two countries and to a descriptive recommendation on what should be changed in the Ecuadorian case to achieve more effective results in the development of renewable energies by means of auctions as policy measure, ideally as good as those achieved by Germany.

3.3 Analytical Tools: Coding and Content Analysis

3.3.1 Concept of qualitative content analysis

At first, content analysis was used exclusively for quantitative approaches, but later it suffered changes towards a more interpretative approach, and thus started to be used also for qualitative data analysis (Graneheim et al., 2017). Interpretation will vary in terms of abstraction and depth, depending on the researcher and how he or she achieves an objective, detached view of the topic. Despite this challenge, confusion related to philosophical concepts is reduced due to a lesser number of rules and a non-specific linkage to specific fields of science when compared to other qualitative research methods, such as phenomenology, ethnography, hermeneutics; etc. (Bengtsson, 2016).

This method of analysis focuses on the subject and its context, highlighting the variations found in the text (which is the most common source of data for this analysis according to Gibbs (2008). This provides the ability to analyze not only interpretative content but also manifest, descriptive and latent contents (Graneheim et al., 2017).

The importance and role of the researcher have to be understood and emphasized in this methodology. Self-reflection is recognized as essential in qualitative research. Therefore preconceived ideas and pre-understandings have to be taken into consideration in all parts of the process to allow for better understanding of the subject and its context but not to influence in the results (Bengtsson, 2016).

3.3.2 Coding basics

In the case of qualitative data analysis, coding refers to labels that intend to organize ideas and to add interpretation to the data, focusing on answering research questions. Codes are usually assigned as texts of different size and are usually a word or short phrase that evocates the essence of a broader idea or theme (Gibbs, 2008; Silver and Lewins, 2014; Miles, et al., 2014).

Coding is used to help to find patterns, anomalies, differences or similarities between different texts analyzed with help of the organizational structure created. Such anomalies usually cannot be seen without using this structure. This procedure helps to retrieve together all the same-label content and find one of the possible 'right ways' of interpreting data, which means that the interpretations made can be supported by the data coded (Auerbach and Silverstein, 2003; Silver and Lewins, 2014).

Coding constitutes an important part of the analysis but it is not analysis on its own (Silver and Lewins, 2014). It helps to find answers to research concerns in a step-by-step process of text analysis, starting with raw information and moving up to a more abstract and complex understanding. A list of the steps followed through text analysis and how it is understood progressively is: "raw text, relevant text, repeating ideas, themes, theoretical constructs, theoretical narrative and finally research concerns" (Auerbach and Silverstein, 2003: 35).

It is important to note that in the process of coding, many times the information that is looked for is not the same as the information found, and that several times the coding structure has to be changed in the process to reflect the results found. The purpose of the coding is not to find perfectly a concept but to provide a structure to go back to the data and think about it again (Silver and Lewins, 2014).

How the coding is produced is determined by the inductive or deductive approach to the research. In the inductive approach, a conclusion is achieved by accumulating information. The text is analyzed with the intention of identifying subjects (codes) that respond the research questions. In the deductive approach, specific, predetermined subjects (codes) are searched for.

A particular situation is therefore explained from the stated categories (Bengtsson, 2016; Silver and Lewins, 2014).

For the present research, as explained in the previous section, a mixed approach has been used, in which a predefined set of codes (generated from the literature reviews and pre-existing ideas) was proved through the first transcripts (deductive) and then adapted with new codes found to be useful to explain the research questions (inductive). The predefined set of codes was generated from a combination between pre-established ideas and complemented with relevant codes from a literature review (inductive) on the main characteristics and requirements of the two policies considered for this thesis: auctions and FITs. Table 7 and Table 8 in this section show these characteristics, the authors citing them and, consequently, the assigned codes.

3.3.3 Computer assisted qualitative data analysis

Computer assisted qualitative data analysis (CAQDAS) refers to the qualitative analysis of data aided by means of software. The functionalities provided by this type of software, which is considered to have appeared in the mid 1980s, are related to provide a “qualitative approach to qualitative data” (Silver and Lewins, 2014: 21). By qualitative data it is understood forms of data which are not structured, like text, audio or audio-visual material. Qualitative approach refers to the necessity of interpreting data, which possibly requires coding (Silver and Lewins, 2014).

The utilization of software for the means of qualitative data analysis adds a component of flexibility to the coding process and there are several software based tools that can be found in the market, some of them are: Atlas.ti, Dedoose, HyperRESEARCH, MAXQDA, NVivo, Transana and QDA Miner (Silver and Lewins, 2014). From these, the tool selected to work with during the development of this thesis is MAXQDA. This selection was based on its user-friendly interface, the features offered and its availability at the University.

Figure 8: Steps for code generation shows the steps to generate the coding structure. The existence of a feed-back step provides the flexibility of adapting the coding the number of times necessary until it suits the needs of the researcher.

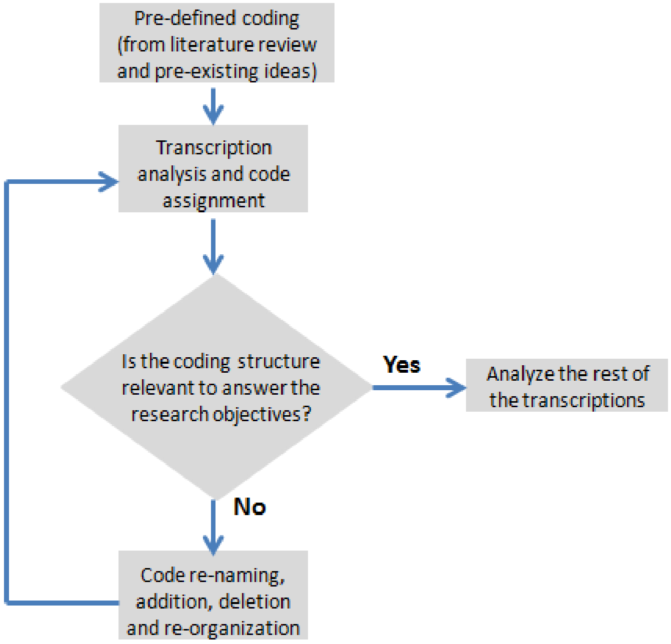


Figure 8: Steps for code generation

Source: Own elaboration

3.3.4 Generation of codes

The generation of codes starts, as it was previously mentioned, with some pre-established ideas. These codes are showed in the table below:

Table 6: Summary of codes from pre-existing ideas

Main Code (category)	Secondary code
Methodology	Comparison and transferability
Policy measures	Auction
Policy measures	FIT
Policy measures	Taxation
Context	Environmental
Context	Social
Context	Political
Context	Economic

Source: own elaboration

From the literature review the characteristics and requirements of FIT and auctions were defined (see Table 7 and Table 8). Here, the sources are cited plus the codes identified from them.

Table 7: FIT characteristics and requirements with consequent code assignment

FIT characteristics and requirements	Assigned code	Authors
Can support a rapid renewable energy development • Long-term contracts	Context/Legislative	Couture (2010), Barbosa et al. (2018), Antweiler (2017), Jacobs (2013)
• Price security	Context/Economic	
• For a variety of technologies	Technology/RE general	
• Evaluated against long-term RE targets	Context/Political	
• Search better market opportunities	Context/Economic	
• Design complexity is flexible	Context/Technical	
Requires high amounts of capital available for support • Financing (taxpayer burden) • Long term cost recovery	Context/Economic	Couture (2010), Rickerson (2012)
Can adopt small-scale projects		COMESA (n.d.), Barbosa et al. (2018), Antweiler (2017), Thayer (2013), Couture (2010), Rickerson (2012)
• Differentiated prices	Context/Economic	
• Energy access to small communities (off-grid) (design)	Context/Political, Context/Legislative	
• Little transaction costs	Context/Economic	
Reduced transactions, administrative and permission fees • Variable administrative and permission fees • Little transaction costs	Context/Economic	Couture (2010), Fell (2009), Rickerson (2012)
Incentive for technological development	Context/Political	Böhringer et al. (2017), Couture (2010), COMESA (n.d.), Thayer (2013)
• Recommends the existence of a feed-in law	Context/Legislative	
• Policy design that promotes specific technologies	Context/Technical, Actor/Government	
• Cost-degression or bonus payments (stimulation of R&D for cost reductions)	Context/Economic	
Should be cognizant of social factors		Couture (2010), Rickerson (2012), Barbosa et al. (2018), Thayer (2013)
• Social equity (taxpayer burden)	Context/Social	
• Citizen participation in projects	Actors/Society	
Mitigate the uncertainties of market and establishes long-term commitments		Pablo-Romero et al. (2017), Antweiler (2017), Thayer (2013), Couture (2010), COMESA (n.d.)
• Long-term contracts	Context/Legislative	
• Generation cost-based rates	Context/Economic	
• Reliability of policy funding sources	Context/Political	
• Renewables expansion stabilize electricity prices	Context/Economic	
Focused on the development of new renewable energy projects		COMESA (n.d.), Barbosa et al. (2018), Couture (2010)
• Long-term contracts	Context/Legislative	

• Varied energy producers accepted	Actors/Private sector, Actors/Society	
• Varied energy sources accepted	Technology/RE general	
Extra costs are passed to consumers		COMESA (n.d.), Rickerson (2012), Böhringer et al. (2017)
• Financing (taxpayer burden), based on political decision and law making	Context/Legislative, Context/Economic, Context/Political	
Considers different renewable sources and their different generation costs		Mendonça (2007), COMESA (n.d.), Couture (2010)
• Varied technologies are chosen on political decision	Technology/Solar PV Technology/Wind, Technology/Biomass Technology/Hydro, Technology/Geo-thermal Actors/Government, Context/Political	
• Profitability ensured by different tech. gen. costs	Context/Economic	
Requires specific technical and managerial competencies and knowledge from designers and implementers of the policy	Context/Economic	Rickerson (2012), COMESA (n.d.), Barbosa et al. (2018)
• Governmental officials need to acquire new knowledge	Context/Technical	
• Costs of technical transfers and knowledge sharing	Actors/Government	

Source: Own elaboration

Table 8: Auctions characteristics and requirements with consequent code assignment

Auctions characteristics and requirements	Assigned code	Authors
Aimed for more mature, developed sectors but able to support less mature ones		IRENA (2015a), Azuela et al. (2014)
• Technology-specific or neutral designs	Context/Technical	
• Stand-alone vs systematic auctions	Context/Technical	
• In general applied in countries with a somehow developed ren. en. Sector	Context/Economic	
Demands transparency and credibility from organizational institutions		EBRD (2018), IRENA (2015a)
• Clearly stated liabilities and responsibilities in the contracts	Context/Legislative	
• Transparent, non-discriminatory processes	Context/Technical	
• Nominating credible institutions that administer auctions	Context/Political	
• Administrative documentation available in a timely, comprehensive manner.	Context/Technical	
Integration to electricity market		EBRD (2018), Hochberg and Poudineh (2018)
• Integration to the grid	Context/Technical, Renewable energy sector/Electricity	
• Ensure priority of dispatch	Context/Legislative	
• They adapt to liberalized markets	Context/Technical, Context/Economic	
• Design options are flexible and allow auctions to be apt for the specific country market	Context/Technical	

• Plan long-term RE markets that can integrate to electricity market	Renewable energy sector/Electricity	
Demands consistency within legal framework, planning and economic strategy		Azuela et al. (2014), Hochberg and Poudineh (2018)
• Regulatory stability	Context/Legislative, Actors/Governmental/Legislation	
• Transparency	Context/Legislative, Context/Political	
• Guarantees to investors	Context/Economic	
Consistency with renewable energy targets		Winkler et al. (2018), Kreiss et al. (2017), IRENA (2015a), Hochberg and Poudineh (2018), EBRD (2018), del Río (2017)
• Align auction volumes with expansion targets	Context/Technical	
• Therefore, the existence of renewable energy targets	Context/Political	
Large governmental/institutional regulatory and design requirements		Azuela et al. (2014), Hochberg and Poudineh (2018), IRENA (2015a)
• Governmental institutions are the largest designers, implementers and regulators	Actors/Governmental/Implementation, Actors/Governmental/Legislative, Actors/Governmental/Regulation and control	
• High design flexibility demands complexity and knowledge transfer	Context/Technical	
Cognizant that factors vary according to region, country; etc.	Context/	Kitzing et al. (2016), EBRD (2018), del Río (2017), Hochberg and Poudineh (2018), IRENA (2015a)
Timing for completion of projects is an important factor	Context/Technical	Kitzing et al. (2016), del Río (2017), Hochberg and Poudineh (2018)
Importance of acceptance from societal groups	Context/Social Actors/Society	P. Stratmann, personal interview, (May 17, 2018), del Río (2017), IRENA (2015a), Morris and Pehnt (2016)
• Possibility of citizen participation in investment projects		
Larger technical knowledge from bidders	Actors/Private sector	Azuela et al. (2014), IRENA (2015a)
• Increased technical requirements as participation pre-requisites	Context/Technical	
Energy cost-reduction oriented		Azuela et al. (2014), Kitzing et al. (2016), Hochberg and Poudineh (2018)
• Real price discovery leads to lower prices	Context/Economic	
Makes use of international participation and the private sector	Actors/Private sector	Bayer (2017), del Río (2017), EBRD (2018), IRENA (2015a), Azuela et al. (2014)
• Conditions can attract international investment	Actors/Third sector (NGO, International Cooperation)	
Requires clarity of technical necessities from bidders	Context/Technical	del Río (2017), EBRD (2018), Hochberg and Poudineh (2018), IRENA (2015a), Winkler et al. (2018)
• Bidders are usually private the sector	Actors/Private sector	
Requires legal fitness of bidders		EBRD (2018), IRENA (2015a), Hochberg and Poudineh (2018)
• Comply with legal pre-requisites	Context/Legislative	
• Bidders are usually the private sector	Actors/Private sector	
Price and quality of energy are more certain (price discovery)	Context/Economic	IRENA (2015a), Kitzing et al. (2016), del Río (2017),

		EBRD (2018), Hochberg and Poudineh (2018), Azuela et al. (2014)
High transactional costs	Context/Economic	IRENA (2015a), Azuela et al. (2014), Winkler et al. (2018), Hochberg and Poudineh (2018), EBRD (2018), del Río (2017), Bayer (2017), Kitzing et al. (2016)
• Bidders pay permit fees, administrative costs, participation fees; etc.		
Allows to determine specific geographic areas where to develop projects, if desired	Context/Geographic	del Río (2017), Kitzing et al. (2016), Hochberg and Poudineh (2018), IRENA (2015a)
Burdensome administrative procedures	Context/Technical	del Río (2017), EBRD (2018), Hochberg and Poudineh (2018), IRENA (2015a)
	Actors/	
Design should pursue socio-economic contribution		IRENA (2015a), EBRD (2018)
• Empower local communities	Context/Social	
• Job creation	Context/Economic	

Source: Own elaboration

Summarizing, the codes obtained from the literature review are listed in Table 9:

Table 9: Summary of codes generated from literature review

Main Code (category)	Secondary code
Actors	Private sector
Actors	Governmental/Legislative
Actors	Governmental/Implementation
Actors	Governmental/Regulation and control
Actors	Society
Context	Political
Context	Social
Context	Technical
Context	Economic
Context	Geographic
Context	Legislative
Technology	RE general
Technology	Solar PV
Technology	Wind
Technology	Hydro
Technology	Geo-thermal
Technology	Biomass

Source: own elaboration

These codes, in addition to those coming from 'pre-existing' ideas (shown in Table 6) resulted in the 'pre-defined' coding. With those, the process established in Figure 8 in section 3.3.3 was followed to generate the final codes presented below:

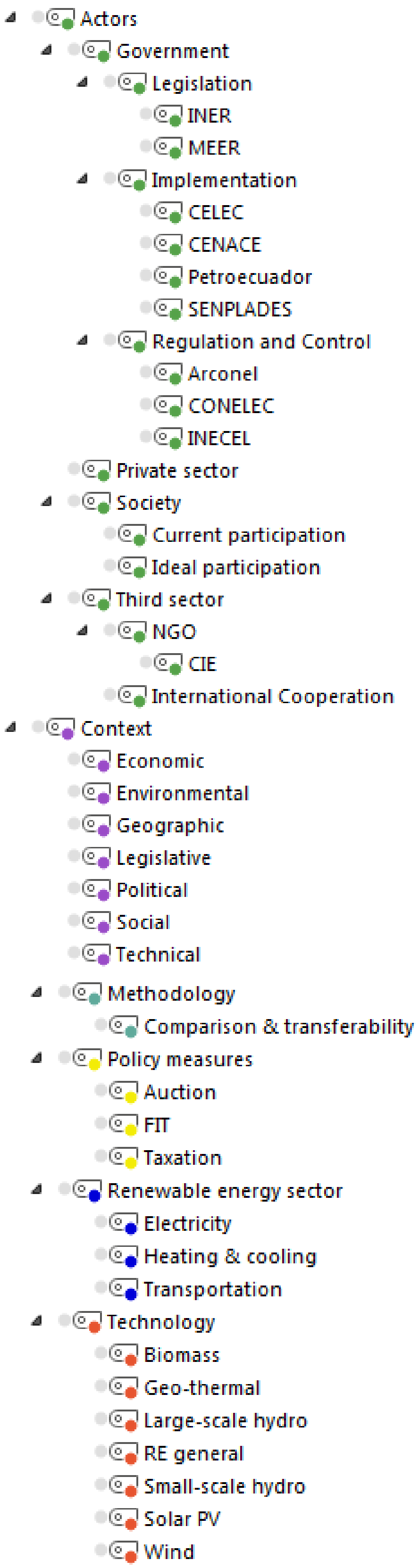


Figure 9: Codes
Source: Own elaboration (generated with MAXQDA)

The codes have been divided in six categories:

- Actors, which describes who play a role in the renewable energy sector and development. They are sub-divided in government, private sector, society and third sector. The government is further divided according to functional areas in legislation, implementation, and regulation & control. After a second round of questions asked to the experts in Ecuador, two subcategories were added to ‘society’: ‘current participation’ and ‘ideal participation’. Finally, the ‘third sector’ is divided into ‘international cooperation’ and ‘NGO’, which includes ‘CIE’ as an active example in Ecuador.
- Context, which centers on the identification of facts that describe the environment in different aspects of interest: economic, environmental, geographic, legislative, political, social and technical. There might be more contextual components but the ones cited are considered the most interesting for the current analysis.
- Methodology, which centers on the aspects that relate or describe the process of learning from other countries in the policy-making. This implies the comparison and transferability of policies.
- Policy measures enclose the most prominent instruments used to steer the development of renewable energies. FIT and auctions are the center of this research but taxation is another important instrument considered.
- Renewable energy sector, which is divided in the three main sectors of application of renewable energies: electricity, heating & cooling and transportation.
- Finally, technology groups the different renewable energy technologies that are found in the two countries and represent the options where policy measures will focus. It has been considered a general category (RE general) plus biomass, geo-thermal, large-scale and small-scale hydro, solar PV and wind.

Figure 10 shows how the coding process looks in MAXQDA. Paragraphs are marked with the different codes and overlaps are also visible.

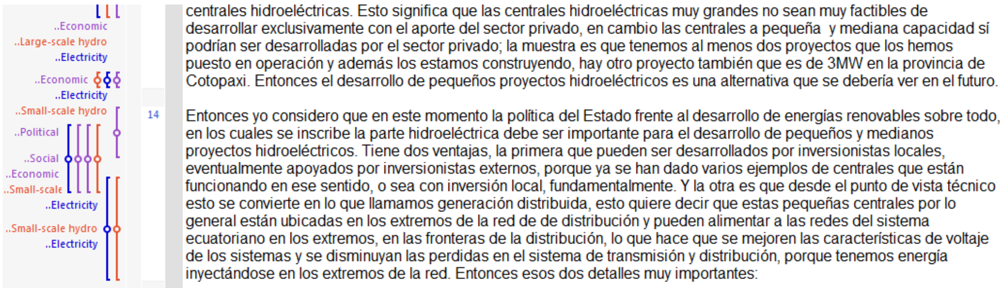


Figure 10: Example of transcription coding in MAXQDA

Subsequently, the software provides tools to analyze the different sections of text, or 'coded segments' in different ways and for different purposes. The specific tools used and the correspondent analysis of their result are provided in the next sections.

3.3.4.1 Evaluation of the relevance of codes generated with MAXQDA

One of the first results checked with MAXQDA was the relevance of the codes generated towards the content of the interviews. This relevance is explained by (a) how often the codes generated are repeated between interviews, (b) how much of the marked content corresponds to the focus of the interviews (in this case the different components of the context), and finally, (c) how much of the content from the interviews finds a category or code to be marked with. For this purpose, the tools *Similarity Analysis for Documents* (to analyze point a) and *Document Portrait* (to analyze points b and c) of MAXQDA were used.

The 'Similarity Analysis' provides two types of analyses. Figure 11 and Figure 12 show the two available methods: existence and frequency of a code. To properly verify point (a) only the frequency of a code is useful and not its mere existence.

		Document A	
		Code/Variable value *exists*	Code/Variable value *does not exist*
Document B	Code/Variable value *exists*	a	b
	Code/Variable value *does not exist*	c	d

Simple match = (a + d) / (a + b + c + d) – Both existence and non-existence are counted as a match. The result is the percentage match.

Jaccard = a / (a + b + c) – Non-existence is completely ignored.

Kuckartz & Rädikers zeta = (2a + d) / (2a + b + c + d) – Existence is counted twice, non-existence once.

Russel & Rao = a / (a + b + c + d) – Only existence is considered a match, but non-existence reduces the similarity.

Note: If you include more than one code into the analysis that does not exist in multiple documents, it may be better to use a coefficient who ignores non-existing codes (Jaccard) or values them less (Kuckartz & Rädiker zeta, Russel & Rao). Otherwise you may receive a high similarity score, even if the codes are not assigned very differently. The non-existing codes will dominate the existing codes in this case.

Figure 11: MAXQDA similarity analysis calculation by “Existence of Code”
Source: MAXQDA (n.d.)

To calculate the distance between two documents based on "Code frequency", the following options are available in which the code frequencies of two documents will be compared:

Squared euclidean distance = The sum of squared deviations (higher deviations will be rated higher as lower ones because of squaring the deviations).

Block distance = The sum of absolute deviations.

Note: Since it is also possible to include variable values in the analysis, all code frequencies and variable values are z- standardized previously beforehand.

Figure 12: MAXQDA similarity analysis calculation by "Code Frequency"
Source: MAXQDA (n.d.)

To determine the simple existence of a code in a document, the matrix shown in Figure 11 is defined per pair of documents, per code. Based on this, different calculation methods are available depending on the level of consideration of non-existing codes into the calculation. Since there are codes which are not always found in the documents, a preferable method would be ‘Russel & Rao’, as recommended by the software producers. Nevertheless, as this method simply considers the existence of the code without counting how frequently it appears in the text, the method based on frequency is the preferred one for this thesis.

The results provided by the frequency-type analysis (Squared Euclidean distance) use green cells to indicate larger similarity between pairs of interviews. These results give the idea of similarity of the codes and how frequent they were discussed by each of the experts in their answers. It does not provide a result in terms of the specific answers provided, only the topics (codes) they consider when they respond.

As previously stated the ‘Document Portrait’ provides results to analyze points (b) and (c). For that, two versions of the same graphic are displayed per case. Graphs (i) show the proportion of coded segments that belong to each category of codes (identified with colors according to Figure 13: Color code for the six principal content codes). Graphs (ii) show the complete map of the transcription with the specific order of codes as they were assigned. White spaces show the parts of transcription that were not marked with any code.

The white spaces can be interpreted as one of several options: they are parts of the interview where the interviewer speaks, the information provided was not related to any category or the information provided corresponds to unreal examples provided only to explain better a given statement.

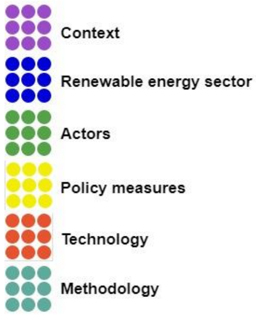


Figure 13: Color code for the six principal content codes
Source: own elaboration based on MAXQDA graphs

The results of this evaluation are shown in section 5.1.

4 Case Studies

4.1 Ecuador

4.1.1 Technical status review of the energy sector in Ecuador

As a starting point, a general idea of how Ecuador's energy matrix is composed is presented in a brief summary.

4.1.1.1 Sources of energy

Figure 14 shows the total primary energy supply in Ecuador for two years: 2000 and 2012. In this period of time is observed a large increase in the energy produced in the country with almost the same share of oil, 85%, which implies a large increase in the utilization of fossil fuels.

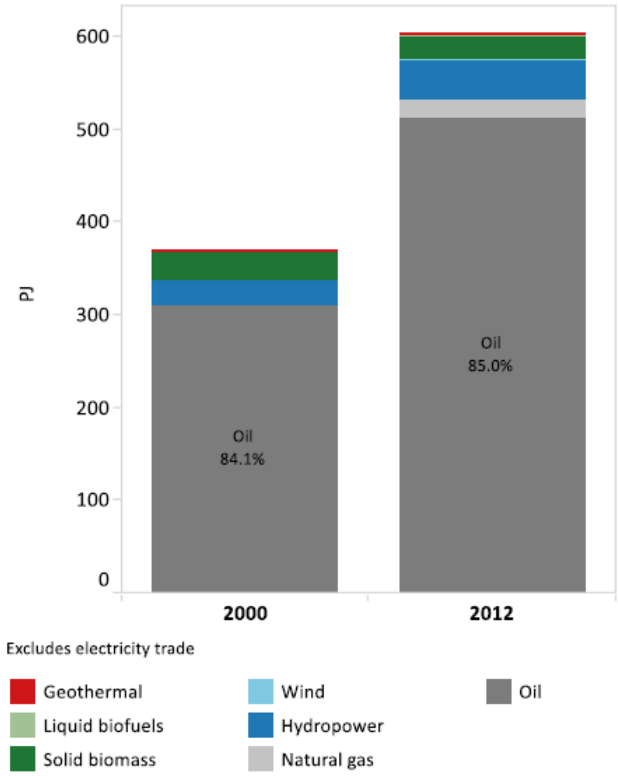


Figure 14: Ecuador: Total Primary Energy Supply, years 2000 & 2012
Source: IRENA, 2015b

4.1.1.2 Renewables participation in the energy matrix

Figure 15 shows a decrease in the participation of renewables in the energy matrix over a period of twelve years. It needs to be considered, however, that there is a parallel increase in the total energy supply, which definitely means an increase in utilization of renewables but not to such an extent as the supply of energy.

		Total Primary Energy Supply	Share of renewables
2000	Total	369.1 PJ	
	Of which renewables	58.7 PJ	15.9%
2012	Total	603.8 PJ	
	Of which renewables	69.7 PJ	11.6%

Total includes electricity trade

Figure 15: Ecuador: Share of renewable in the Total Primary Energy Supply, years 2000 & 2012
Source: IRENA, 2015b

4.1.1.3 Renewables participation in the electricity generation

Figure 16 shows renewable energy share for three years. Here is considered the conventional hydro power in form of large scale plants for electricity generation.

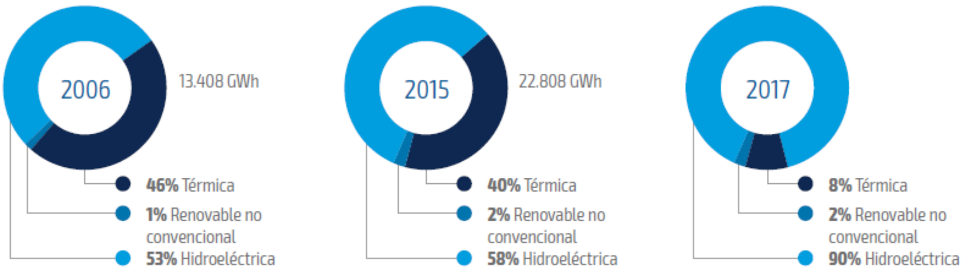


Figure 16: Renewable energy share in the electricity generation for three years
Source: Ministerio coordinador de Sectores Estratégicos, 2016

In Ecuador's case, biomass and wind are the sources of NCRE that contribute the most to the energy matrix. Electricity capacity contributed by these sources is presented in Figure 17. The term NCRE is used to exclude large-scale hydro from the list of renewable energies. However, it does include small-scale hydro.

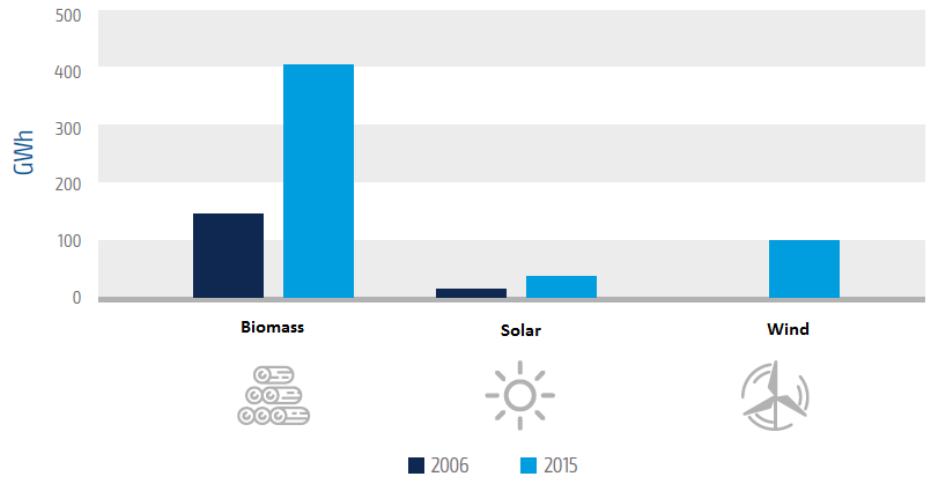


Figure 17: NCRE sources contribution to electricity generation in Ecuador
Source: Ministerio coordinador de Sectores Estratégicos, 2016

Despite the fact that solar energy is not broadly exploited, several studies demonstrate the importance of this resource around the country. The Solar Atlas (Atlas solar del Ecuador) shows an average value of insolation of 4574,99 Wh/m2/day which denotes solar as an important source for electricity generation (Corporación para la Investigación Energética - CIE, 2008).

4.1.1.4 Capacity

Figure 18 the status of the capacity of power generation with NCRE shows two points of transition. From 2007 to 2008 and from 2012 to 2013. The top value of approximately 110 MW in 2013 is still very small compared to the more than 2000 MW produced by hydro in the same year.

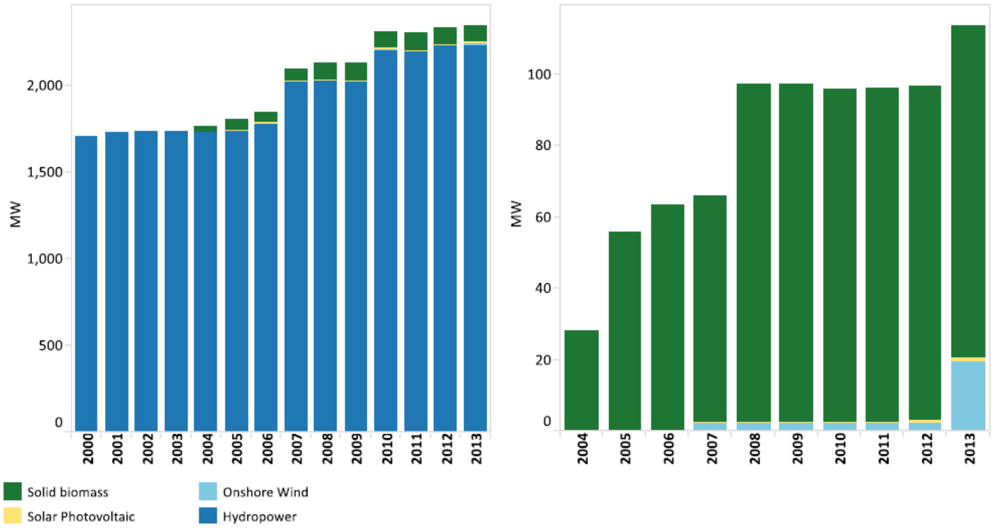


Figure 18: Ecuador: Renewable power capacity 2000-2013
Source: IRENA, 2015b

4.1.1.5 Efficiency

The National Constitution (Art. 413) (Asamblea Constituyente, 2008) and the National Plan for the Good Living (Plan Nacional del Buen Vivir 2013-2017, 2013) are the main instruments for the promotion of efficiency and sufficiency.

The current plans and programs to promote energy efficiency are shown in Table 10:

Plan or program
PLANEE (Plan Nacional de Eficiencia Energética)
Energy-saving bulbs (Programa de focus ahorradores)
Renova (Efficient refrigerators)
Induction cookers (Programa de cocinas de inducción)
Energy efficiency in the industrial sector (Eficiencia energética en el sector industrial)
Efficient Public lighting (Alumbrado público eficiente) and Hybrid & Electric vehicles (Vehículos híbridos y vehículos eléctricos)

Table 10: Plans and programs to promote energy efficiency
Source: (Peláez Samaniego and Espinoza Abad, 2015).

Another initiative that has to be considered is the Program for the Energy matrix transformation (Programa de Cambio de la Matriz Energetica, CME), financed by the IDB, Inter-American Development Bank, with a total investment of US$150.000.000. With this instrument Ecuador promotes and funds the expansion, modernization, improvement and construction of more power stations and distribution lines to reduce losses and improve the operating efficiency in the whole system. This is also an important contribution to the energy sufficiency of the country (BID, 2017).

4.1.1.6 Review of the current and the expected development of demand in Ecuador

Faisal (2012) estimates and projects the demand of energy using a Reference Scenario (REF) and a Demand Side Management Scenario (DSM) as two indicators to value the energy demand in Ecuador. They are referred in Table 11 as follows:

Reference Scenario (REF)	Demand Side Management Scenario (DSM)
Based on the historical data (energy, population, GDP, economy, industry, etc.) until 2012	Inherits all characters from REF
Future planned and committed programs of the stakeholders	Energy intensity decreasing
Forecasted based on the demand growth and the availability of resources.	Electricity load factor improvement
	Reduction of losses in the T&D system (oil derivative products and electricity sector)
	More diversities and expansion of RE in the supply sides

Table 11: REF and DSM Scenarios
Source: Own elaboration based on Faisal (2012)

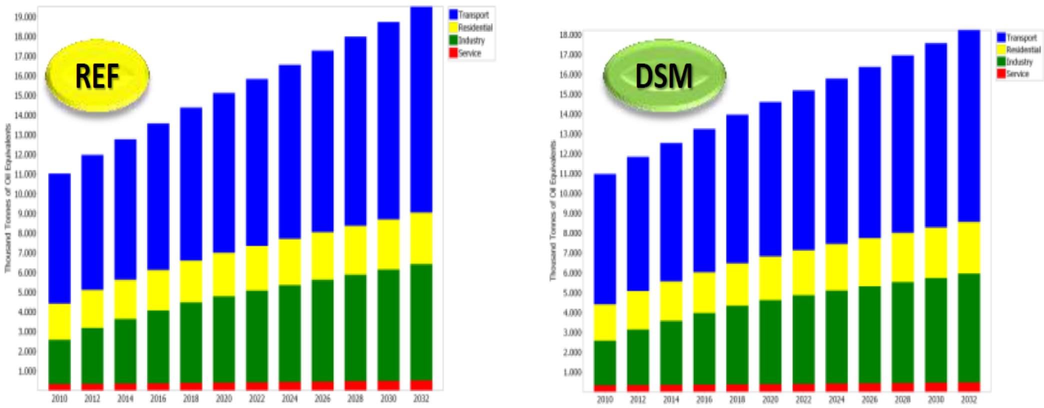


Figure 19: Energy demand by sectors in Ecuador 2010-2032
Source: Faisal (2012:88, 90)

	Energy Demand/Thousand TOE			
Sector	**REF**		**DSM**	
Year	2010	2032	2010	2032
Transport	6500	10000	6500	9500
Residential	2300	3000	2300	2900
Industry	2200	6000	2200	5600
Service	300	500	300	600

Table 12: Expected energy demand from 2010 to 2032
Source: Own elaboration based on Faisal (2012)

Figure 19 and Table 12 display the expected energy demand in four different sectors: transport, residential, industry and service, projected for twenty-two years: from 2010 to 2032; in which service reflects an increment of 66% for REF and DSM; Industry reflects an increment of 172% for REF and 154% for DSM; Residential sector increases a 30% in REF and 26% in DSM, and Transport a 53% increment for REF and 46% for DMS.

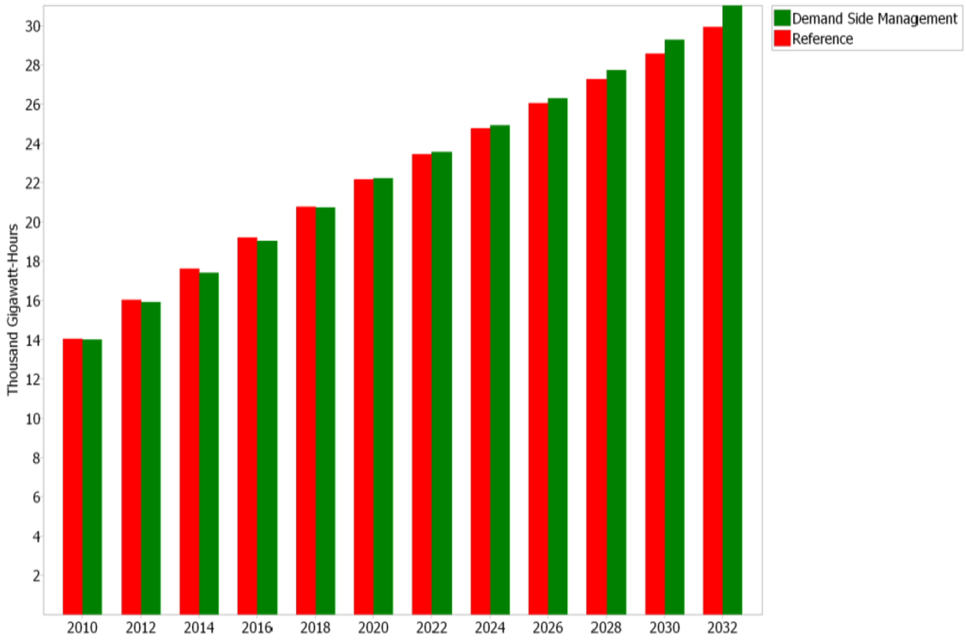


Figure 20: Electricity demand in Ecuador 2010-2032
Source: Faisal 2012

Electricity Demand/GWh		
Scenario	2010	2032
DSM	14000	31000
REF	14000	30000

Table 13: Expected electricity demand from 2010 to 2032
Source: Own elaboration based in Faisal (2012)

Figure 20 and Table 13 show an increase of the electricity demand, expected for twenty-two years, from 2010 to 2032, in which REF values an increment of 114% during this period, while DSM estimates an increment of 121%

In the electricity sector, hydroelectricity is expected to contribute 88.8 % of the electricity supply in 2032, followed by 5,9 % from Geothermal, and 3.4 % from Bagasse Power Plants. The total electricity supply is 48,7 Thousand GWh, more than double if it is compared to 21.7 GWh in 2012 (Faisal, 2012).

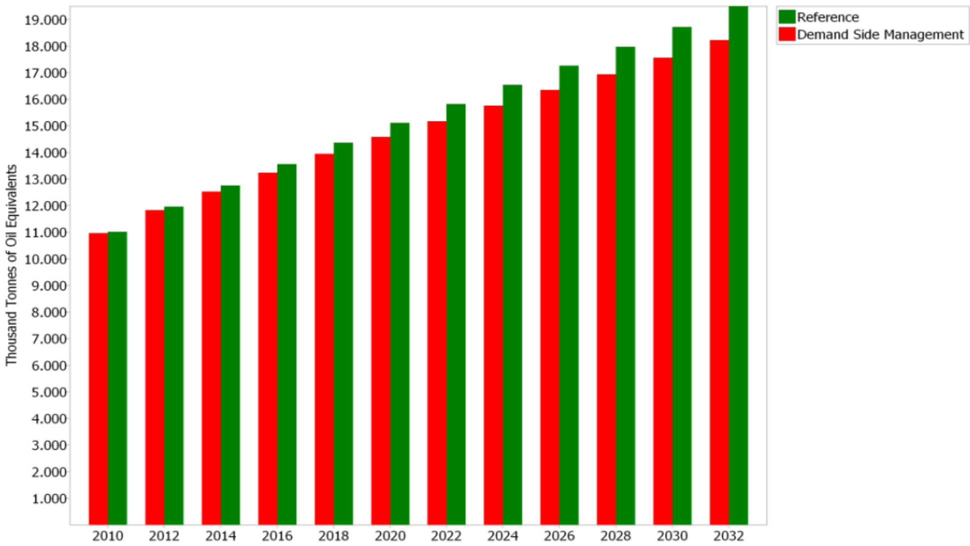


Figure 21: Total energy demand in Ecuador 2010-2032
Source: Faisal, 2012

All Energy Demand/Thousand TOE		
Scenario	2010	2032
DSM	11000	18000
REF	11000	19500

Table 14: Expected total energy demand from 2010 to 2032
Source: Own elaboration based in Faisal (2012)

In the case of the total demand of energy, during the same referred years, the REF values an increment of 77% during this period, while DSM estimates an increment of 63%.

4.1.2 Political organization

Ecuador's political structure is based on a Democracy, defined as a "Constitutional State of rights and justice" (Asamblea Constituyente, 2008) .

The public sector is defined by five functions: Executive, Legislative, Judicial and indigenous justice, Electoral and Transparency and Social control.

The executive function is represented by the President, Vice-president, ministries and secretariats. The president is the head of this function and is elected by popular majority every four years, with the possibility of being re-elected only once.

In relation to the public policies, the legislative duties are carried out by the Constitutional Assembly and that includes the expedition, codification, reformation and derogation of laws, where energy sector laws are included.

This Assembly is formed by Ecuadorian citizens, who are at least 18 years old and count with all their political rights. The total number of members of the Assembly varies according to the total population. Fifteen are elected by national circumscription, plus two per province, and plus one per 200,000 or fraction above 150,000 inhabitants. Currently the assembly consists of a total of 137 members, which are elected every four years. The assembly has its headquarters in Quito (Asamblea Constituyente, 2008).

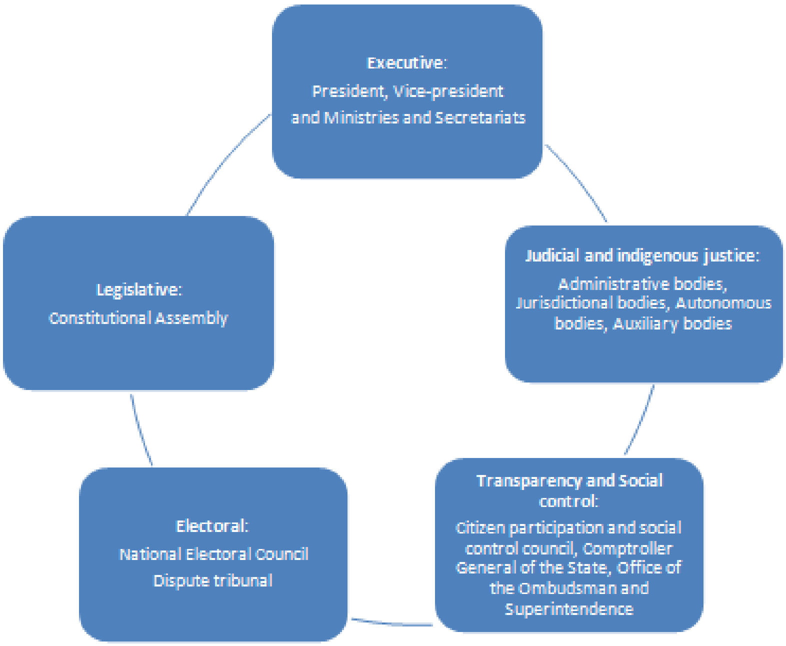


Figure 1: Ecuador: Functions of the State.
Source: Own elaboration, based on the National Constitution of Ecuador (Asamblea Constituyente, 2008).

4.1.3 Legislative context and development of energy policies

National laws are always approved by the legislative, specifically the Constitutional Assembly, but draft laws are responsibility of, and can be presented by, diverse governmental institutions.

The Ministry of Electricity and Renewable Energy has the function of formulating the regulations, development plans, and sector-specific policies in the field of electric energy in the country. These regulations are in line with the National Constitution of Ecuador (Asamblea Constituyente, 2008) and the “National Plan for Good Living” (Plan Nacional del Buen Vivir 2013-2017, 2013), which are the two top level instruments to define the objectives and directives for the country and its development sectors, including renewable energies.

In a similar way, the Ministry of Hydrocarbon executes comparable functions in regards to the oil and natural gas sectors, being the largest contributors to the primary energy sources matrix. This ministry also regulates the production and use of biofuels.

To better coordinate those two ministries, there is a third ministry called the Ministry of Strategic Sectors. Hence, these three ministries primarily define the compounded energy policy in the country.

The recently created "ARCONEL" (Regulation and Electricity Control Agency) in 2015, is the institution dedicated to control the expansion of the electric energy sector and the effectiveness of the regulatory coverage of this expansion. In coherence with the existing national energy policies, ARCONEL is entitled to elaborate the regulations for the national electrical companies, the National Operator of Electricity (CENACE) and the consumers/final users.

Likewise, for the hydrocarbon sector, the ARCH (Regulation and Hydrocarbon control Agency) controls and oversees the hydrocarbon operations in the country. This includes the regulation of the institutions and operations related to the exploration, exploitation, refining, transport, storage and commercialization of the resources.

4.2 Germany

4.2.1 Technical status review of the energy sector in Germany

4.2.1.1 Sources of energy

According to Figure 22, in Germany from a total of 308 Mtoe in 2015, fossil fuels continue to be the most important contributor to the primary energy supply, with almost 80% altogether. These are represented by oil with 32.3%, coal with 25.5% and natural gas with 20.9%. The renewable energy technologies that contribute to the energy supply are: wind, solar and geothermal with 3.5%, biofuels/waste with 9.6% and hydro with 0.5%. The nuclear energy still contribute with a 7.7%

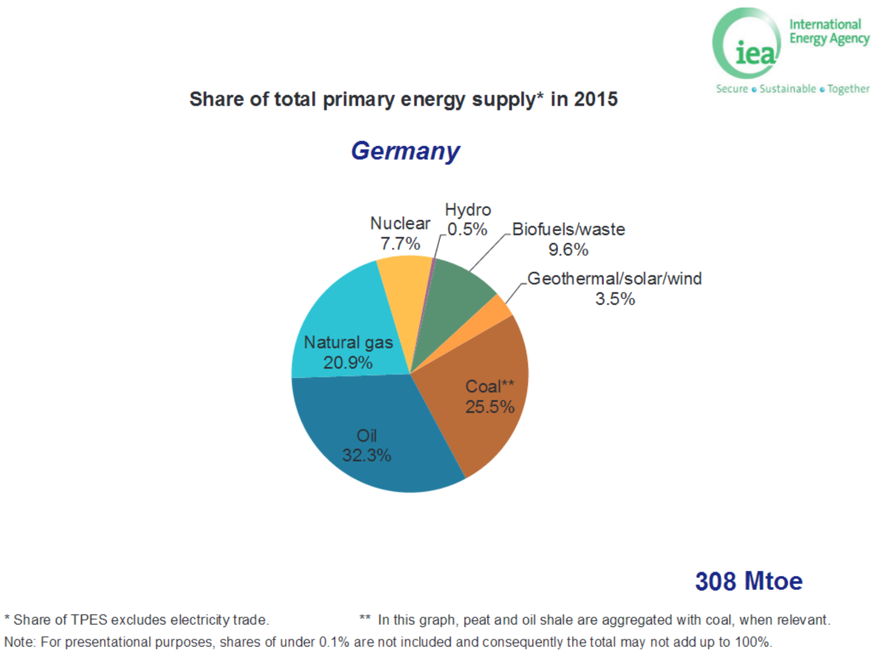


Figure 22: Germany: Total Primary Energy Supply, year 2015

Source: (IEA, 2018) https://www.iea.org/stats/WebGraphs/GERMANY4.pdf

4.2.1.2 Renewables participation in the energy matrix

From Figure 22, the renewable technologies can be added up and result in total 13.6% from a 308 Mtoe total primary energy supply in 2015.

4.2.1.3 Renewables participation in the electricity generation

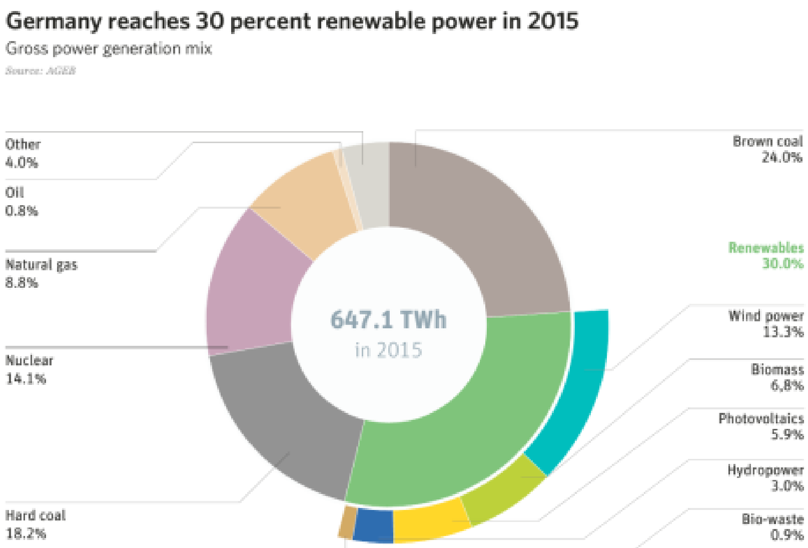


Figure 23: Germany: Gross power generation mix in year 2015

Source: Morris and Pehnt (2016)

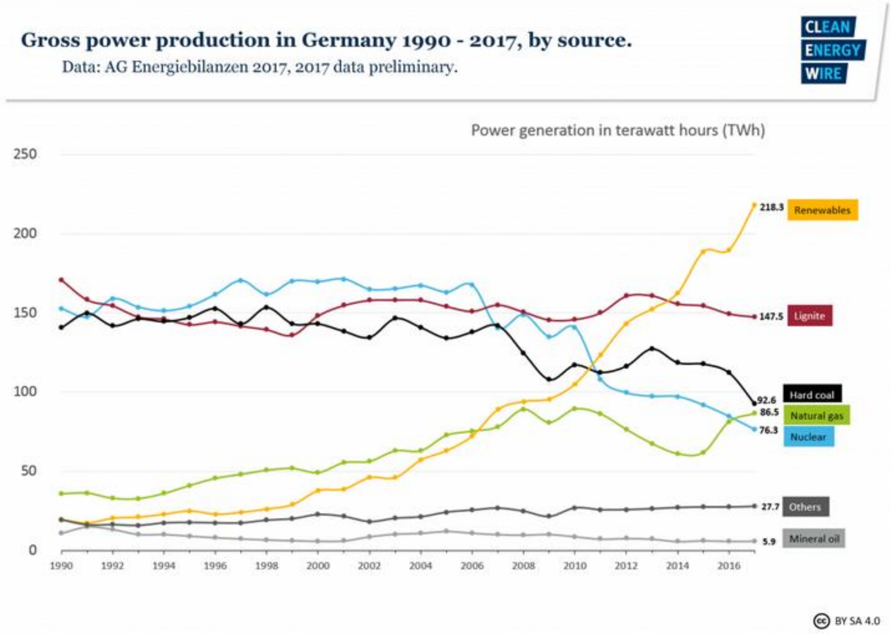


Figure 24: Germany: Gross power generation from 1990 to 2017
Source: Appunn et al., 2018

The renewables' share in Germany's power generation has grown rapidly after 1999. Figure 23 shows that in 2015 the renewables altogether reached the first place as contributors to the power generation, over coal and nuclear as main competitors.

Figure 24 also shows another important fact, which is that 2014 was the first year when the renewables surpassed the other sources of energy in the power generation. This constitutes a big message from Germany on how committed it is to the generation of renewable electricity.

4.2.1.4 Capacity

If considered the net electricity generation for public power supply (which counts the actual quantity consumed in the households, therefore the electricity that is fed in the grid), the big change in the renewables participation is observed since 2015 and not in 2014 as observed with the gross power production. Figure 25 also shows that every six years or less, the corresponding shares from renewables doubled, incrementing in total from approximately 18 GW in 2002 to 113 GW in 2017.

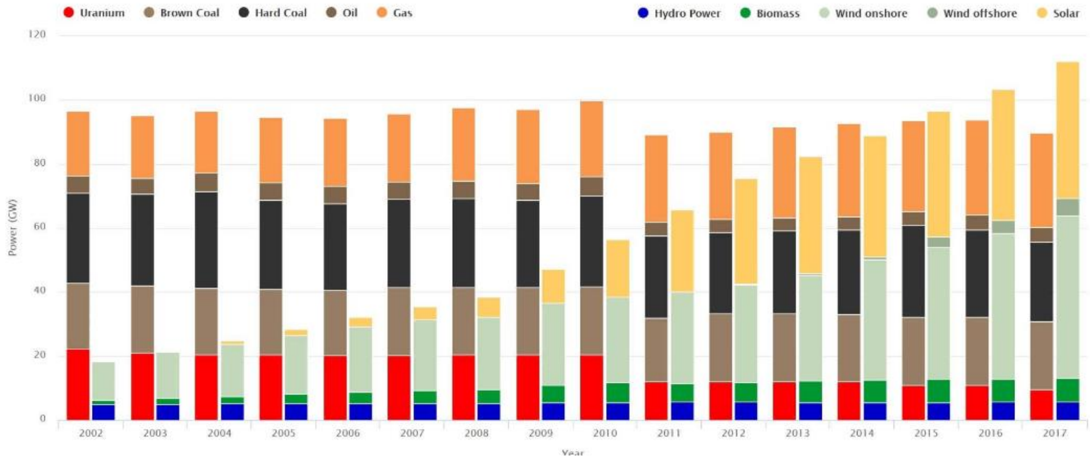


Figure 25: Net installed electricity generation capacity in Germany

Source: Burger (2017)

Furthermore, as an interesting fact, Figure 26 shows the different ownership possibilities of the electricity generated from renewable sources in year 2012: an important 34.4% of the generation comes from citizen owned projects. This participation can be as individual owners or in cooperatives. Broader citizen participation is accepted as minority shareholders in an 11.6%. In total, citizen based generation reaches a 46.6% of the generation. This is an important reason why renewable energy has become so developed in Germany (P. Stratmann, personal interview, May 17, 2018).

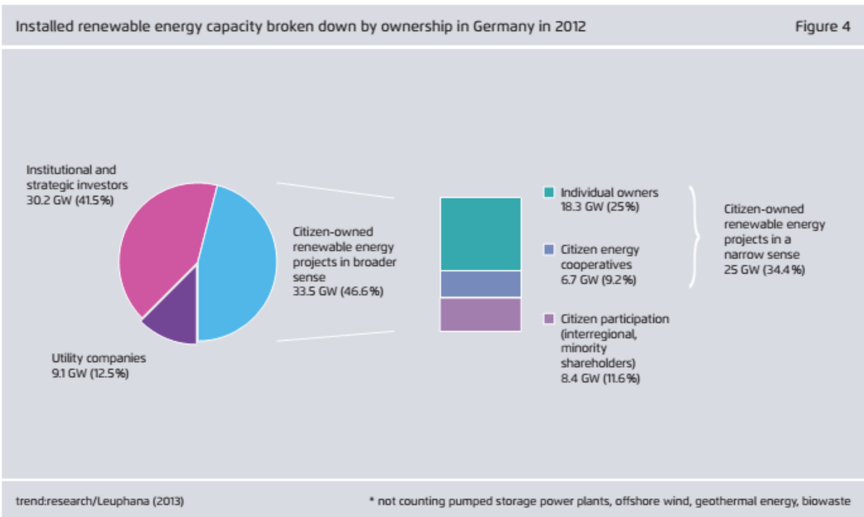


Figure 26: Germany: Installed renewable capacity by ownership in 2012

Source: Agora Energiewende (2015)

4.2.1.5 Efficiency

Energy efficiency is a topic of major importance in the energy transition and is capable of large reductions of energy consumption, especially in sectors like the industry. Despite the fact that the goals set by Germany for energy efficiency were not met in 2015, there still exists a reduction goal by 2020 of 20% in the primary energy consumption. The reason for this delay might be that while other goals like carbon emission reduction and renewable energy shares are binding, energy efficiency is not (Morris and Pehnt, 2016; Agora Energiewende, 2015).

To counteract this problem, the German Government started in 2014 the National Action Plan for Energy Efficiency, which contains instruments and financing mechanisms, including tenders for energy efficiency and auditing for companies and households. One major acknowledgment is that the ability of achieving a 100% renewable is limited by the current rate of consumption; therefore energy efficiency is vital for the transition process (Morris and Pehnt, 2016).

To complement the importance of the energy efficiency it can be said that it enhances energy security and reduces CO_2 emissions by a reduction of the consumption and the waste of energy. Therefore, it would require less burning of fossil fuels and also less investment in power plants to satisfy the otherwise expected increase in the demand (Agora Energiewende, 2015; Agora Energiewende, 2013).

4.2.1.6 Review of the current and the expected development of demand in Germany

Part of the plans of energy efficiency includes the reduction of primary energy demand. Figure 27 shows the values for energy consumption for four sectors: transport, industry, commercial and household. These values can be seen clearly decreasing. At the same time, the renewable energy capacity supply is planned to be incremented. By 2015, a total of approximately 8500 PJ were consumed, while the planned demand for 2050 is shortly higher than 5000 PJ. This means a reduction of approximately 41% in the demand. On the other hand, it is forecasted a considerable increase in the production of renewable energy. It is expected to increase from approximately 1500 PJ in 2015 to 3000 PJ by 2050.

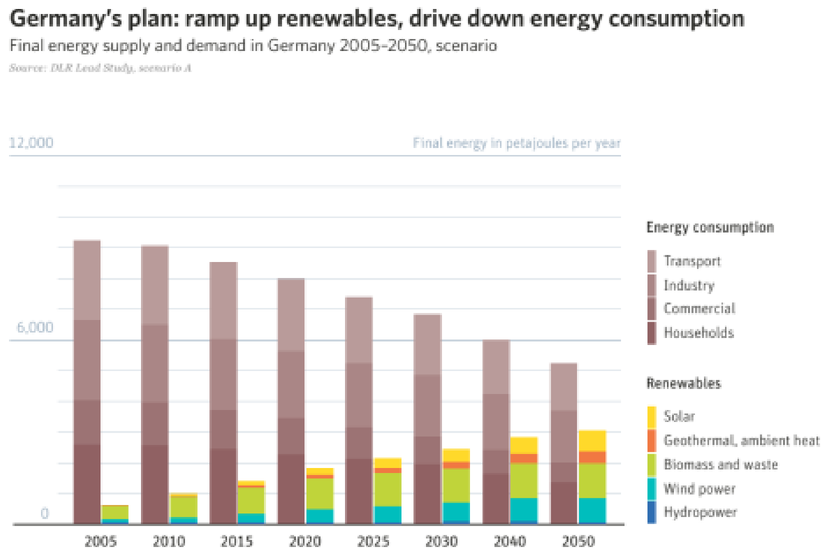


Figure 27: Energy supply and demand in Germany. Scenario 2005 - 2050
Source: Morris and Pehnt (2016)

This planned reduction in the demand is accompanied by legislation changes that were introduced in 2007 with the First National Energy Efficiency Action Plan, then its second stage in 2011 and later on the National Action Plan for Energy Efficiency in 2014, as shown in Figure 28.

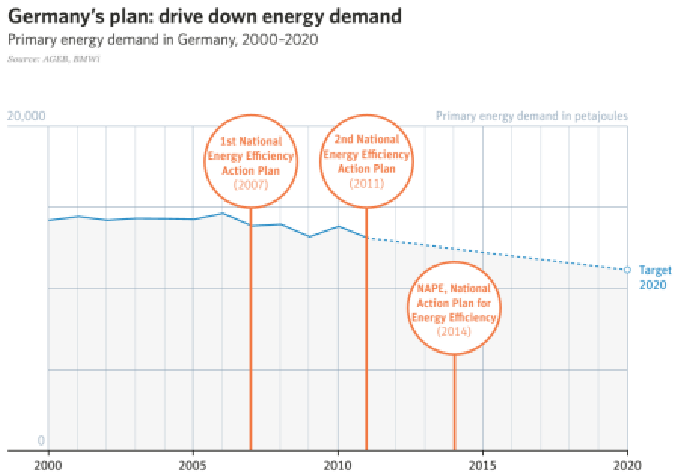


Figure 28: Primary energy demand in Germany, 2000 - 2020
Source: Morris and Pehnt (2016)

4.2.2 Political organization

Germany is federal parliamentary democracy which is based on the "Basic Law" or National Constitution. This declares the tripartition of powers, which are: Executive, Legislative and Judicial. The executive is formed by the chancellor, ministers and the president, who is recognized to have limited powers and a ceremonial role. The legislative is formed by two bodies, which are the

'Bundesrat' and the 'Bundestag'. Finally, the judicial is based on the "Basic Law" and the court system is divided in the federal courts (for constitutional matters) and state courts (for criminal, civil, labor and social matters) (Legislative Council Secretariat, 2015).

The German energy transition or 'Energiewende' is a political project, which in its current presentation was launched by the Federal Government during years 2010 and 2011. This constitutes a long-term project with quantitative and verifiable targets by year 2050 in the energy sector (Unnerstall, 2017). However the beginnings of this political project are very well established by a series of events and political movements starting in the 1970s. A very brief list of the most important events is cited in Table 15.

Table 15: Brief history of Germany's Energiewende

Year	Event
1973	Oil crisis
1974	Foundation of the Federal Environment Agency
1973-75	Birth of the anti-nuclear energy movement
1978	First Multi-Megawatt Wind Turbine creation
1979/1980	Foundation of the Green Party
1980	Publication of "Energie-Wende: Growth and Prosperity Without Oil and Uranium"
1983	The Green Party enters the Parliament
1986	Chernobyl nuclear plant melt down
1986	Climate change starts to be a topic of discussion
1991	Establishment of the Feed-in Act for renewables
1992	Off-grid solar house built in Freiburg by the Fraunhofer ISE
1997	Kyoto Protocol
1998	Liberalization of Germany's energy market
2000-present	Renewable energy production in Germany grows rapidly
2000	Renewable Energy Act (EEG)
2011	Fukushima melt down and nuclear phase-out plan in Germany

Source: Hockenos (2015) and Morris and Pehnt (2016)

Despite the very important political actions that have reached to the point of developing such a long-term project of energy transition, which have overcome different governments and political schedules, there is another very important institution in the success of the Energiewende and that is the German society (Unnerstall, 2017).

In this sense, the Energiewende is also recognized as a social transition. In this process, changes of behavior and culture are of the utmost importance, as well as more energy efficient devices, since culturally, the German society is recognized as appealed towards technology. Another important societal component is the model of cooperatives, which allows citizens to be part and own energy projects. This is a major driver towards acceptance and consumption awareness (Morris and Pehnt, 2016).

4.2.3 Legislative context and development of energy policies

In terms of how the energy policies are made, the federal government is the main actor introducing the legislation by means of the Federal Ministry of Economics and Technology (BMWi), which also monitors the security of supply in electricity and gas. The legislation is later passed on to the states, which are responsible for the implementation (IEA, 2013).

Another institution responsible for renewable energies is the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), which Is dedicated to the research on renewable energies and the market adoption of renewable sources. The BMU also has the responsibility of managing the Renewable Energy Act (EEG) and the environmental regulations related to the energy production and consumption (IEA, 2013).

In the sector of renewable energies, the EEG might be the most important and also copied legislation. The EEG, which originally established the FITs, was created in 1991 and later adjusted in years 2000, 2004, 2009, 2012, 2014 and the last time in 2016, adding the auctions as preliminary step for energy systems larger than 100 kW (Morris and Pehnt, 2016).

4.3 Introduction to FIT

4.3.1 Definition

FITs are policy instruments specific for the development of renewable electricity that are designed in foundation of minimum these principles: a purchase obligation of the electricity generated, and a determined tariff (energy price) guaranteed over a period of time that usually ranges between ten to twenty five years (Jacobs, 2010; Couture, 2010). Mendonça (2007) adds to that that the payments should be based on the generation costs of the electricity. FIT has proven to be the policy instrument most successfully and widely used around the world for the development of renewable electricity. It is also very flexible in nature and can be adapted to the local framework conditions and markets (Jacobs, 2010; Couture, 2010).

Over the design of FITs it is recommended to have a control of the overall costs. This is due to the capacity of the measure to provide a large and strong incentive, which can lead to an overwhelming development for regulators and that, might require a drastic and sudden policy change. Couture (2010) mentions the case of Spain in 2008 as an example.

The flexibility of FITs include several design options that consider market integration, especially in the case of a liberalized electricity market but also for developing countries and emerging economies (Jacobs, 2010). In the market integration consideration, which means to determine if the payments would depend of the market price of electricity or not, FITs usually provide two options: fixed price or premium price. In the fixed option, the price is not dependant of the market price and therefore it is fixed over the time. In the premium price, the final payment adds a tariff to the price of the market (Couture, 2010).

Other considerations in FIT design are related to the generation costs, which helps the designers to guarantee certain profitability for investors. As explained, the generation costs are an important component mentioned by Mendonça (2007). These costs are also considered based on the specific renewable technology used, including “investment costs, grid-related and administrative costs, (grid connection cost, costs for the licensing procedure, and so on), operation and maintenance costs, and fuel costs (in the case of biomass and biogas)” (Jacobs, 2010).

Couture (2010) exposes the necessity to integrate the design options inside a framework, that should also contribute to the evaluation of the policies all-together and that would help to maintain a desired pace of development and avoid the costs of runaway programs. Additionally, a tariff degression is also promoted as a good practice, since it helps to anticipate the cost reductions, result of the technology advancement and the consequence of overcompensating generation in the long-term.

4.3.2 First FIT implementations

FIT was probably first found in the “National Energy Act” from the United States during the 1973 energy crisis. This legislative initiative pursued to establish a framework that would help to regulate the market and introduce initiatives like tax incentives, alternative fuels, energy efficiency and energy conservation (Harris & Navarro, 1999).

In the EU case, FIT was firstly introduced in Germany in 1990 with the ‘Stromeinspeisungsgesetz’ or “Law on feeding electricity into the grid”. This was a set of policies used to promote and accelerate the development of electricity generated by renewable sources as biomass, hydropower, geothermal, solar PV and wind (Rickerson & Grace, 2007).

Since 1990, FIT has contributed largely to the development of the renewable energy market in Germany. Already in 2006 FITs were attributed to have created the largest market of solar energy in the world (Maycock et al., 2006). Solely in the EU, FIT has contributed to more than 15,000 MW of solar PV and 55,000 MW of wind electricity between 2000 and 2009 (Couture, 2010). Globally, since FIT implementations, they are accounted for about 75% of PV and 45% of wind power generation, according to figures cited by Couture (2010) from the Deutsche Bank.

With such important achievements and high effectiveness, other EU countries adopted the FIT policy; some of the first ones were Denmark and Spain. These have used the famous policy measure to install over 31 GW of wind power capacity, which corresponds to 53% of the total global installed capacity between years 1990 and 2005 (Stirzaker, 2006).

4.3.3 FIT in Ecuador

Since 2008, Ecuador's Constitution (Asamblea Constituyente, 2008) explicitly establishes and states that the government's commitment to promote the use of clean and alternative energy sources in addition to energy efficiency, while providing access to public services, preserving the environment and maintaining food and water security, among others (IRENA, 2015).

Ecuador also recognized its potential in renewable energy in the publication of 'The National Plan for Good Living, 2013–2017' in which, a target of 60 per cent of national electricity capacity from renewable energy sources by 2017, was fixed. Objective 11.1 of this National Plan lays special emphasis on hydropower and bioenergy.

Feed in tariff, was introduced in Ecuador in the year 2000 and accepted projects to be register until the 31st of December 2016. The policy evolved over these years in terms of duration, rates and technologies included. In 2013, a regulation of the Nacional Electricity Council, CONELEC 001/13 (from now CONELEC) (Consejo Nacional de Electricidad) removed solar PV from the feed-in tariff and set overall technology-specific capacity limits for wind, biomass and biogas, ocean energy and geothermal installations eligible for the tariff.

CONELEC approved in 2014 a resolution which maintained the feed-in tariff only for biomass and biogas, with differentiated rates for the first time, and for hydropower smaller than 30 MW (Currie, 2016).

A history of all feed-in tariff regulations since year 2000 in presented in Table 10 with the list of technologies included and the prices paid in USD/MWh.

	2000*	2002*	2004*	2006*	2011	2013[$]	2014[$$]
CONELEC Regulation	008/00	003/02	004/04	009/06	004/11	001/13	001/13c***
Tariff[$$$] (USD /MWh) [$$$$]							
Wind	100.5	100.5	93.1	93.9	91.3	117.4	X
Solar PV	136.5	136.5	283.7	520.4	400.3	X	X
CSP	X	X	X	X	310.2**	257.7	X
Biomass[3]	102.3	102.3	90.4	96.7	110.5 (<5MW) 96.0 (>5MW)	110.8	96.7
Ocean	X	X	X	X	447.7**	324.3	X
Biogas	102.3	102.3	90.4	96.7	110.5 (<5MW) 96.0 (>5MW)	110.8	73.2
Geothermal	81.2	81.2	91.7	92.8	132.1	138.1	X
Hydro 30-50MW	X	X	X	X	62.1	65.1	X
Hydro 10-30MW	X	X	X	X	68.8	68.6	65.8
Hydro 5-10MW	X	X	50.0	50.0	71.7	78.1	65.8
Hydro <5MW	X	X	58.0	58.0	71.7	78.1	65.8

* Max Power per project was 15MW for all technologies except for small hydro.
** Added in 2012 by CONELEC Resolution 017/12
*** As modified by Resolution CONELEC 014/14
[$] Max total installed capacity per technology: wind - 100 MW; solar CSP -10 MW; ocean - 5 MW; biomass and biogas (combined) – 100 MW; geothermal – 200 MW; small hydro – no limit.
[$$] Max total installed capacity per technology: biomass and biogas (combined) – 100 MW; small hydro – no limit.
[$$$] The Galapagos Islands had differentiated tariffs, for the last feed-in tariff in force it was: Biomass USD 106.4/MWh, Biogas USD 80.5/MWh.
[$$$$] All amounts expressed in USD in original legislation

Figure 29: Feed-in tariff regulations in Ecuador.
Source: IRENA, 2015

Table 16: Feed-in tariff and technology/price changes in regulations

Regulation	Technology	Price in continental territory (cUSD/kWh)	Price in Galapagos (cUSD/kWh)
CONELEC 004/11			
Year 2011	Wind	9,13	10,04
	Thermo-electric solar	40,03	44,03
	Photovoltaic	31,02	34,12
	Marine current	44,77	49,25
	Biomass	11,05	12,16
	Biogas	9,60	10,56
	Geothermal	13,21	14,53
	Hydro up to 10 MW	7,17	7,17
	Hydro >10 MW, <30 MW	6,88	6,88
	Hydro >30 MW, <50 MW	6,21	6,21
CONELEC 001/13			
Year 2013	Wind	11,74	12,91
	Thermo-electric solar	26,77	28,34
	Marine current	32,43	35,47
	Biomass and biogas	11,08	12,19
	Geothermal	13,81	15,19
	Hydro <= 10 MW	7,81	-
	Hydro >10 MW, <30 MW	6,86	-
	Hydro >30 MW, <50 MW	6,51	-
CONELEC 001/13 resolution 014/14			
Year 2014	Biomass	9,67	10,64
	Biogas	7,32	8,05
	Hydro power <= 30 MW	6,58	-

Source: Own elaboration based in Regulations CONELEC 004/11, CONELEC 001/13, Resolution 014/14

No specific targets for RE implementation and its possible future growth could be found in the different governmental documents (National Plan for the Good Living, PLANEE, CONELEC regulations: CONELEC 004/11, CONELEC 001/13 and CONELEC 002/13). Therefore, it is not possible to assess the achievements regarding the specific policies' targets. Nevertheless, national goals concerning RE have been declared and these will be used for the assessment of feed-in tariff.

The Ministry of Electricity and Renewable Energy defines the following:

Country goals by 2020
86% of electricity from hydro power
2% by NCRE
The rest is expected to come from thermoelectric energy and imports
9% thermoelectric
3% imports

Table 17: Ecuador's goals by 2020 for energy generation
Source: CONELEC (2013)

4.3.4 FIT in Germany

Germany and the whole EU have been important participants of the Kyoto Protocol. This has been one important reason for the establishment of country goals for renewables (Thayer, 2013). The beginning of the FIT in Germany was in the 1990s and the regulatory instrument where it is described is the EEG (Morris and Pehnt, 2016). Its first implementations in Germany, the FIT did not have differentiated treatment per technology and established a cap of 5% of the total electricity generation (Thayer, 2013). In year 2000 this law was revised and after that, every three or four years it amended. The last major revision was the one of 2016 that adopted the auctions for projects larger than 175 kW (Morris and Pehnt, 2016).

In Germany, the FITs have a twenty year guarantee for the price set and have been widely accessible for the society. A good example is that the actual contract for this measure is only two pages long (Morris and Pehnt, 2016).

The good conditions that this policy offers are responsible for a large development in the market. This has led Germany to enjoy the cheapest solar electricity thanks to the guarantees for investors and the maturity in the market (Morris and Pehnt, 2016).

The general targets set by the Energiewende and which the FIT has helped to achieve are: reduction of 20% in the primary energy consumption by 2020 and a reduction of 50% by 2050. These are levels compared to 2008

4.4 Introduction to auctions

Auctions are support schemes that have been considered a useful alternative to former support instruments used to define the level of compensation of electricity generated by renewable resources (del Río, 2017). They have gained popularity, reaching to point of being preferred over other instruments or used in combination with them. This can be appraised in Figure 30 by the considerable increase in the number of countries adopting auctions, from six to approximately sixty from 2005 to 2015 (IRENA, 2015a). An important contribution to this increase is the current Guidelines on State aid for environmental protection and energy in the EU, which establishes the auctions as the mandatory support scheme for renewable energies since 2017 (Winkler et al., 2018; del Río, 2017).

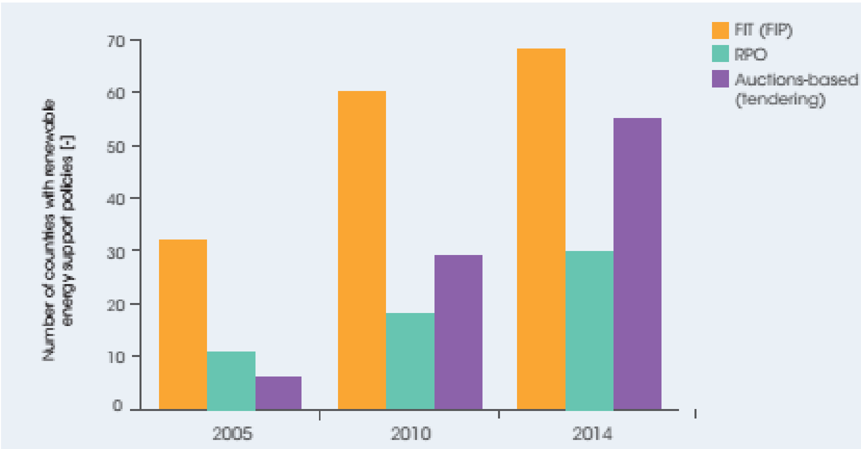


Figure 30: Countries with renewable energy policies by type
Source: IRENA (2015a: 16)

The auctions are used to fulfill specially two functions of a support system: first, support levels are defined in a competitive market and second, they help to control the expansion of renewable technologies and the support costs by setting caps (budget, capacity or generation based). For that reason they influence the effectiveness and efficiency of the support systems, theoretically to improve them, however empirical effects of auctions still need broader analysis, regardless of some results that coincide with this hypothesis (Winkler et al., 2018). In fact, particular conflicts may raise between effectiveness and support costs, allocative efficiency and between the same support costs, allocative efficiency and "system costs, local impacts, dynamic efficiency and actor diversity" (del Río, 2017:11).

According to IRENA (2015a), the main reasons for auctioning systems to thrive in the world of support schemes are its capabilities to obtain well-planned, cost-effective and transparent deployments. This is achieved by means of flexibility, real-price learning, forecasting requirements, commitment and transparency.

As other instruments, auctions can and should be adapted to local conditions and specific circumstances, so despite there are some 'best practices', which include: auction scheduling, disclosure of volume, price ceilings, potential penalties and a complete administrative procedures and information available to participants; governmental priorities remain important in the design (del Río, 2017). Moreover, the flexibility of design, characteristic in auctions, is very well acknowledged as determinant in its success, as the selection of the support scheme itself (Winkler et al., 2018).

Extending the importance of the design elements in auctions, del Río (2017) enumerates three important issues to be considered when the impact of these design options are analyzed: a) some design options work together with others and therefore their impact is increased or decreased b) external factors also affect the design options in an auction (these could be social, financial, political factors; etc.) and c) some design options might work well in one scenario but not in another, therefore the 'regulatory cultures' should be considered.

4.4.1 Classification of auctions

To better understand auctions, there has been established a basic classification based on the number of projects to satisfy the demand being auctioned (single-unit or multi-unit) and on the number of different products offered in the auction (single product or multiple product), which for the specific case of renewable electricity can be an auction in terms of energy (MWh) or capacity (MW). Generally, single-unit, single product are the simplest way to design and participate in an auction, however, they offer less capabilities for acquiring new capacity. Multi-unit, multiple products are on the other hand more complex and therefore more difficult to design and to participate in. The advantage is that they offer more opportunities for new capacity (Hochberg and Poudineh, 2018).

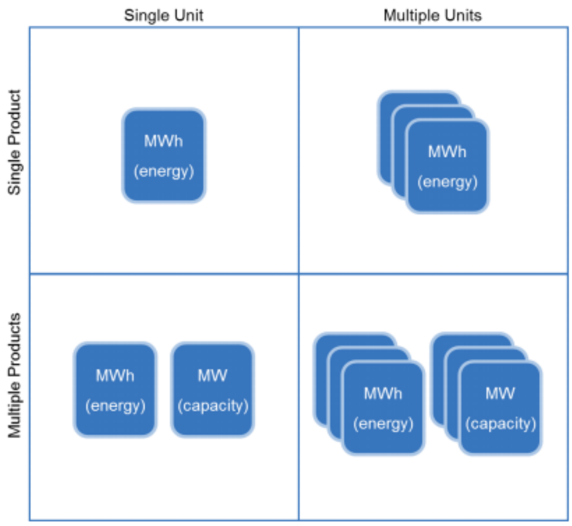


Figure 31: Basic auctions classification
Source: Hochberg and Poudineh (2018:5)

4.4.2 Design elements in an auction

The minimum design elements for auctions are described in Table 18.

Design element	Description
Volume	Capacity: total quantity measured in MW. Generation target: total amount of MWh. Budget target: amount of financial support provided.
Diversity	Determined through type of technologies, location, implementers, size.
Timing	Period of time between the call for auction and the bidding time.
Participating conditions	Information availability, communication with stakeholders, prerequisites; etc.
Support conditions	Payment for generation (MWh) or capacity (MW), under FIT or FIP.
Auction format	Type of auction: single-product, etc.
Pricing rules	According to the highest accepted bid (HAB) or the lowest rejected bid (LRB)
Price ceiling	Price limit to each technology, disclosure or not of the ceiling.
Realization period	Deadlines along the project phases.
Penalties	Determine the reasons and the actual sanctions
Assessment criteria	How to determine a winner in the auctioning process.

Table 18: Basic design elements in auctions
Source: own elaboration based on del Río (2017: 2-4)

4.4.3 Auctions in Ecuador

In Ecuador, the implementation of auctions is not specific to renewable energy but is a general legal instrument to promote the alliance between public and private sector for investment. The auctions are called 'Public – private associations' and were introduced in the legal framework in December 2015, one year before FIT allowed the last projects to be enrolled. Only the next year, in 2016, was defined the Regulation for the law of incentives for these associations. Finally, in 2017 was defined the methodology for the participation in these projects (Ley Orgánica de incentivos para Asociaciones Público Privadas 2015 (Ecu); Reglamento ley de incentivos para Asociaciones Público Privadas 2016 (Ecu); Comité Interinstitucional de Asociaciones Público Privadas, 2017).

4.4.4 Auctions in Germany

Auctions came as a result of the last revision to the EEG in 2016 and the EU normative to adopt this method as the mandatory support scheme (Winkler et al., 2018; del Río, 2017). The main purpose of these is to establish more governmental control on the capacity installed every year and by technology. Additionally, Germany is looking forward to reducing the electricity prices as this measure is based on competition. This will allow the country not to exceed the renewable energy targets and control pace of growing of the renewable capacity (Morris and Pehnt, 2016).

Auctions however, do not replace FITs, it is just a mechanism for price setting. In the FIT the price set is administratively (and high) and in the auctions it is set by competition (lower and closer to real prices) (P. Stratmann, personal interview, May 17, 2018).

5 Results

5.1 Relevance of codes generated for interview content analysis

5.1.1 Results from Ecuador

5.1.1.1 How often the codes generated are repeating between interviews

Figure 32 shows the distance matrix between the interviews in Ecuador. The content of the interviews was found to be more similar in its topics (codes) and in the frequency they appear, between the pairs Andres Sarzosa – Sandra Reed and Andres Sarzosa – Juan Espinoza. On the other hand the topics found between the pairs Alfredo Mena – Juan Espinoza and Alfredo Mena – Sandra Reed, were more dissimilar. However, it is clear that a good level of similarity exists in general.

Distance matrix (Squared euclidean distance)

Document name	Andres ...	Juan ...	Sandra...	Alfredo...
Andres Sarzosa_MEER	0.00	84.38	87.87	109.05
Juan Espinoza_EDU	84.38	0.00	103.17	133.89
Sandra Reed_LAW	87.87	103.17	0.00	121.64
Alfredo Mena_NGO	109.05	133.89	121.64	0.00

Figure 32: Similarity of documents based on code frequency (Squared Euclidean)
Source: Results from MAXQDA

This is enough to see that the questions asked trigger often the codes generated. Therefore the codes are considered from this point of view relevant in these interviews and their content in the case of Ecuador.

5.1.1.2 How much of the marked content corresponds to 'context' and how much of the content is not marked

Figures (i) show the relative amount of text marked with each category of codes according to the colors in Figure 13. On the other hand, figures (ii) show the actual order in which codes were assigned in the text and the white spaces show the not-marked segments.

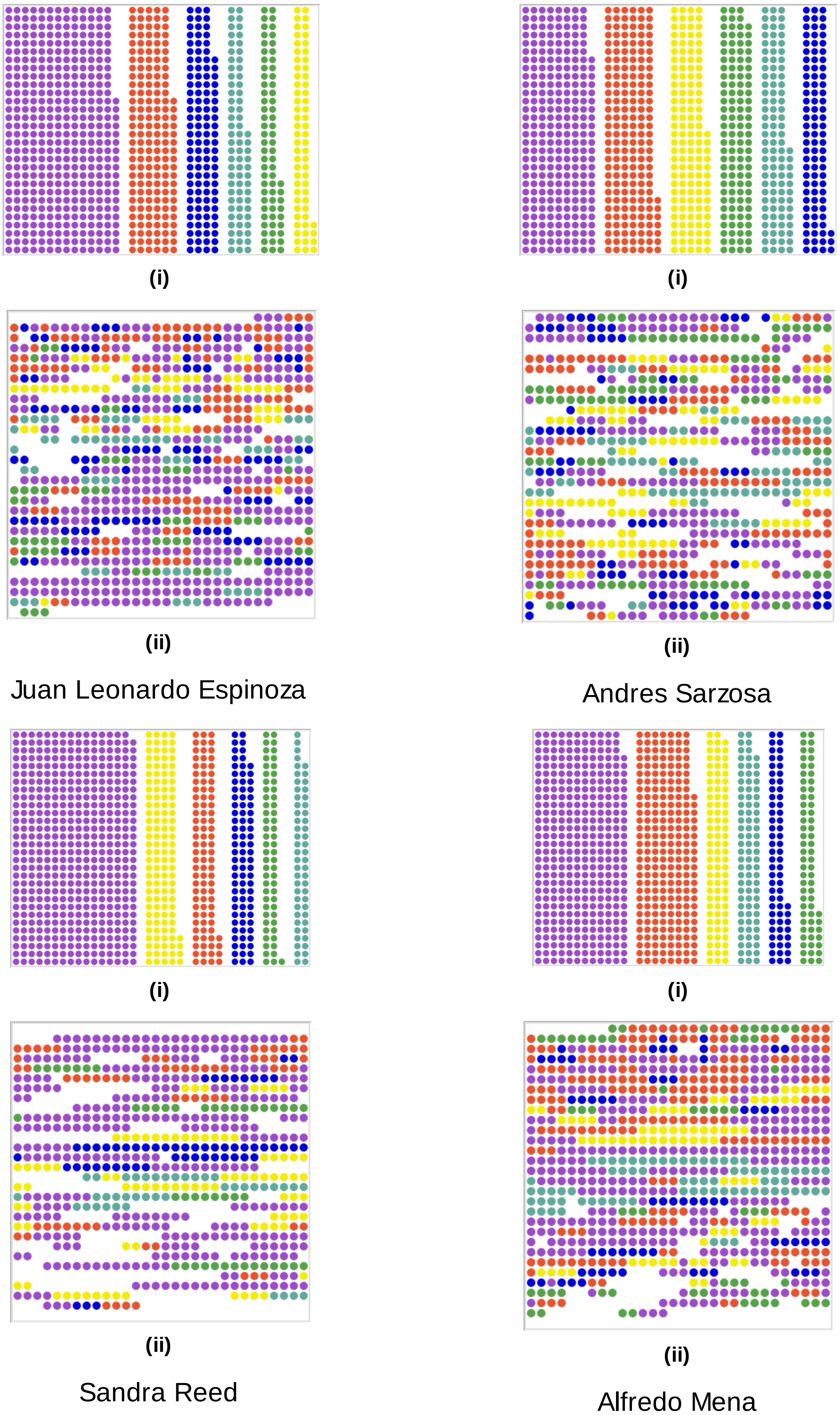


Figure 33: MAXQDA results for document portrait. Interviews in Ecuador

In these graphs it is seen in the four cases, that the largest part of the content belongs indeed to the context, also, in three of the cases the second largest part of content belongs to technology. The least discussed topics are related to the methodology of policy transfer and the actors of the energy transition.

With these results it is seen that most of the content is related to the context and that also most of the content of the interviews found codes to be marked with. In the case of Ecuador the three aspects determined to prove code relevance met the expectations.

5.1.2 Results from Germany

5.1.2.1 How often the codes generated are repeating between interviews

Figure 34 shows the distance matrix for the interviews in Germany. It can be seen that the numeric values among the interviews are more similar, which consequently means more similarity in the codes marked and their frequency. The most similar interviews were found to be the pairs Mario Ragwitz – Sacha Samadi and Mario Ragwitz – Volker Stelzer, on the other hand, the most dissimilar pairs were Peter Stratmann – Volker Stelzer and Peter Stratmann – Sacha Samadi.

In general terms, however the codes generated repeat frequently among the interviews and can be said that from this analysis, the codes are relevant in the case of Germany.

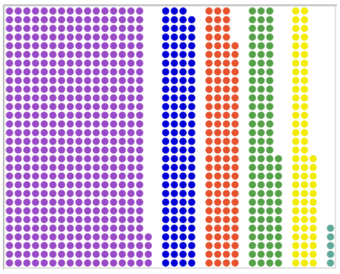
Distance matrix (Squared Eucledian)

Document name	Volker...	Sascha...	Peter...	Mario...
Volker Stelzer-KIT ITAS	0.00	85.38	77.52	50.74
Sascha Samadi-Wuppe...	85.38	0.00	90.70	67.52
Peter Stratmann-Bund...	77.52	90.70	0.00	76.14
Mario Ragwitz - ISI Fra...	50.74	67.52	76.14	0.00

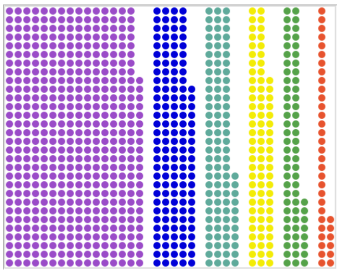
Figure 34: Similarity of documents based on code frequency (Squared Euclidean distance)
Source: Results from MAXQDA

5.1.2.2 How much of the marked content corresponds to 'context' and how much of the content is not marked

The following graphs show the results for Germany and can be interpreted under the same criteria as for the results from Ecuador.



(i)



(i)

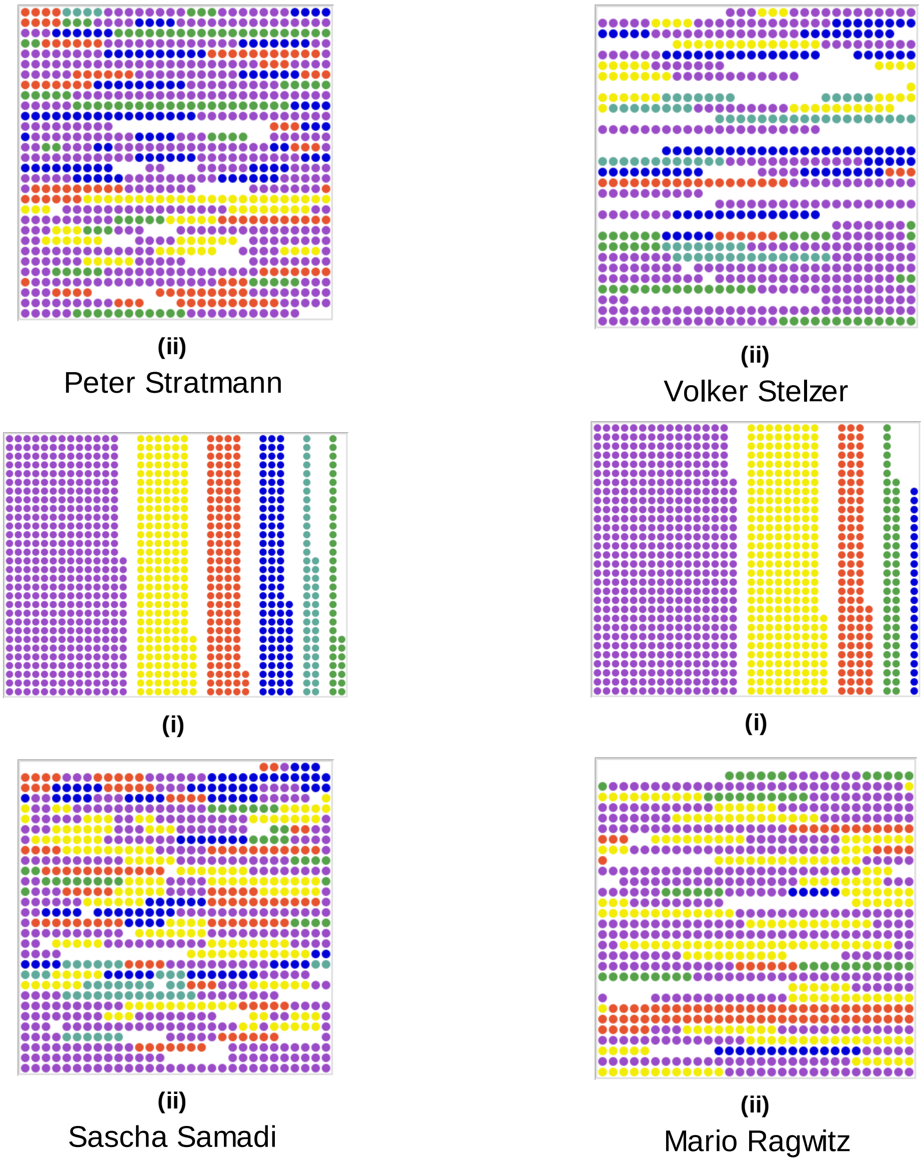


Figure 35: MAXQDA results for document portrait. Interviews in Germany

In the case of Germany it is also visible that the largest part of the context was determined to be the 'context' and that the vast majority of the text was marked with a code.

From the three parts of the analysis then, it is also clear that the codes generated are relevant in the case of Germany.

5.2 Coding results for Ecuador

5.2.1 The society as an actor in Ecuador's energy transition

After the first round of analyses it was noted for the specific case of Ecuador, that for the four interviews no information regarding the society as an actor was found. This means that through the segment coding, no information provided by the experts mentioned the society and the general citizens as empowered actors of the energy transition or active participants of the renewable energies in general. This analysis was realized with the *Code Matrix Browser* from MAXQDA, which provides a matrix representing the transcription of each expert vs. all the codes. A variable size marker is shown for each code depending on the relative amount of coded segments found. For the 'society' as an actor none was found. Figure 36 shows this result.

This first result was double checked by reviewing again the content of the interviews and trying to find, specifically, segments that should have been marked with this code but for some reason escaped the analysis. In the second check it was still found to be zero.

Figure 36: MAXQDA Code Matrix Browser results for actor analysis per interview (Ecuador)

For this reason it was decided to do a follow-up questionnaire to the same experts in Ecuador to try to identify specifically what was the perception of the society as actor in the renewable energy transition. This process leaded to the final addition of two codes to the 'society' code category to identify the difference between what experts believe should happen and what actually does. These two additional codes were: 'current participation' and 'ideal participation'. In Figure 37 are shown the results after including these additional questions in the analysis. From the four experts, three responded the questionnaire. The additional information from Andres Sarzosa, in representation of the MEER is missing.

Figure 37: MAXQDA Code Matrix Browser results for actor analysis per interview (additional questions)

This is a result that establishes the lack of consideration and active participation of the society as actor in the energy transition. The expressed gap between what 'should be' and 'what is' in the responses from experts reveals a nonconformity with the current level of participation of society.

5.2.2 The most important contexts in Ecuador and their relation

From the rest of the *Matrix Browser* results it can be appraised that the legislative and political contexts play an important role for the experts, followed by the economic. The social and technical contexts are mentioned but in a rather less frequent way. Finally, the environmental and geographic contexts are much less frequently considered within the discussions.

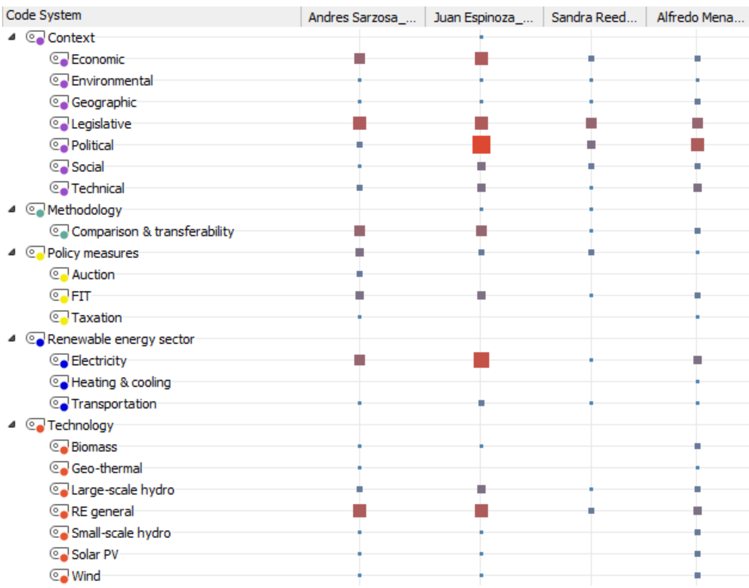


Figure 38: MAXQDA Code Matrix Browser results w/o actor analysis per interview (Ecuador)

The next analysis corresponds to a complete matrix exclusively among the codes created (in x-axis and y-axis) by means of the *Code Relation Browser* tool of MAXQDA. This means that a relationship was established by pairs of codes in all possible combinations. The result provides an idea of how frequently the specific combination is present as an overlap or intersection in the same segment.

Figure 39 to Figure 42 show this matrix subdivided in parts for better presentation. Figure 39 depicts a very important relationship between 'political' and 'legislative' contexts, as well as between 'economic' and 'political' and between 'economic' and 'legislative'. The 'social' context also shows importance in relation to the 'political' context.

Despite the exact content of the text is not considered for the elaboration of these graphs, it is of great importance to reveal how the contexts are paired in the discourse. This shows a great power from the side of the political, legislative and economic forces, with a reduced but still present social factor. Very much less importance is perceived from the environmental, geographic and technical contexts.

Figure 39: MAXQDA results for code relations w/o actors (part 1 - Ecuador)

5.2.3 The policy measures

FITs are the most recognized policy measure and it is shown to be mainly in relation to the legislative context, however it is seen that it is also related to almost all other contexts with exception of the geographic and social.

Auctions are less present in the discourse and that is related to the fact that they were still in planning within the government and not used yet in Ecuador at the moment of the interviews.

5.2.4 The renewable energies and the electricity sector

Furthermore, the renewable energies in their general sense are related to economic, legislative and political contexts largely, but also with less frequency or less strength to the social and technical contexts. Renewable energies were also recognized in relation to policy measures, form which FIT was reasonably the most important, and in the category of energy sector, they were found to be by far mostly related to electricity rather than transportation or heating & cooling.

The electricity sector at the same time was found to be mostly related to the economic, legislative, political and technical contexts, and on the side of the technologies, it is frequently related to large-scale hydro.

Figure 40: MAXQDA results for code relations w/o actors (part 2)

5.2.5 The relations between actors

As previously explained, in Ecuador have been identified three groups within the government, according to their functions. These groups are: legislation, implementation and regulation and control. In each of them is listed a further subdivision of the institutions identified during the interviews. Considering these three functional groups enclosed in the three rectangles in Figure 41, it is visible that the institutions working with legislation have broader amplitude of topics in relation with other actors but were not found in topics related to the private sector in these specific interviews. The implementation institutions present an intersection of topics with the private sector and depict frequent relation to topics related to the other two groups of governmental institutions. The current control and regulation institution, Arconel, was also found in topics related to the private sector and as the other two groups, present an interaction within the governmental actors.

From the rest of actors, the private sector clearly plays an important role in relation to governmental actors, society and the third sector. The least active actors identified are the society and the third sector. The society presents a focus on a better participation with the government, the private sector and the third sector. The third sector presents a few topics in relation to the government, its legislative institutions and the private sector, which is in a great way related to their purpose but seen in a very infrequent way in the interviews.

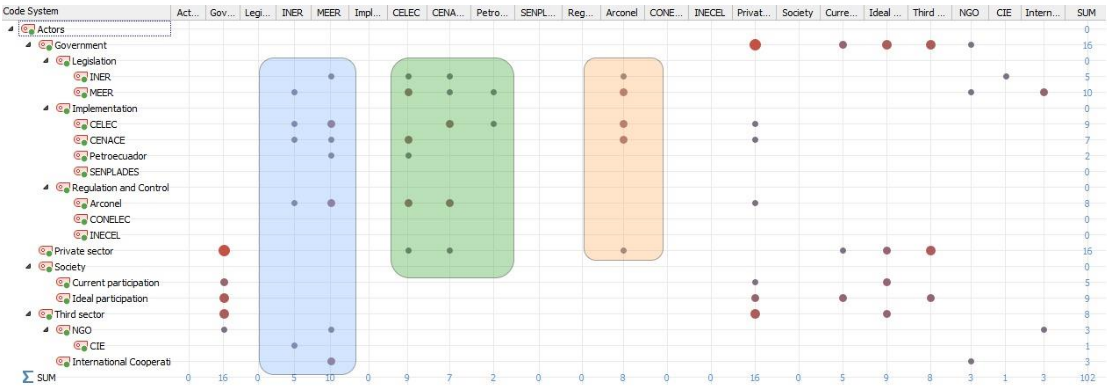


Figure 41: MAXQDA results for code relation between actors (Ecuador)

To finalize the description of results for actors, the code relation between all actors and all codes is provided in Figure 42. This shows a generalized view of the interactions and gives a clear visual idea of the most important relations. These are: government – private sector, government – political context, private sector – economic context, private sector – legislative context and private sector – political context.

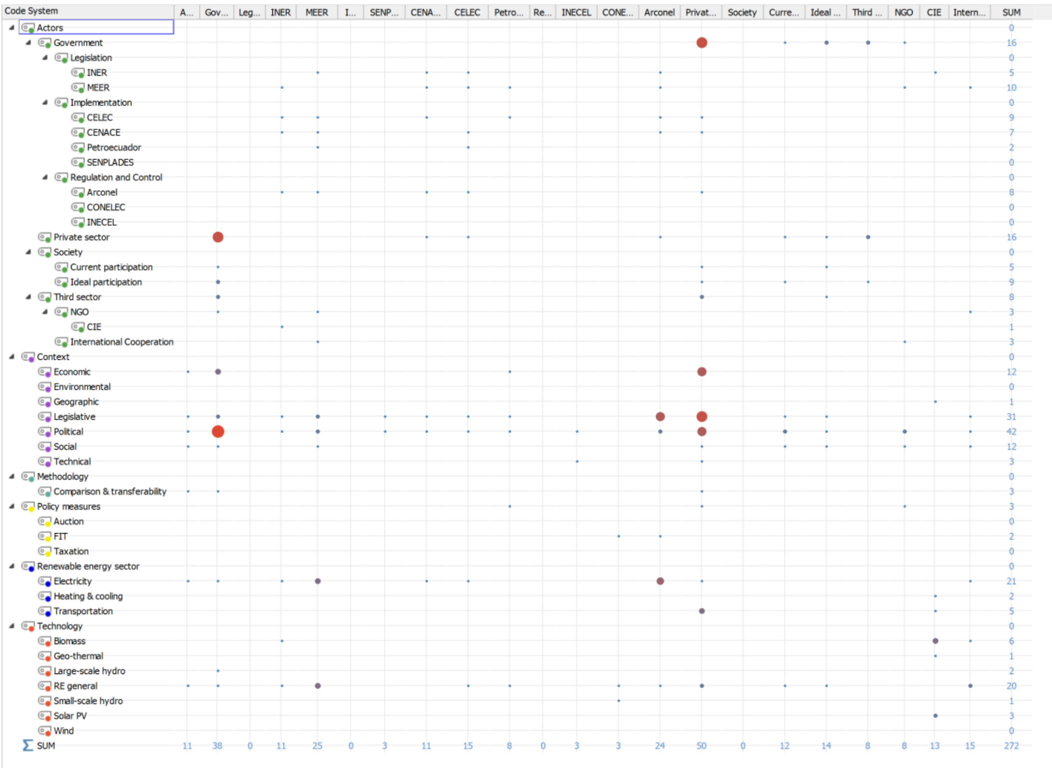


Figure 42: MAXQDA results for code relation of (actors in Ecuador)

5.3 Coding results from Germany

5.3.1 The society as an actor in Germany's energy transition

In the case of Germany, the arrangement of actors among the discourses of the four experts interviewed shows a clear importance of the society in first place, then the government and the private sector. Much less presence is perceived from the third sector. This is seen in Figure 43 from the *Code Matrix Browser* tool from MAXQDA.

This result is a clear indicator of the influence of the societal participation in Germany's energy transition.

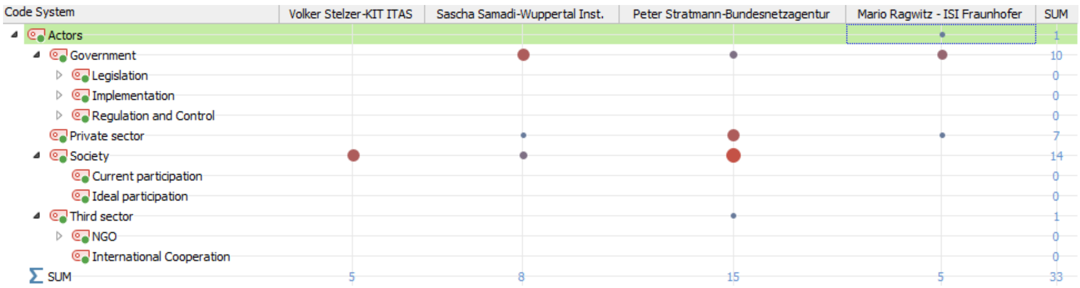


Figure 43: MAXQDA Code Matrix Browser results for actor analysis per interview (Germany)

5.3.2 The most important contexts in Germany and their relation

In Figure 44, the results from *Code Matrix Browser* without the actors are presented. In this figure it is visible that two are the main contexts in the discourse from the experts, these are: economic in first place and very closely the technical. Furthermore it is interesting to note that the following contexts are very similar in importance, this includes the political, social and legislative contexts. At the end of the scale it is visible that the environmental context was still mentioned but less frequently, and the least mentioned context was the geographical.

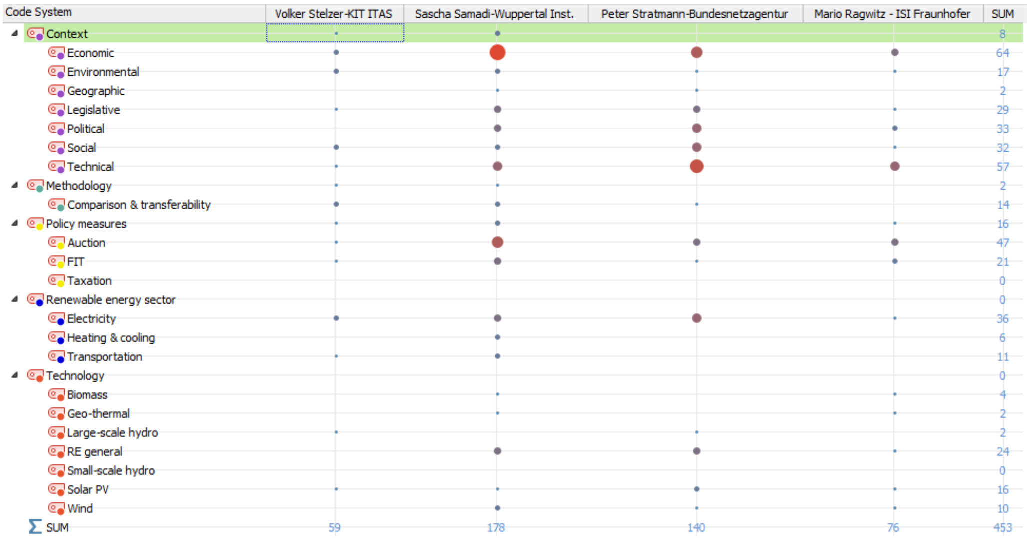


Figure 44: MAXQDA Code Matrix Browser results w/o actor analysis per interview (Germany)

Similarly as in the case of Ecuador, the next analyses comprise the *Code Relations Browser* for the rest of codes but 'actors'. In Figure 45, it is appraised that there is a more intense 'economic'-driven relation of contexts. This means that the economic context paired with legislative, political and technical contexts is more frequency among experts. Other relevant result is that beyond this dominance the difference in size with the rest of relations does not depict a very large gap.

5.3.3 The policy measures

It is also visible in Figure 45 that FITs and auctions are mostly related to the economic, legislative, political and technical contexts, being the economic and technical the most discussed. Additionally, auctions were more frequently discussed than FITs and in more contexts, including environmental and geographical. Auctions and FITs are at the same time related to several renewable energy technologies, such as solar PV and wind, however, auctions are additionally related to biomass and geo-thermal.

5.3.4 The renewable energies and the electricity sector

The electricity sector shows an important relation with the technical context in first place and then with the economic. With the rest of the contexts the relation shown in Figure 45 is considerably weaker. On the other hand, in Figure 46 it can be appraised that the renewable energies in general maintain a consistent relation with contexts and policy measures, which gives the idea of a stable sector.

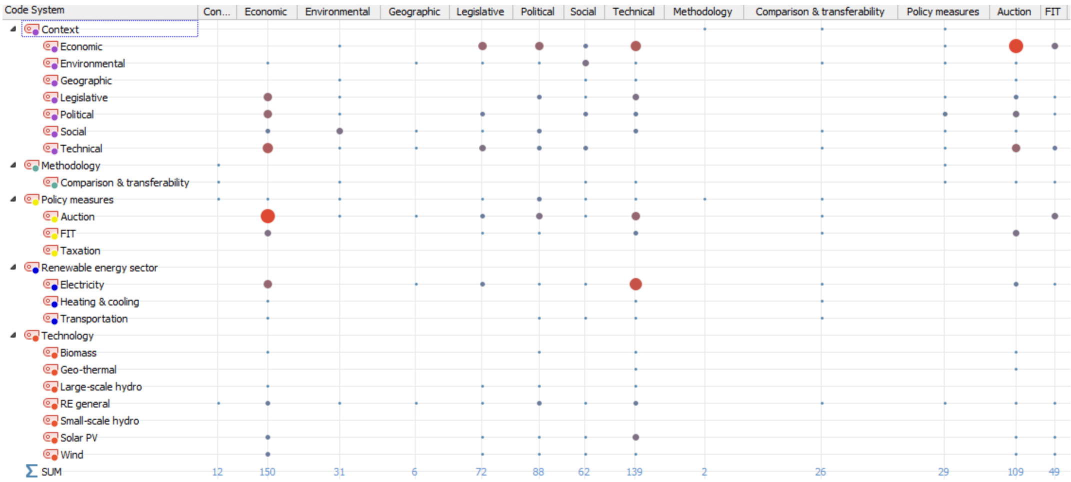


Figure 45: MAXQDA results for code relations w/o actors (part 1 - Germany)

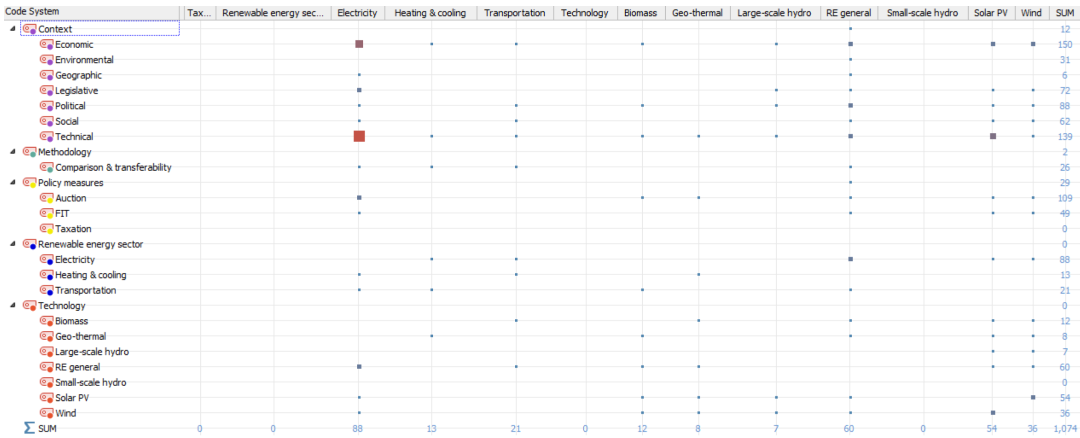


Figure 46: MAXQDA results for code relations w/o actors (part 2 - Germany)

5.3.5 The relations between actors

The first thing that becomes apparent in Figure 47 is that there is in general a rather limited discussion about the relation between actors and less frequent than the case of Ecuador. Nevertheless, the most important relations are society driven society with the government, private sector and the third sector.

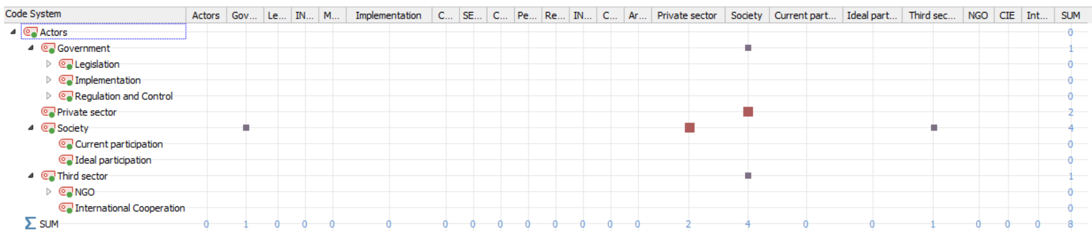


Figure 47: MAXQDA results for code relation between actors (Germany)

Furthermore, in Figure 48 the rest of relations of actors are shown from the four general categories of actors only the third sector showed a much less presence in the interviews. Society in first place followed by the government and the private sector show a similar level of participation, especially between government and the private sector. It has to be noted that the third sector does have a small but visible priority.

Additionally, the relations of these actors are mostly centered on the context, with visible less frequency related to the environmental and geographic contexts.

In the case of the government, it shows a stronger relation with the economic and political contexts, with important relations with the auctions and the renewable energies, not only in general but also with solar PV and wind. The contexts: environmental, legislative, social and technical are also present but considerably less.

The private sector shows a more important relation with the technical context but also with the economic, as the most depicted. However, social, political and legislative contexts are also visible relations but in a weaker way.

Finally, the society shows for obvious reasons a large relation with the social context and in visible but much less frequent way, with the legislative, technical, political, economic and environmental contexts. Society is also mentioned in relation with FIT and auction policy measures, the electricity sector and specifically the solar PV and wind technologies, but also with the renewable energies in general.

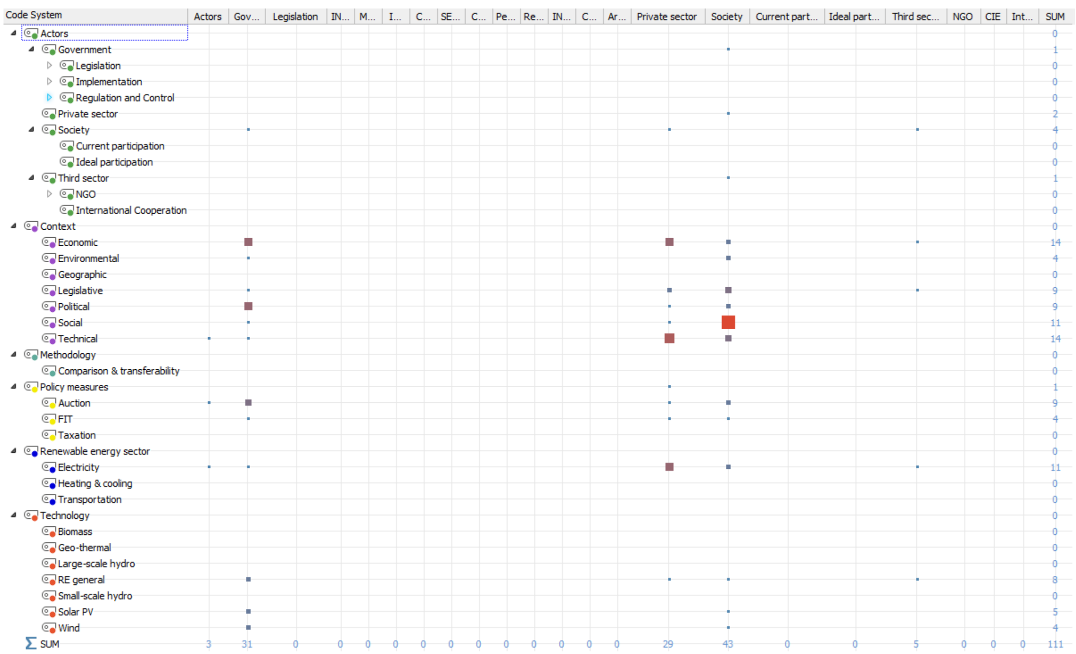


Figure 48: MAXQDA results for code relation of (actors in Germany)

6 Discussion

In this section are discussed the major findings of this thesis. Quotes and statements from the experts interviewed have been used as a resource. These are shown in boxes for presentation reasons, with the intention of supporting the arguments without distracting the reader.

6.1 Transferability of FIT and auction policies

As it was described in section 2.2, a prospective transferability of policies is analyzed in terms of its transferability and applicability. The transferability, understood as 'generalisability' looks for a determination of how possible is to extend the policy to other countries and to make it shareable in face of the possibility of obtaining similar outcomes.

In this respect, the two policies considered in this thesis are without a doubt instruments widely transferable. As years of implementation with a trend to increase prove, FITs and auctions show that they can be adapted and implemented in other countries, within certainly the most varied contexts.

Figure 49 shows the growing trends for FITs and auctions from 2004 to 2016. Certainly FITs show a more robust trajectory and despite a possible non-growth period in the next years, it still demonstrates a growing trend. On the other hand, auctions are increasing in number with a large pace since 2008.

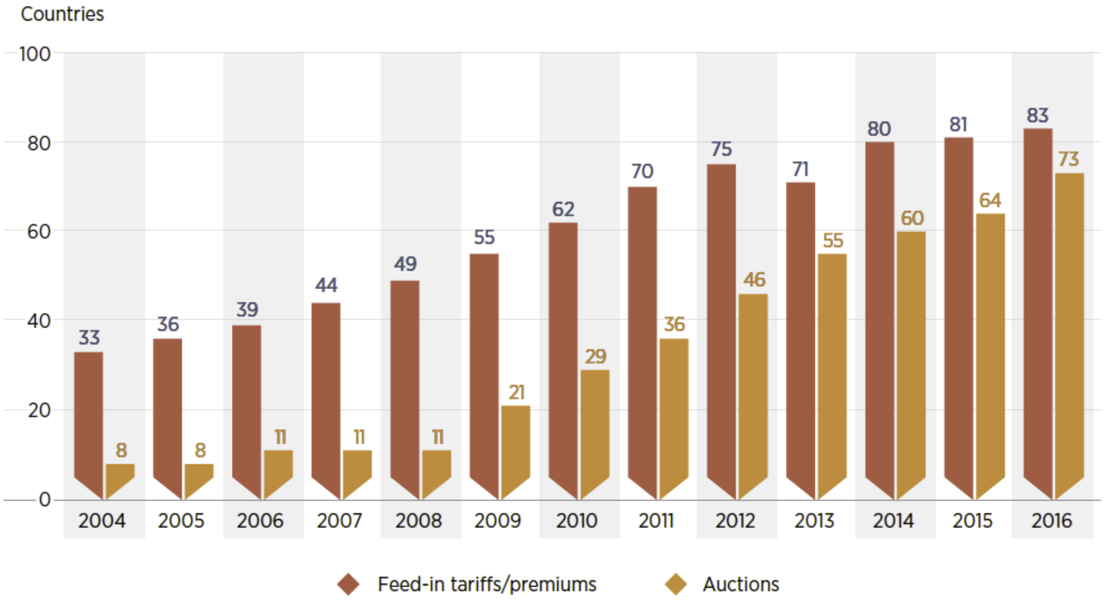


Figure 49: Adoption of FITs/FIPs and auctions, years 2004-2016
Source: IRENA et al. (2018)

6.2 Applicability of FIT and auction policies

To complement the analysis of transferability of the FIT and auction policies, the applicability of their particular requirements and characteristics within the specific contexts of Ecuador and Germany has been evaluated with the criteria described in section 2.2.4.

Usually this evaluation is intended to select from a number of policies the ones that better adapt to the given context, so they have better chances of being transferred. In this case, these results are used to do the opposite. Two policies that have been already selected, are used to evaluate the contexts, so possible improvement areas are identified.

The applicability of FITs and auctions is based on Table 7 and Table 8 (defined in section 3.3) and has been graded based on a five-ladder scale, from (1) to (5), where (1) means not applicable and (5) fully applicable. Additionally, the reasons behind this grading are detailed. These grading is not intended for a numeric calculation but rather for an appraisal and subsequent interpretation.

6.2.1 FIT

Table 19 shows the evaluation of contexts in Ecuador and Germany for FIT's characteristics and requirements.

Table 19: FITs' applicability evaluation in Ecuador and Germany

FIT characteristics and requirements	Applicability in Ecuador's context	Applicability in Germany's context
Can support a rapid renewable energy development • Long-term contracts • Price security • For a variety of technologies • Evaluated against long-term RE targets • Search better market opportunities • Design complexity is flexible	2 • There is a lack of security for investors. • Lack of financial support	5 • Germany's FIT proved a large and rapid development of renewables.
Requires high amounts of capital available for support • Financing (taxpayer burden) • Long term cost recovery	3 • Taxpayer burden might be a challenge. • Other financing sources are not available	5 • The electricity cost is high and citizens pay the burden. EEG surcharge.
Can adopt small-scale projects • Differentiated prices • Energy access to small communities (off-grid) (by design) • Little transaction costs	4 • Support for remote site electricity access already exists (off-grid)	4 • Germany's FIT can adopt small-scale projects but integration to the grid is necessary.
Reduced transactions, administrative and permission fees • Variable administrative and permission fees • Little transaction costs	1 • No clear process is currently available for renewable projects (specially independent,	5 • There is no strict application process. Plants up to 100 kW are eligible

	small-scale, not government proposed)	
Provides incentive for technological development • Recommends the existence of a feed-in law • Policy design that promotes specific technologies • Cost-degression or bonus payments (stimulation of R&D for cost reductions)	2 • Ecuador does not develop renewable technologies locally. Most of it is imported	5 • Germany counts with a feed-in act with support for different technologies and cost-degression plan
Should be cognizant of social factors • Social equity (taxpayer burden) • Citizen participation in projects	1 • Society as an actor is not visible.	5 • Citizens can participate of projects. Culturally there is more acceptance of renewables
Mitigate the uncertainties of market and establish long-term commitments • Long-term contracts • Generation cost-based rates • Reliability of policy funding sources • Renewables expansion stabilize electricity prices	2 • Ecuador does not provide a stable market of ren. en. for investment. Different contracting approaches have been used with the private sector	5 • FIT contracts are established for 20 yrs. A well-functioning liberalized market provides
Focused on the development of new renewable energy projects • Long-term contracts • Varied energy producers accepted • Varied energy sources accepted	2 • Ecuador is focused in the development of large-scale centralized projects, specifically hydro	4 • Small projects up to 100 kW can be developed easily • Tendency to use auctions limits participants and technologies to those tendered for larger capacities
Extra costs are passed to consumers • Financing (taxpayer burden), based on political decision and law making	2 • Taxpayer burden might be a challenge • Social concerns for the cost of electricity despite certain subsidies available.	5 • German taxpayers have a large acceptance for the costs of renewable electricity
Considers different renewable sources and their different generation costs • Varied technologies are chosen on political decision • Profitability ensured by different tech. gen. costs	4 • Differentiated costs based on FIT for new projects ended in 2016, however the existing projects under old FIT maintain the prices agreed • Different technologies are paid differently	5 • The eligible technologies are clearly defined and also the differentiated prices
Requires specific technical and managerial competencies and knowledge from designers and implementers of the policy	1 • There is not an academic approach when designing	5 • The policy-making is highly related to the

• Governmental officials need to acquire new knowledge	and implementing the policies. It is more empirical	academic and research sectors. It is highly technical
• Costs of technical transfers and knowledge sharing		

Source: own elaboration

From the context evaluation for FITs it is observed that no real suitability exists in Ecuador and the complete opposite situation occurs in Germany. FIT is indeed not anymore an existing policy, nevertheless the projects registered until December 2016 will still enjoy the benefits. No retroactive measures have been taken in that scope.

The former regulation itself would be expected to have contributed in Ecuador, in a large extent, to improve the context characteristics for this kind of measure. However, this is not the case and that gives the idea that the regulation was not really effective. As a result from the years of FIT in Ecuador (2000-2016) twenty two solar PV projects are actively parts of the National Interconnected System (SNI), three since 2013 and the rest since 2014, with a total of approximately 26 MW in capacity. However, as not many regulations for support of renewables have been developed in Ecuador, FITs are recognized as the most important. This is especially true for the development of wind power, as the studies from Espinoza and Barragán (2013). These wind and other biomass projects that were also generated contribute with more capacity but are less in number (Agencia de Regulación y Control de Electricidad, 2015).

Other solar PV off-grid projects have been developed in remote areas like the Amazon and the Andes. Nevertheless, these were realized with the contribution of the international cooperation and not by the application of the FIT. That is the case of the EUROSOLAR project that implemented solar kits in 91 rural communities.

6.2.2 Auctions

Table 20 shows the evaluation of contexts in Ecuador and Germany for auction’s characteristics and requirements.

Table 20: Auctions' applicability evaluation in Ecuador and Germany

Auctions characteristics and requirements	Applicability in Ecuador's context	Applicability in Germany's context
Aimed for more mature, developed sectors but able to support less mature ones • Technology-specific or neutral designs • Stand-alone vs systematic auctions • In general applied in countries with a somehow developed ren. en. Sector	2 • Ecuador's renewable sector is not mature. What exists is determined isolated projects • The focus are large-scale hydro	5 • Germany's sector is well structured and established. The expansion of renewables needs to be controlled
Demands transparency and credibility from organizational institutions • Clearly stated liabilities and responsibilities in the contracts • Transparent, non-discriminatory processes • Nominating credible institutions that administer auctions • Administrative documentation available in a timely, comprehensive manner.	3 • Ecuador is changing once more the organizational structure of the sector • Institutions to manage and control auctions are new and specific for this purpose	5 • The institutions regulating the sector are long-lasting and have developed it for years • Well managed informational sources for bidders
Integration to electricity market • Ensure priority of dispatch • They adapt to liberalized markets • Design options are flexible and allow auctions to be apt for the specific country market • Plan long-term RE markets that can integrate to electricity market	3 • In order to adapt coherently to the market a well-established renewable sector needs to be planned • A very technical team has to be built to study and plan the market considering specific objectives for renewable technologies	5 • Counts with a well established liberalized energy market • Rules are clearly established • Counts with a detailed plan of energy objectives and plans
Demands consistency within legal framework, planning and economic strategy • Regulatory stability • Transparency • Guarantees to investors	2 • A long lasting institutional organization and regulation is needed • Long-term commitments and objectives on renewables are not set • Investors feel the need of additional contractual obligations for security of investment	5 • Long-term country plans and goals are set for renewables and climate change mitigation • Specific plans and regulations are based on the large, long-term objectives • Regulatory stability
Consistency with renewable energy targets • Align auction volumes with expansion targets • Therefore, the existence of renewable energy targets	3 • Specific renewable energy targets for other that large-scale hydro are not set	5 • Technology-specific objectives are set • Plan of renewables expansion is available
Large governmental (regulatory and technical) requirements • Governmental institutions are the largest designers, implementers	2 • Knowledge transfer exists but not in a technical way, more empirical	5 • Germany already counts with Institutions dedicated to design,

and regulators • High design flexibility demands complexity and knowledge transfer	• There is a gap between the time required for meeting the requirements and the time when auctions were legally introduced	monitor and control the policies and the energy market • Germany is one of the countries at the front of policy planning and innovation in the EU
Cognizant that factors vary according to region, country; etc.	3 • There is acknowledgement of the importance of country factors but there is no academic or technical way of tackling these differences	5 • Country specific context is considered and well-known due to the amount of knowledge generated and resources spent on research
Importance of acceptance from societal groups • Possibility of citizen participation in investment projects	1 • There is a very low consideration of society a shapers of the energy transition • Low levels of participation and importance of renewables from society	5 • Society is active participant of renewable projects • Social acceptance is a factor considered
Larger technical knowledge from bidders • Increased technical requirements as participation pre-requisites	3 • Local investors may have to rely on international manufacturers, designers and support	4 • Local investors and project bidders are well prepared in general but the common citizens may be limited to participate as easy as with FITs
Energy cost-reduction oriented • Real price discovery leads to lower prices	2 • Market in Ecuador is not liberalized, prices are administratively set	4 • Price reduction of renewables in Germany is already a topic of discussion due to the 'merit order' effect
Makes use of international participation and the private sector • Conditions can attract international investment	5 • Well established auctions might bring international funding for renewable projects and therefore creating jobs	4 • Large local private investors are attracted but also international corporations. In the case of Germany that is not necessarily a strong need
Requires legal fitness of bidders and imposes penalties for non-realization • Comply with legal pre-requisites • Bidders are usually the private sector	4 • A clear structure of legal rights and obligations might help to also bring more security to investors • Non-realization is one of the major challenges seen when using auctions • Penalties might make the investment unattractive in Ecuador	5 • Non-realization is one of the major challenges seen when using auctions
Price and quality of energy are more certain (price discovery)	4 • More control on the sources of electricity is gained • Some conflict might arise with the price	5 • Germany can make use of the large governmental control tools to shape the quantity and quality of energy auctioned

	determination as that is administratively set	according to country goals • Price discovery is one of the main reasons why Germany adopted auctions
High transactional costs • Bidders pay permit fees, administrative costs, participation fees; etc.	3 • Ecuador's lack of investment might be further affected by complicated schemes and costly participation	4 • Large projects with large responsibilities are more limited to more specialized participants
Allows to determine specific geographic areas where to develop projects, if desired	5 • In a centralized model like Ecuador, the selection of specific locations, technologies and capacities to be installed would be appreciated	4 • Despite being an important possibility, it is probably more important in Germany to determine the specific technology more independently of the location
Burdensome administrative procedures	3 • Considerably much more time would be necessary for the planning, assessing and selection of winners. Given the lack of investment security long burdensome processes might turn investment away	4 • More complex procedures might attract less investors, however long processes are already normal in Germany
Design should pursue socio-economic contribution • Empower local communities • Job creation	5 • This would be of much importance in Ecuador, if socio economic contributions were since the beginning of projects a requirement	3 • Renewables market already contributes in an important scale to job creation and social benefits

Source: own elaboration

In the case of auctions, Ecuador reflects that several characteristics of this measure could be useful and applicable to the contexts. However, major challenges are seen in the long-term of aspects like: planning, objectives, institutional structure and credibility and legal framework consistency. Technical skills and learning processes from other countries will also need refinement and resources.

As it is seen from various perspectives, contexts in Ecuador have been shaped by the short-term resolution of conflicts and problems. There is an institutionalized lack of long-term thinking, when the opposite is the base for a transition and the design of any policy measure and sector, specially the so-called strategic sectors like energy.

The permanent change of institutions, regulations and officials has not allowed for a proper, sector development with a long-lasting goal. This is what is exactly opposite in Germany, where the energy transition is seen as a societal project of long-lasting characteristics, managed by governments. This difference has allowed to the project to develop beyond the governmental periods.

Furthermore, the regulation and governmental information generated for the auctions in Ecuador, is built at large extent with a more legislative perspective than technical, focused on the renewable technologies.

In Germany, the context looks much more prepared to cover the requirements of the auctions, and also its characteristics seem beneficial for the context. The challenges that might be seen in Germany regarding the auctions are more related to the realization of auctioned projects. This is the reason why the penalties are a useful tool. In Germany so far, especially for solar PV, high realization rates have been seen.

> "So at least at the short term it looks like it has been quite successfull reform with clear planning horizon for all actors in the electricity sector, for the renewable capacity."
>
> M. Ragwitz, telephonic interview, July 21, 2018

6.3 Context in the regime

6.3.1 Germany

In section 2.1 the MLP framework is presented to analyze and describe a socio-technical transition process. Figure 50 illustrates the current state MLP representation of the energy transition for the electricity in Germany. Here the regime is established by the fossil fuels. In the niche there is currently a very strong pressure from the renewable technologies up to the current regime. Also in the niche, are found the nuclear technologies, which together with the fossil fuels dominate 70% of the electricity generation.

In the landscape are identified the external factors that are relevant for the transition process. Here are also analyzed the contexts defined by means of the content analysis. These influence the transition to potentially create windows of opportunity. From the legislative context toward the regime, the two specific policies studied, FITs and auctions, are included in the analysis.

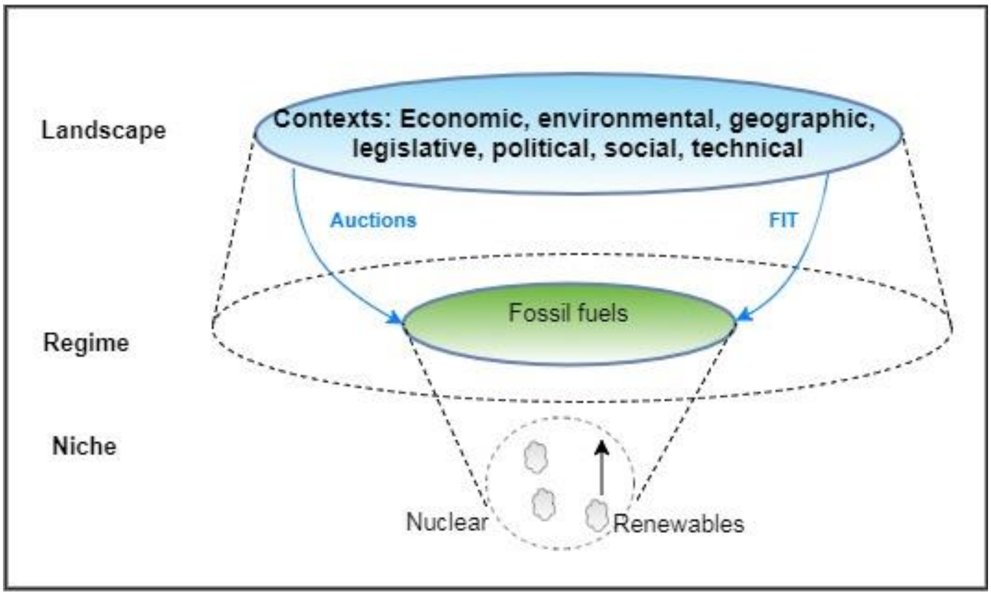


Figure 50: MLP representation of the current status of energy transition in Germany

6.3.1.1 Actors

In Germany, social actors represented by citizens and also cooperatives have been widely recognized as the most relevant contributors of the Energiewende. This is actually verified by the content analysis results of this thesis, which shows three main actors in the German transition, first the society, and evenly in second place the government and the private sector.

As it is clearly appraised from the history of the Energiewende, social factors have been influencing Germany’s energy sector and decision-making since the 1970s. Therefore, the social empowerment is a result of a long-term participation and preoccupation from the society regarding clean energy, mainly for environmental reasons and the opposition against nuclear plants. This preoccupation was taken even more seriously by the government after Fukushima’s nuclear disaster, which was a starter for the current political project of the ‘Energiewende’ and the nuclear phase-out program.

Government and the private sector are also consistent actors in the transition. These two actors, plus the society interact mostly in a beneficial, positive way. Efforts and directions are seen as coherent towards the same purpose, with the government as a mediator between the private sector and the society. It should also be considered that the ‘government – private sector’ is a very strong relation that is mostly connected by the economic context. Despite this is understood as normal since the government regulates economic activities it is also worthy to look at the lobbying from the industry and its role in the energy transition.

The private sector in Germany, represented by industry (not only from renewables but other sources), small and medium size businesses, enjoy in general, development and economic growth. In the specific sector of the renewables, they have benefited in large extent the increase in solar PV and wind deployments. It is already an important source of jobs, technological research and innovation in the country. Furthermore, these companies are at large extent national-based. This benefit is the result of decades of investment and research that not any country pursuing or even achieving an energy transition can obtain. This is a privilege of the countries that started the evolution of renewable technologies and therefore own the patents, the knowledge, the expertise and the market.

6.3.1.2 Regime level context

Within the regime, the generation of electricity and its transmission infrastructure constitute determinant factors. These can be categorized as technical among the contexts defined in this thesis. In the next section is discussed the technical context to exemplify the analysis and description of regime level contexts using the MLP framework and in combination with the information retrieved from interviews by means of MAXQDA.

For a complete analysis of a transition, all contexts should be analyzed in a similar manner and also considering the most important interactions among them. For considerations of the extension of this, only the technical context has been analyzed.

With the large development in renewables demonstrated in the last twenty years in Germany and the integration of citizen projects, the grid expansion and stability has been an important factor to consider.

One example is the promotion of PV self-supply and the possibilities of reducing the electricity payments and the network needs. These are of the most advertised benefits of the renewable energy at home, and with much reason it has been a great source of interest for the German public. Furthermore, they might be important tools to create awareness.

However, this practice implies some technical challenges on the side of the infrastructure. Self-supply PV, especially in cities, implies the utilization of rooftop PV, which is expensive in terms of maintenance and is less efficient. Moreover, seasons and social circumstances still create the need of grid connection.

> "High performance solar [exists in south Germany] and network operators have to build more networks to transport PV electricity, which is not needed in place but elsewhere in Germany or in Europe
>
> P. Stratmann, personal interview, May 17, 2018

> "At Christmas time in Germany, there's no sun, but there's maximum demand. So you need just the same networks connected to the powerplants outside the city."
>
> P. Stratmann, personal interview, May 17, 2018

Furthermore, there are regions where the grid does not have enough capacity to receive the input generated by renewable projects. This affects not only home implementers of the renewables but mainly to commercial installations. This is especially true due to the large expansion generated by FITs, which did not force the projects to be realized in specific areas. That is one of the reasons why auctions have been introduced, since they provide more control to the government to decide where new capacity can be installed, according to the grid characteristics.

> "[sometimes, wind energy]cannot be taken by the grid because it is already in this regions to full-capacity, so you have to shut-down these plants and the same with solar PV"
>
> S. Samadi, personal interview, April 27, 2018

6.3.2 Ecuador

The MLP framework applied to the case of Ecuador is shown in Figure 51. Here, the dynamics of the regime has changed in a large extent in the last ten years and even more in the last three, where the share of renewables represented by large-scale hydro has taken over about 80% of the electricity generation from a previous 58% just in 2015. In this case, the dominating fossil fuels in the regime compete with a mature niche of large-scale hydro.

In the niche, NCRE (to exclude from the list large-scale hydro while keeping small-scale hydro) generate a very weak pressure on the regime upwards. It is only 2% of the electricity generation what is covered by other sources like solar PV, wind, geothermal or biomass. This figure has only changed from 1% to 2% in the last 12 years.

The debate about 'renewables' and 'non-conventional' renewables lays in the fact that so massive constructions of hydropower, despite not burning fossil fuels, might be as dangerous and contaminant for the methane emissions they produce (Deemer et al., 2016; Paucar et al., 2018; Samiotis et al., 2018). Moreover the further environmental concerns about biodiversity and ecological impacts are not very well assessed (Rosenberg et al., 1995; Fearnside, 2006; Schilt, 2007; Abbasi and Abbasi, 2011; Finer and Jenkins, 2012; Mahmud et al., 2018)

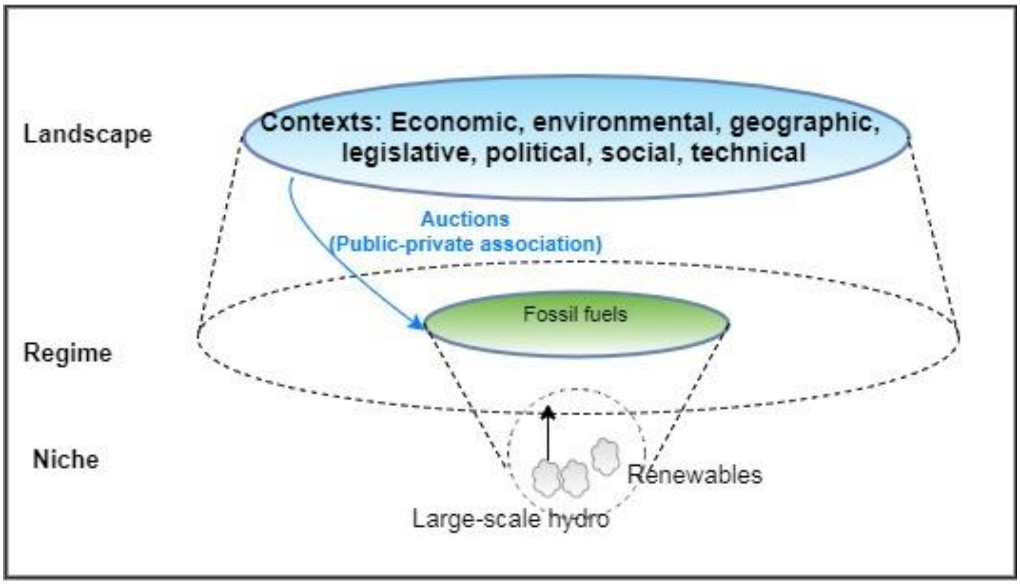


Figure 51: representation of the current status of energy transition in Ecuador

In the landscape, the same components as in Germany are incorporated, however it has to be noted that in the case of Ecuador FITs are not available for new projects since December 2016 and auctions have been legally implemented since 2015 despite the regulation and methodology for bidders' participation were launched only in 2016 and 2017 respectively.

6.3.2.1 Actors

There are only two visible actors in Ecuador's transition and those are: the government as the most important and then the private sector. As it was reported in section 5.2.1.3, it is not visible the society as an actor and the governmental institutions from the implementation, legislation and regulation sectors are the largest players. This clearly depicts the historical political situation in Ecuador that gained force in the last 10 years. The government is the central figure in the politics, the economy and the planning, with a visible negative impact on the societal participation. The government role in the energy sector is reinforced as the Constitution establishes such a sector as strategic for Ecuador's development.

Despite there are regulatory figures that promote the social participation in different aspects of the political life, including the 'Transparency and Social control' function of the government, it is seen that in the practice, citizens are more electricity consumers that are not well incorporated to the energy transition process, also making visible a lack of environmental awareness and interest of participation on their side.

To complement this figure, the private sector plays the mediator or interconnecting role between the government and the society. Nevertheless the participation of the private sector in the energy transition has been clearly reduced in the last ten years, due to the increase of the oil revenues and the much centralized governmental model. Much of the large infrastructure in renewables has been funded by large governmental investments and governmental concessions to international (mostly public) corporations.

Another issue seen regarding the participation of the private sector is its lack of confidence to invest in the country due to the constant changes in regulations, institutional organization and distrust in the political order.

6.3.2.2 Regime level context

In Ecuador, the distribution grid presents other concerns and is seen with a different perspective. As a background, it should be noted that in the years previous to 2007, there were reports of very high losses in the system. According to Ponce-Jara et al. (2018) technical losses were superior to 21% and the non-technical losses were approximately 20% higher. This is an indicator of the challenges that already existed in the network before the implementation of the Plan for the Reduction of Electrical Energy Losses in 2006 and the subsequent years of improvements.

The arrival of more renewable energy projects has been seen as beneficial regarding the grid for two reasons: first, remote places have been beneficed with off-grid systems as the only source of electricity. Second, places that were previously off-grid (with solar PV especially) and were after covered by the grid, enjoy better service and help to stabilize the grid. A good example is what happened with the project EUROSOLAR mentioned previously.

> ...from the technical point of view, the distributed generation can help to feed electricity in the far ends, improing the system's voltage and reducing losses
>
> A. Mena, personal interview,August 7, 2017

> With biomass, sugar mills have a FIT approved for the commercialization of the exedent electricy generated
>
> A. Sarzosa, personal interview, August 8, 2017

Additionally, the possibility of injecting electricity to the grid by citizens is not yet a reality. Only the private sector enjoys the possibility of producing their own electricity based on renewables, mainly for self-supply. This brings taxation exemptions, and in the case of sugar producers, a FIT for biomass generated electricity that is fed to the grid.

6.4 Context in the landscape

6.4.1 Context in Germany

There is a strong and determinant participation from the economic and technical contexts in the energy transition. These two external factors have shown to be particularly in-line with the objectives of renewable energy expansion and therefore providing impulse for their development. Specially, the economic context is seen establishing important links with other contexts, particularly with the legislative, political and technical. This economic importance is seen in the large amounts of financial resources destined for the promotion of renewables, including the EEG surcharge shared among the electricity consumers.

On the other hand is the technical context, which also demonstrates a very important influence in the renewables' expansion. The technical context influence is not only determined by the specifics of renewable technologies but mainly by the technical expertise and scientific knowledge in the design, planning, implementation and control of the policy measures and the decision making. In Germany there are many sources of this technical and scientific contribution, being not only the government and education institutions but many private research institutes, think tanks and lobbying communities.

> "...very strong scientific support by a number of institutions, different scientific bodies, ... but also private consulting looking in detail for the evaluation and impact assessment of different renewable policies"
>
> M. Ragwitz, telephonic interview, July 21, 2018

Despite the environmental context is not seen in section 5.2.2.4 as a main determinant, due to the reason it is not as frequently mentioned in the conversations, it is important to recognize that it is probably as important as the economic or technical contexts. Environmental awareness has played for decades an indisputable role in the energy transition, and still does. This factor is very much blended with the social context and society as an actor, as can be understood also from the Energiewende history.

> "...for the German story this environmental awareness is the reason why we, without any question, easily accept that we spend 10-27 billion a year for renewables support"
>
> P. Stratmann, personal interview, May 17, 2018

> "As I said before in the case of Germany it counts a lot for the energiewende the participation of the people and the energiewende has come from botton-up"
>
> V. Stelzer, telephonic interview, March 20, 2018

Political and legislative contexts are as important as social in Germany, sharing an important role in the definition of the future of the energy transition. Frequent revisions and improvements on the EEG and the stability of the political project and institutions beyond governmental periods and parties in power give a very strong basis for the understanding of the process over the long run and the ability to create and achieve country goals. In Germany, the 'long-term' appraisal of the transition is probably one clue for achieving so important changes.

Germany shows a tremendous growth of renewables in the electricity sector in the last twenty years, with more visible changes in years 2000, 2004 and 2012. These visible changes coincide with the changes in the EEG, which basically include the FIT and more recently the auctions policies. It is unquestionable this growth is the result of policy changes and their positive interaction with the country's context, which supported the policy objective of renewable electricity growth.

> "I think we have been very successful in the past 20 - 25 years, in the advance of renewable energy use in the electricity sector, that has been a susccess that almost no one has envisioned"
>
> S. Samadi, personal interview, April 27, 2018

Germany is a leading country in the energy transition, not only in the EU but also in the world. Probably countries like Finland, Denmark, Sweden, Norway or the Netherlands might present a higher readiness for transition, according to the World Economic Forum (WEF, 2018). Nevertheless, the general status in Germany demonstrates characteristics that foster the energy transition in a coherent, consistent manner: well-established set of institutions, clear and transversal regulatory framework, economic resources, political stability, long-term planning and objectives, high-level social participation and environmental awareness, R&D investment and recognition of the Paris agreement on Climate Change and the consequent set of long-term country goals.

The current issues that Germany is looking at are more related to economics of the renewables and its influence in the liberalized market of electricity, being an important concern the 'merit order effect' that brings down the cost of renewable electricity and takes revenues from the still important fossil fuel sources. Another economic aspect which is carefully considered is the 'EEG surcharge' by which the costs of the financing of renewable energies, especially for the FITs are shared among the electricity consumers

6.4.2 Context in Ecuador

Three are visibly the most important contexts in Ecuador: the political, legislative and economic. In much less extent the social and technical contexts are part of the discussion and environmental and geographic contexts are almost inexistent.

Ecuador presents a deep rooting in a centralized model of politics which is also characterized by a large influence of the economic interest, legitimized by the existence or absence of concrete legal instruments. Existence when there are figures that clearly grant supreme powers to the government, for example the determination of the oil prices, which additionally have a large governmental subsidy (Asamblea Constituyente, 2008)). Inexistent, when there are no clear specifications in the laws and the higher authorities or regulatory bodies have to decide upon specific cases.

> The centralized, statist model does not tend to request advice
>
> J. Espinoza, telephonic interview, August 18, 2017

> Now the government has centralized everything and must be the overseer of every project
>
> S. Reed, personal interview, August 30, 2017

Furthermore, this economic interest, which has historically been present in Ecuadorian politics in the form of corruption scandals of all sorts, also affects the private sector in a relative shorter proportion. These negative strong relations seen between economic-legislative, economic-political and political-legislative contexts accurately represent what is appraised in the development of the energy transition.

From the legislative side, Ecuadorian energy policies in general are contradictive and show a heavily politicized construction, without any real participation of stakeholders, principally the society. This incongruence also affects the credibility of climate targets in the long-term, which largely rest in the growth of large-scale hydro projects and not in the development of NCRE (Jakob, 2017).

To exemplify this incongruence, on one side are strong laws that protect nature and promote renewables in the highest legal instruments in the country: in the National Constitution (Asamblea Constituyente, 2008), the recognition of Nature's right (Art. 71) and commitment towards mitigation of climate change (Art. 440), and also objectives 7 and 10 from the National Plan for Good Living 2013–2017, promoting sustainability and renewable energies (Escribano, 2013).

> A country that constantly changes the rules of the game dispels anyone
>
> J. Espinoza, telephonic interview, August 18, 2017

> An example is the electric law of 1996... [some tax exemptions] benefited the renewables... but the tributary and the customs laws basically derogated the articles of the electric law...
>
> A. Mena, personal interview,August 7, 2017

> New governments with control of the Assembly change the laws... it is more an understanding of the serious consequences of these changes, and pursue what we want
>
> S. Reed, personal interview, August 30, 2017

> Ecuador in the last ten years has maintained stability
>
> A. Sarzosa, personal interview, August 8, 2017

On the other hand, exist very large subsidies to fossil fuels (heavily consumed by the transport sector, which is the largest and most pollutant) and a progressive approach toward the exploitation of natural resources, namely oil in very sensitive areas of the Amazon like the Yasuni National Park and new mining projects in other natural areas.

Furthermore, is frequent to find published legislations that refer to yet non-existing regulations that might be released in the future, which opens the door to manipulation (Jakob, 2017).

In general terms the trajectory of Ecuador towards an energy transition based on NCRE sources is seen as just starting, with a weak long-term perspective.

Despite new projects on wind and geothermal sources are being planned, they constitute the exception and not the rule. There is not a homogeneous contribution of the contexts towards a unified goal. Some of the negative characteristics seen in Ecuador that are considered relevant for the energy transition are: lack of institutional stability, lack of financial sources, mistrust from the private sector on the governmental policies, absence of active social participation and environmental awareness, over focusing on the large-scale hydro as a renewable source of energy, weak regulatory framework, lack of scientific approach to the energy planning, absence of a technological sector, lack of specific long-term objectives for NCRE and credible country objectives according to the Paris agreement on Climate Change.

Some of these problems found in this analysis are also identified in other research. For example, Espinoza and Barragán (2013) discuss the legitimacy of institutions. Here, they argue that the interaction between formal institutions (legal framework) and informal institutions (social, cultural practices) generate 'legitimacy' of a given industry. This legitimacy generates benefits of acceptance and support for the industry. Therefore, in the case of the NCRE in Ecuador, it can be said that they lack of legitimacy.

This is a collection of negative characteristics that make it certainly difficult to generate a window of opportunity for a transition to renewables. Nevertheless, it does exist advance in some fields and that needs to be a focus for further improvement, for example: the drastic change in concluding energy projects that were left behind for years, specifically the latest hydro power plants; the determination of solar, wind, geothermal and biomass country potentials; the generation of information about the electricity sector (which was not available ten years ago) and the creation of a dedicated institute for renewable energy.

Together, these characteristics conflict adding and reducing the ability of the country to achieve an energy transition. That is the reason why more importance should be placed on the context and how the different actors interact in this system that is in essence, dynamic.

7 Conclusions

7.1 The current paths and stages in the energy transition

Germany still depends on fossil fuels as main source for electricity generation. However, the development of the renewable energy sector is remarkable and increases its share in the generation steadily every year. This growth has turned the renewables into a very mature sector, which currently determines in great extent the prices in the spot market for electricity. This resembles an influencing sector that definitely expects a larger participation in the generation in the years to come. Moreover, it counts with large resources for its development. These resources come at large from German tax payers, who are willing to support the 'Energiewende'. In fact, social participation and society's acceptance of the transition is recognized as the most important driver for success. The Energiewende is a society's project managed by the government.

In the transition, Germany depicts a path with diversification of capacity among different sources of renewables and the planned phase-out of nuclear plants. Coal and gas still remain as the principal sources of generation and contribute to security of supply. Policy-making is a critical contributor to the long-term project that set specific long-term goals for each technology. Additionally a strong integration with the R&D sector is considered.

On the other hand, Ecuador has integrated important large-scale hydro electric plants in the last three years. As a consequence, oil has suddenly been displaced to a secondary role in the electricity generation. Therefore, Large-scale hydro has become a top priority in the government's agenda, which has left NCRE with little opportunity for development. In fact, the current participation of NCRE is insignificant with no clear plans for growth. There are no other signals from the government that could be considered as serious intentions of developing the sector. Therefore, an energy transition can only be considered in regards of large-scale hydro, which is very arguably a sustainable source of electricity.

Ecuador's path towards transition is shaped by economic and political interests with little relation to sustainable development goals and environmental protection. This has put aside any interest in a local R&D sector and scientific advice. Decisions are made centrally by the government neglecting society and academic institutions as actors.

7.2 The context suitability for FITs and auctions in Ecuador and Germany

This thesis has verified that the basic requirements of FITs and Auctions represent a major concern in Ecuador. Policy measures in general require long-term commitment from the government to provide the necessary regulatory, financial and institutional guarantees. These are not met and therefore further technical differences (in the design) become secondary for success. However, the design differences at this level are useful to determine transfer opportunities from Germany.

The FITs in Ecuador have not developed visibly the NCRE sector and auctions are too recent for that matter. From these two, FITs are the only renewables-specific policy that the country has adopted. The impact of FITs during its years of availability in the generation has been insufficient to signify a competition of NCRE to fossil fuels. However, this is in great extent a result of the pressure from the context, rather than its specific technical design. The mistrust between the main actors in Ecuador's transition is one example. These actors are high profile politicians and the private sector, neglecting society as a stakeholder. Moreover, the institutional discontinuity, legislative inconsistency and the lack of long-term planning are long-lasting factors determine the context and execute a negative pressure on FITs and auctions to develop.

In the case of Germany, the context presents a much more prepared environment for the FITs and auctions. There is a very close collaboration of technical, economic and political actors whose efforts have set long-term objectives for renewables' development. These objectives have been translated into a consistent regulatory framework with institutional continuity and are related to long-term country objectives on environmental protection

7.3 Transfer opportunities in Ecuador from Germany

The differences from the German implementation of the auction policy depict some improvement opportunities in Ecuador by means of a transfer. Some of these changes can be realized in the mid-term and others in the long-term.

Mid-term changes are: define clear specific goals for each NCRE technology in the long-term, design specific types of auctions for each NCRE and define specific technologies and sizes of projects for citizen participation (with a direct FIT, no auctions).

Long-term changes are based on one large goal: establish an energy transition project with clear long-term objectives closely related to environmental protection objectives. This project must be independent of political parties.

Additionally, to complement this, it should be necessary to: define the institutions and regulations that support such project, integration of society as participant and stake-holder and integrate the scientific community as decision-making advisors.

7.4 Research limitations

Limitations according to time were found in regards to the number of experts interviewed. More interviews would enrich the analysis and the validity of the results. However, the time required for processing and analyzing these, as well as the availability of the experts has reduced to four the number of experts to analyze and define the countries' contexts.

Additionally, large amounts of time are required to process, categorize and analyze transcriptions. This has created a vast amount of information that requires more time to take advantage of its potential. An example is the delimitation of analysis at the regime level to one context and not all of them and their possible interactions.

Furthermore, the nature of this research has required a constant contrast between theory, the data collected and the facts of the countries. This has required a constant process of learning new skills and concepts to adapt the research approach to fulfill the objectives. Therefore it might be possible to find some inconsistencies between the theoretical frameworks and their application.

7.5 Future research

Certainly, this thesis has created the possibility for further research. To establish more reliable results it could be possible to add more interviews and additionally several persons to code the same content. With this practice it could be possible to measure how different the coding among them is. This would reduce the possibilities of biased results due to subjectivity.

Additionally, the different contexts defined at the regime level could be further analyzed individually and between them. This would contribute to a much more complete understanding of the relations between actors, the current state and the possible future scenarios of the energy transition.

From the theoretical framework perspective, it could be possible to explore the analysis from the perspective of a multi regime model. This might open the possibility to better depict the characteristics of the energy sector in both countries. In Germany, the nuclear and the renewable energies could be considered regimes competing with the fossil fuels. The same would occur in Ecuador with the large-scale hydro.

8 Bibliography

Abbasi, T., & Abbasi, S. A. (2011). Small hydro and the environmental implications of its extensive utilization. Renewable and sustainable energy reviews, 15(4), 2134-2143.

Agencia de Regulación y Control de Electricidad. (2015). Estadística Anual y Multianual del Sector Eléctrico Ecuatoriano.

Agora Energiewende. (2013). 12 insights on Germany's Energiewende. Berlin, www. agora-energiewende. de/fileadmin/downloads/publikationen. Agora_12_Insights_on_Germanys_Energiewende_web. Pdf

Agora Energiewende. (2015). Understanding the Energiewende. FAQ on the Ongoing Transition of the German Power System. Berlin: Agora Energiewende.

Antweiler, W. (2017). A two-part feed-in-tariff for intermittent electricity generation. Energy Economics, 65, 458-470.

Appunn, K., Bieler, F., Wettengel, J. (2018). Germany's energy consumption and power mix in charts. Retrieved from https://www.cleanenergywire.org/factsheets/germanys-energy-consumption-and-power-mix-charts#dossier-references

Asamblea Constituyente (2008). Constitución de la República del Ecuador.

Auerbach, C., & Silverstein, L. B. (2003). Qualitative data: An introduction to coding and analysis. NYU press.

Azuela, G. E., Barroso, L., Khanna, A., Wang, X., Wu, Y., & Cunha, G. (2014). Performance of renewable energy auctions: experience in Brazil, China and India.

Barbosa, L., Ferrão, P., Rodrigues, A., & Sardinha, A. (2018). Feed-in tariffs with minimum price guarantees and regulatory uncertainty. Energy Economics, 72, 517-541.

Bayer, B. (2017). Experience with auctions for wind power in Brazil. Renewable and Sustainable Energy Reviews.

Bechberger, M., & Reiche, D. (2004). Renewable energy policy in Germany: pioneering and exemplary regulations. Energy for Sustainable Development, 8(1), 47-57.

Bengtsson, M. (2016). How to plan and perform a qualitative study using content analysis. NursingPlus Open, 2, 8-14.

Berkhout, F., Smith, A., & Stirling, A. (2004). Socio-technological regimes and transition contexts. System innovation and the transition to sustainability: theory, evidence and policy. Edward Elgar, Cheltenham, 44(106), 48-75.

BID. (2017). ECUADOR, Apoyo al Avance del Cambio de la Matriz Energética del Ecuador

Böhringer, C., Cuntz, A., Harhoff, D., & Asane-Otoo, E. (2017). The impact of the German feed-in tariff scheme on innovation: Evidence based on patent filings in renewable energy technologies. Energy Economics, 67, 545-553.

Bouly De Lesdain, S. (2015). Installing rooftop solar panels in private homes: The case of small electricity producers on reunion island (indian ocean) doi:10.1108/S0190-128120150000035002 Retrieved from www.scopus.com

Brücher, W. (2009). Energiegeographie: Wechselwirkungen zwischen Ressourcen, Raum und Politik. Borntraeger.

Buffet, C., Ciliska, D., and Thomas, H. (2011) It worked there. Will it work here? Tool for Assessing Applicability and Transferability of Evidence. Hamilton, ON: National Collaborating Centre for Methods and Tool.

Buffett, C. Ciliska, D. and Thomas, H. (2007) Can I Use This Evidence in my Program Decision? Assessing Applicability and Transferability of Evidence. Hamilton (ON): National Collaborating Centre for Methods and Tools.

Burger, B. (2017). Power generation in Germany–assessment of 2017. Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany.

COMESA. (n.d.) Feed-in Tariffs guidelines

Comité Interinstitucional de Asociaciones Público Privadas. (2017). Guía metodológica para presentación y aprobación de proyectos bajo la modalidad de Asociación Público - Privada. Retrieved from https://www.energia.gob.ec/wp-content/uploads/downloads/2018/07/2.-Gui%CC%81a-Metodologica.pdf

CONELEC. (2013). Plan Maestro de Electrificación 2013 - 2022. Aspectos de sustentabilidad y sostenibilidad social y ambiental. Retrieved from: http://www.regulacionelectrica.gob.ec/wp-content/uploads/downloads/2015/12/Vol4-Aspectos-de-sustentabilidad-y-sostenibilidad-social-y-ambiental.pdf

Corporación para la Investigación Energética - CIE. (2008). Atlas solar del Ecuador con fines de generación eléctrica. Quito, Ecuador: CONELEC

Couture T., Cory K., Kreycik C., Williams E. (2010). A Policymaker's Guide to Feed-in Tariff Policy Design. Chicago, ILL: NREL

Currie S. (2016). Renewable energy in Latin America. 11 December 2017, de Norton Rose Fulbright Website: http://www.nortonrosefulbright.com/knowledge/publications/134775/renewable-energy-in-latin-america-ecuador

Dahal, K., Juhola, S., & Niemelä, J. (2018). The role of renewable energy policies for carbon neutrality in helsinki metropolitan area. Sustainable Cities and Society, 40, 222-232. doi:10.1016/j.scs.2018.04.015

David, M., & Schönborn, S. (2018). Bottom-up energy transition narratives: Linking the global with the local? A comparison of three german renewable co-ops. Sustainability (Switzerland), 10(4) doi:10.3390/su10040924

Deemer, B. R., Harrison, J. A., Li, S., Beaulieu, J. J., DelSontro, T., Barros, N., ... & Vonk, J. A. (2016). Greenhouse gas emissions from reservoir water surfaces: a new global synthesis. BioScience, 66(11), 949-964.

del Río, P. (2017). Designing auctions for renewable electricity support. Best practices from around the world. Energy for Sustainable Development, 41, 1-13.

DiCicco-Bloom, B., & Crabtree, B. F. (2006). The qualitative research interview. Medical education, 40(4), 314-321.

Dolowitz (2003). A policy–maker's guide to policy transfer. The Political Quarterly, 74(1), 101-108.

Dolowitz and Marsh. (1996). Who learns what from whom: a review of the policy transfer literature. Political studies, 44(2), 343-357

Dussauge Laguna, M. I. (2013). Cross-national policy learning and administrative reforms: the making of'management for results' policies in Chile and Mexico (1990-2010) (Doctoral dissertation, The London School of Economic and Political Science (LSE)).

EBRD. (2018). Competitive Selection and Support for Renewable Energy. European Bank for Reconstruction and Development

Enkhardt, S. (2018). Germany reports high realization rate for PV projects selected in auctions. PV Magazine. Retrieved from https://www.pv-magazine.com/2018/01/09/germany-reports-high-realization-rate-for-pv-projects-selected-in-auctions/

Erlingsson, C., & Brysiewicz, P. (2017). A hands-on guide to doing content analysis. African Journal of Emergency Medicine, 7(3), 93-99.

Escribano, G. (2013). Ecuador's energy policy mix: Development versus conservation and nationalism with Chinese loans. Energy Policy, 57, 152-159.

Espinoza, J. L., & Barragán, E. A. (2013). Renewable Energy Policy and Legitimacy: a Developing Country Case. In Universities Power Engineering Conference (UPEC), 2010 45th International (No. 11).

Facchinetti, E., Eid, C., Bollinger, A., & Sulzer, S. (2016). Business model innovation for local energy management: A perspective from swiss utilities. Frontiers in Energy Research, 4(AUG) doi:10.3389/fenrg.2016.00031

Faisal F. (2012) Forecasting and Analysis of the Potential Renewable Resources for Ecuador‘s Power Sector (2012-2032). Cologne, Germany. Institute for Technology and Resources Management in the Tropics and the Subtropics

Fearnside, P. M. (2006). Dams in the Amazon: Belo Monte and Brazil's hydroelectric development of the Xingu River Basin. Environmental management, 38(1), 16.

Feenstra and Bunzeck. (2015). Copy paste policies?! An analysis of the transferability of successful local and national Policies related to alternative fuels. Energy research centre of the Netherlands. http://www.ecn.nl/docs/library/report/2010/m10079.pdf

Fell, H. (2009). Feed-in Tariff for Renewable Energies: An Effective Stimulus Package without New Public Borrowing. member of the German Parliament. Berlin, Germany.

Finer, M., & Jenkins, C. N. (2012). Proliferation of hydroelectric dams in the Andean Amazon and implications for Andes-Amazon connectivity. Plos one, 7(4), e35126.

Fylan, F. (2005). Semi-structured interviewing. In A handbook of research methods for clinical and health psychology (pp. 65-78). New York: Oxford University Press.

Geels, F. W., & Schot, J. (2007). Typology of sociotechnical transition pathways. Research policy, 36(3), 399-417.

Geels, F. W., & Schot, J. (2010). The dynamics of transitions: a socio-technical perspective.

Geels, F. W., (2002). Technological transitions as evolutionary reconfiguration processes: A multi-level perspective and a case-study, Research Policy 31 (8/9): 1257–1274.

Gibbs, G. R. (2008). Analysing qualitative data. Sage.

Graneheim, U. H., Lindgren, B. M., & Lundman, B. (2017). Methodological challenges in qualitative content analysis: A discussion paper. Nurse education today, 56, 29-34.

Grin, J., Rotmans, J., & Schot, J. (2010). Transitions to sustainable development: new directions in the study of long term transformative change. Routledge.

Haas, R., Watson, J., & Eichhammer, W. (2008). Transitions to sustainable energy systems—Introduction to the energy policy special issue.

Harris F. & Navarro P. (1999). Policy Options for Promoting Wind Energy Development in California: A Report to the Governor and State Legislature. Irvine, CA: University of California-Irvine

Hochberg, M., & Poudineh, R. (2018). Renewable Auction Design in Theory and Practice: Lessons from the Experiences of Brazil and Mexico.

Hockenos, Paul. (2015). Milestones of the German Energiewende. Retrieved from https://www.cleanenergywire.org/factsheets/milestones-german-energiewende

Hughes, T. (1987). "The evolution of large technical systems." In W. Bijker, T. Hughes and T. Pinch (eds.) The Social Construction of Technological Systems: new directions in the sociology and history of technology, 51-82. MIT Press, Cambridge, MA.

IEA (2013). Energy policies of IEA countries Germany 2013 review. International Energy Agency and Organisation for Economic Co-operation and Development, Paris.

IEA (2018). Germany: Indicators for 2015. Retrieved from https://www.iea.org/statistics/statisticssearch/report/?year=2015&country=GERMANY&product=Indicators

IRENA (2015a). Renewable Energy Auctions-A Guide to Design. International Renewable Energy Agency and Clean Energy Ministerial. Aufrufbar unter http://www. irena.org/DocumentDownloads/Publications/Renewable_Energy_Auctions_A_Guide_to_Design. Pdf

IRENA, OECD/IEA and REN21. 2018. Renewable Energy Policies in a Time of Transition

IRENA. (2015b). Renewable Energy Policy Brief: Ecuador. Retrieved from: http://www.irena.org/DocumentDownloads/Publications/IRENA_RE_Latin_America_Policies_2015_Country_Ecuador.pdf

Jacobs D. (2010). Introduction to feed-in tariffs. 12 December 2017, de Renewable Energy Focus Website: http://www.renewableenergyfocus.com/view/13313/introduction-to-feed-in-tariffs/

Jacobs, D., Marzolf, N., Paredes, J. R., Rickerson, W., Flynn, H., Becker-Birck, C., & e, M. S.-P. (2013). Analysis of renewable energy incentives in the Latin America and Caribbean region: The feed-in tariff case. Energy Policy (601, 610).

Jakob, M. (2017). Ecuador's climate targets: A credible entry point to a low-carbon economy?. Energy for Sustainable Development, 39, 91-100.

Jamshed, S. (2014). Qualitative research method-interviewing and observation. Journal of basic and clinical pharmacy, 5(4), 87.

Kitzing, L., Islam, M., Soysal, E. R., Held, A., Ragwitz, M., Winkler, J., ... & Klessmann, C. (2016). Recommendations on the role of auctions in a new renewable energy directive.

Kooijman-van Dijk, A. L., & Clancy, J. (2010). Impacts of electricity access to rural enterprises in bolivia, tanzania and vietnam. Energy for Sustainable Development, 14(1), 14-21. doi:10.1016/j.esd.2009.12.004

Kreiss, J., Ehrhart, K. M., & Haufe, M. C. (2017). Appropriate design of auctions for renewable energy support–Prequalifications and penalties. Energy Policy, 101, 512-520.

Legislative Council Secretariat. (2015). Fact Sheet Political System of Germany. Retrieved from http://www.legco.gov.hk/research-publications/english/1415fsc05-political-system-of-germany-20150218-e.pdf

Ley Orgánica de incentivos para asociaciones Público Privadas 2015 (Ecu)

Li, F. G. N., & Pye, S. (2018). Uncertainty, politics, and technology: Expert perceptions on energy transitions in the united kingdom. Energy Research and Social Science, 37, 122-132. doi:10.1016/j.erss.2017.10.003

Longhurst, R. (2003). Semi-structured interviews and focus groups. In Key methods in geography (pp. 143-156). London, Los Angeles, New Delhi, Singapore: SAGE.

Loorbach, D. (2007). From theory to practice of transition management: The case of Sustainable Living and Housing in Flanders.

Magnani, N., & Osti, G. (2016). Does civil society matter? challenges and strategies of grassroots initiatives in italy's energy transition. Energy Research and Social Science, 13, 148-157. doi:10.1016/j.erss.2015.12.012

Mahmud, M. A. P., Huda, N., Farjana, S. H., & Lang, C. (2018, May). Environmental sustainability assessment of hydropower plant in Europe using life cycle assessment. In IOP Conference Series: Materials Science and Engineering (Vol. 351, No. 1, p. 012006). IOP Publishing.

MAXQDA. (n.d.). Similarity Analysis for Documents. Retrieved from https://www.maxqda.com/help-max18/mixed-methods-functions/similarity-analysis-for-documents

Maycock, P. D., Bradford, T., Letendre, S., & Flynn, H. (2006). World photovoltaic market assessment: 2006 PV energy analysis, trends, & risk factors. Williamsburg, VA and Cambridge, MA: PV Energy Systems, Inc. and Prometheus Institute for Sustainable Development

McDonald, K., Bosshard, P., & Brewer, N. (2009). Exporting dams: China's hydropower industry goes global. Journal of environmental management, 90, S294-S302.

MEER (2014). PLAN ESTRATÉGICO INSTITUCIONAL 2014-2017. Retrieved from http://www.energia.gob.ec/wp-content/uploads/downloads/2014/09/PLAN-ESTRAT%C3%89GICO-2.pdf

Mendonça, M. (2007). Feed-in Tariffs: Accelerating the Deployment of Renewable Energy. London: EarthScan.

Miles, M. B., Huberman, A. M., & Saldana, J. (2014). Qualitative data analysis: A method sourcebook. CA, US: Sage Publications.

Ministerio coordinador de Sectores Estratégicos. (2016). Agenda Nacional de Energía 2016-2040. Retrieved from: http://biblioteca.olade.org/opac-tmpl/Documentos/cg00362.pdf

Morris, C. (2017). The state of auctions in Germany. Energy Transition: The global Energiewende. Retrieved from https://energytransition.org/2017/10/the-state-of-auctions-in-germany/

Morris, C., & Pehnt, M. (2016). The German Energiewende Book. Heinrich Böll Foundation, Berlin, Germany.

NASA (2018). A blanket around the Earth. Retrieved from https://climate.nasa.gov/causes/

Olson-Hazboun, S. K. (2018). “Why are we being punished and they are being rewarded?” views on renewable energy in fossil fuels-based communities of the U.S. west. Extractive Industries and Society, 5(3), 366-374. doi:10.1016/j.exis.2018.05.001

Pablo-Romero, M. D. P., Sánchez-Braza, A., Salvador-Ponce, J., & Sánchez-Labrador, N. (2017). An overview of feed-in tariffs, premiums and tenders to promote electricity from biogas in the EU-28. Renewable and Sustainable Energy Reviews, 73, 1366-1379.

Paucar, M. A., Amancha, P. I., San Antonio, T. D., Acurio, L. P., Valencia, A. F., & Galarza, C. (2018, May). Methane Emissions from Ecuadorian Hydropower Dams. In IOP Conference Series: Earth and Environmental Science (Vol. 151, No. 1, p. 012002). IOP Publishing.

Peláez Samaniego, M. R., & Espinoza Abad, J. L. (2015). Energías renovables en el Ecuador. Situación actual, tendencias y perspectivas. In U. d. Cuenca (Ed.).

Plan Nacional de Eficiencia Energética 2016-2035. (2017). Quito, Ecuador. Retrieved from: https://www.celec.gob.ec/hidronacion/images/stories/pdf/PLANEE%20version%20espa%C3%B1ol.pdf

Plan Nacional del Buen Vivir 2013-2017, (2013). Retrieved from: https://www.unicef.org/ecuador/Plan_Nacional_Buen_Vivir_2013-2017.pdf

Ponce-Jara, M. A., Castro, M., Pelaez-Samaniego, M. R., Espinoza-Abad, J. L., & Ruiz, E. (2018). Electricity sector in Ecuador: An overview of the 2007–2017 decade. Energy Policy, 113, 513-522.

Reglamento ley de incentivos para asociaciones Público Privadas 2016 (Ecu)

Regulación N° CONELEC 001/13 resolución 014/14, (2014).

Regulación N° CONELEC 001/13, (2013a) (Ecu)

Regulación N° CONELEC 002/13, (2013b) (Ecu).

Regulación N° CONELEC 004/11, (2011) (Ecu).

Rickerson W. &. Grace R. (2007). The Debate over Fixed Price Incentives for Renewable Electricity in Europe and the United States: Fallout and Future Directions. Berkeley, CA: The Heinrich Böll Foundation

Rickerson, W. (2012). Feed-in tariffs as a policy instrument for promoting renewable energies and green economies in developing countries. UNEP.

Rip, A., & Kemp, R. (1998). Technological change. Human choice and climate change, 2(2), 327-399.

Rose (1991). What is lesson-drawing?. Journal of public policy, 11(1), 3-30.

Rosenberg, D. M., Bodaly, R. A., & Usher, P. J. (1995). Environmental and social impacts of large scale hydroelectric development: who is listening?. Global Environmental Change, 5(2), 127-148.

Rotmans, J., & Loorbach, D. (2009). Complexity and transition management. Journal of Industrial Ecology, 13(2), 184-196.

Ruggiero, S., Varho, V., & Rikkonen, P. (2015). Transition to distributed energy generation in finland: Prospects and barriers. Energy Policy, 86, 433-443. doi:10.1016/j.enpol.2015.07.024

Samiotis, G., Pekridis, G., Kaklidis, N., Trikoilidou, E., Taousanidis, N., & Amanatidou, E. (2018). Greenhouse gas emissions from two hydroelectric reservoirs in Mediterranean region. Environmental monitoring and assessment, 190(6), 363.

Schilt, C. R. (2007). Developing fish passage and protection at hydropower dams. Applied Animal Behaviour Science, 104(3-4), 295-325.

Seiwald, M. (2014). The (up)scaling of renewable energy technologies: Experiences from the austrian biomass district heating niche. Moravian Geographical Reports, 22(2), 44-54. doi:10.2478/mgr-2014-0011

Shabdin, N. H., & Padfield, R. (2017). Sustainable energy transition, gender & modernisation in rural sarawak. Chemical Engineering Transactions, 56, 259-264. doi:10.3303/CET1756044

Shum, K. L. (2017). Renewable energy deployment policy: A transition management perspective. Renewable and Sustainable Energy Reviews, 73, 1380-1388.

Silver, C., & Lewins, A. (2014). Using software in qualitative research: A step-by-step guide. Sage

Smith, A., Stirling, A., & Berkhout, F. (2005). The governance of sustainable socio-technical transitions. Research policy, 34(10), 1491-1510

Sovacool, B. K. (2017). Experts, theories, and electric mobility transitions: toward an integrated conceptual framework for the adoption of electric vehicles. Energy research & social science, 27, 78-95.

Steinbacher, K. (2015). Drawing lessons when objectives differ? assessing renewable energy policy transfer from germany to morocco. Politics and Governance, 3(2), 34-50. doi:10.17645/pag.v3i2.192

Stirzaker, M. (2006). Sunshine and silicon: Is Spain ready for a real PV boom? Renewable Energy World, 9(3), 52- 61

Thayer, R. P. (2013). A Policymaker's Guide to Feed-In Tariffs: Encouraging a Responsible Transition to Renewable Electricity in California.

UNFCCC (2015). President Obama: Climate Change Greatest Threat to Future Generations. Retrieved from https://unfccc.int/news/president-obama-climate-change-greatest-threat-to-future-generations

UNFCCC (2017). Yearbook of Global Climate Action 2017. UNFCCC. Bonn, Germany

Unnerstall, T. (2017). The German Energy Transition: Design, Implementation, Cost and Lessons. Springer.

von Wirth, T., Gislason, L., & Seidl, R. (2018). Distributed energy systems on a neighborhood scale: Reviewing drivers of and barriers to social acceptance. Ren

Williams et al. (2014). Evaluating the cross-national transferability of policies: a conceptual framework. Journal of Developmental Entrepreneurship, 19(04).

Winkler, J., Magosch, M., & Ragwitz, M. (2018). Effectiveness and efficiency of auctions for supporting renewable electricity–What can we learn from recent experiences?. Renewable Energy, 119, 473-489.

World Economic Forum (2018). Fostering Effective Energy Transition A Fact-Based Framework to Support Decision-Making. Retrieved from http://www3.weforum.org/docs/WEF_Fostering_Effective_Energy_Transition_report_2018.pdf

Appendix

Questions for renewable energy experts in Ecuador
Semi-structured interviews

Prepared by: Mauricio Barriga as part of the research for Master's thesis on *"Comparative study of renewable energy policies between Ecuador and Germany. Shifting from FITs to Auctions"*

Universities: UASLP, Mexico and TH Köln, Germany

1. What is your trajectory in the field of Renewable energies and public policies?
2. How advanced do you consider is the work on Renewable energies policies in Ecuador?
3. In the case of Ecuador, what is your position regarding the differentiated support to renewable energy generation by means of hydropower generation vs. non conventional energy like wind or photovoltaic? An specific case would be the national plan for good living 2013-2022 and the electrification master plan.
4. Are there any plans in development for increasing participation in non conventional Renewable energies production?
5. Would you consider feed-in tariff still current and a valid regulation to pursue a cross-national transfer of policies, based in the development and continuity of it? If not, which program or policy would you consider?
6. How can financial stability be guaranteed in this type of regulation (feed-in tariff), considering that in the last 10 years it suffered considerable changes in the price and technology benefited?
7. How can continuity and stability be reached for feed-in tariff in the long term in case of continued?
8. If electricity is the sector with most developed renewable energy policies, do you consider this is actually an advantage of disadvantage in case of comparing it to the German case, and why?
9. When trying to evaluate Ecuador's policies, would you consider effectiveness a good indicator of the effects of a specific policy? How do we know that Ecuador's policies are working?
10. How would you measure effectiveness?
11. How could a comparison of Renewable energies policies help or not to identify possible changes to Ecuador's Renewable energies policies to improve the utilization of these technologies?
12. Why do regulations in Ecuador constantly change the specifications of programs?

13. If the constitution and the National Plan of Good Living are the top rulers for public policy in the country, how can they be used or adapted to guarantee more stability in the regulations, plans and programs for renewable energy?
14. Why there are not enough fiscal provisions considered part of the current Electric law (2015) in the specific case of renewable energy policies?
15. Considering 3 major areas of Renewable energies policies: Electricity, energy access and transport, what would you say is the most feasible for applying a cross-national transfer of policies?
16. In the case of transportation and considering that it consumes most of the total energy budget in the country, what aspects would you consider key to evaluate in case of comparing this sector's policies to Germany?
17. What is the main challenge to extend the existing law that mandates 5% of bioethanol blend for all gasoline in Guayaquil to the rest of the country?
18. Which are the actors in Ecuador's transportation sector that could be impacted by changes in the energy sources to be used?
19. How does it impact in the transportation sector the fact that most of it is private and not public, for the case of adopting changes in policies?
20. What other policies for renewable energy utilization in the transportation sector could be implemented in Ecuador? Are they available in other countries that you know?
21. I f according to the current legislation, every foreign funded project has to be coordinated and assessed by a governmental institution, how does this affect private and NGO initiatives that previously could work directly with foreign organizations and attract more international funding, specially for medium and small scale projects?
22. In the case of foreign funded projects like ERGAL or EURO solar that ran several years ago, what was the role of private sector and NGOs in their development.
23. Renewable energy project auctions that have been incorporated to Ecuador as a new policy strategy have gone under a process of comparison and analysis of how they work in neighboring countries like Peru. Has it been used a specific methodology or an academic approach in order to complete this task?
24. What could be the benefits of using an academic approach and a previously used methodology to adopt changes in the current policies taken from other countries' experiences?

Preguntas adicionales para expertos en políticas de energía renovable en Ecuador
E-mail communication

Preparado por: Mauricio Barriga como investigación para la tesis de Maestría en Ciencias Ambientales (UASLP, México y TH Köln, Alemania).

1. Si consideramos a cuatro los actores más importantes dentro la transición a energías renovables: gobierno, sector privado, sociedad, tercer sector (ONGs, cooperación internacional, etc.). ¿En qué orden los ubicaría respecto a su influencia en este proceso? Por favor ordénelos de mayor influencia a menor influencia. El interés es determinar su apreciación sobre qué actores dominan esta transición.
2. ¿Cuál cree usted que debería ser el rol de la sociedad en la transición a energías renovables?
3. ¿Considera usted suficiente la participación de sociedad en nuestro país dentro de la transición a energías renovables? Por favor indique qué se podría mejorar y cómo.
4. ¿Conoce usted legislaciones o programas específicos que empoderen a los ciudadanos individuales, no dentro del sector privado, como participantes dentro de la producción energética renovable? En caso de ser afirmativo, por favor indique cuáles son.
5. ¿Considera usted que la política energética del país, especialmente en el sector de las energías renovables debería implementar la participación ciudadana para su planteamiento? ¿Considera esto viable en nuestro país? Por favor argumente. [Esta pregunta busca colocar al actor "sociedad" dentro de la transición energética, basándonos la gobernanza como lo describe Kooiman (1993), en donde el gobierno mantiene una interacción con los diferentes actores sociales para la formulación de políticas y donde la transición del término "gobierno" a "gobernanza" se puede entender como la consecuencia de una mayor complejidad social (Mayntz, 1993; Jessop, 1997)].

Referencias:

- Jessop, B. (1997). The governance of complexity and the complexity of governance: preliminary remarks on some problems and limits of economic guidance. *Beyond market and hierarchy: interactive governance and social complexity*, 95-128.
- Kooiman, J. (1993). Social-political governance: Introduction. *Modern governance: New government-society interactions*, 1-8.
- Mayntz, R. (1993). Governing failures and the problem of governability: some comments on a theoretical paradigm. *Modern governance: New government-society interactions*, 9-20.

Questions for renewable energy experts in Ecuador
Semi-structured interviews

Prepared by: Mauricio Barriga as part of the research for Master's thesis on *"Comparative study of renewable energy policies between Ecuador and Germany. Shifting from FITs to Auctions"*

Universities: UASLP, Mexico and TH Köln, Germany

1. What is your trajectory in the field of renewable energies and public policies?
2. How advanced do you consider is the work on Renewable energies policies in Germany?
3. What is the main difference between feed-in tariffs and auctions?
4. Which advantages and disadvantages of auctions can you mention between these two?
5. How do auctions impact the constitution of the energy matrix in Germany? fear
6. What economic constraints do you perceive in the application of auctions from the project implementers perspective?
7. Are there any specific Renewable energies technologies or size of projects benefitted/affected by the application of auctions?
8. What are the main drivers to move away from feed-in tariff into auctions?
9. How costly is it to implement auctions instead of fee-in tariff as the preferred policy?
10. If electricity is the sector with most developed renewable energy policies, do you consider this is an advantage or disadvantage in case of comparing this sector between Germany and Ecuador?
11. When trying to evaluate energy policies, would you consider effectiveness a good indicator of the effects of a specific policy? How do we know that policies are working?
12. How would you measure effectiveness?
13. Considering 3 major areas of Renewable energies policies: Electricity, energy access and transport, what would you say is the most feasible for applying a cross-national transfer of policies?
14. If environmental awareness and culture are very strong factors that impulse the energy transition in Germany, do you think that policies can still work and have positive impacts in countries like Ecuador, where environmental awareness is not much developed?
15. Do energy policies need to be implemented by hand of education policies in order to reach the energy transition?

Transcription example

	muchos otros países latinos principalmente en la región donde la hidroelectricidad se impuso por trayectoria, por historia, se podría analizar muchísimas razones, porque la hidroelectricidad ha sido por costos también obviamente, por recurso, hay muchísimas razones por las que la hidroelectricidad se ha impuesto a nivel de región, pero el tema ya el caso específico ecuatoriano se da por una matriz fuertemente inclinada hacia dos fuentes, la una es la hidroelectricidad y la otra es la termoelectricidad. Ahora, el por qué ahora porque eso podríamos analizar por etapas. La primera etapa era totalmente justificable en el sentido de que no había todavía desarrollo de las renovables no convencionales desarrollado a escala comercial, la solar, eólica etc. para nuestro medio, estamos hablando de inicios del siglo XX no cierto? cuando empezó a llegar la hidroelectricidad, pequeñas centrales bueno algunas disputas también eso fue en Loja, o en Guayaquil, pero digamos que por esas fechas digo fue a Guayaquil a Loja, llegó Quito luego a Cuenca se fue atomizando el sector eléctrico con centrales hidroeléctricas pequeñas, eso ya marca una trayectoria tecnológica hacia esta tecnología y luego fue madurando en crecientes escalas también y a partir de los años 60 cuando ya aparece el Inecel y empiezan a aparecer las mega obras hidro eléctricas conectadas al sistema interconectado buena parte de esas inversiones, fruto del bum petrolero no cierto, lo que se hace es reforzar esa tecnología. Ahora, a medida que se iban implementando los proyectos también se iba avanzando en los estudios, entonces digamos que a la hidroelectricidad el estudio al Ecuador la mente de los últimos 50, 60 años es el potencial, entonces habiendo ese antecedente cuando llega el último gobierno que nos gobernó durante 10 años, me estoy refiriendo al gobierno de la denominada revolución ciudadana y lo que hace el gobierno es simplemente afianzar eso, reforzar eso, ver que es lo que se tenía en carpeta para invertir en los proyectos y obviamente la primera opción era explotar el enorme potencial, digo enorme comparado con el tamaño del país el enorme potencial hidroeléctrico que se tiene, que es lo que ya tenía como ampliar, habían proyectos rezagados que ya estaban bastante estudiados, es algo que tiene alguna lógica, una explicación de el por qué con la hidroelectricidad.
	9.27
	Ahora ese es el lado de la trayectoria y bien en los últimos 20, 25 años las otras tecnologías, hablemos de la

3

MAXQDA 2018 8/11/2018

fotovoltaica, eólica que han avanzado muchísimo en el mundo, en el Ecuador no se le toma mucho en cuenta, porque esas son las barreras, primero porque con todo el levantamiento de la información que se hizo con fines energéticos se hizo la hidroelectricidad de recursos grandes y muy poco se había estudiado el recurso de renovables no convencionales. Hablemos de que el atlas solar con fines energéticos recién aparece por el 2008 por iniciativa del Conelec, el atlas eólico para fines energéticos recién aparece en el 2013, entonces tampoco es que había mucho estudiado, independientemente de que las tecnologías hayan estado estaban avanzado, pero ya si quieres mi punto de vista yo creo que en pocas palabras sí se ha hecho la tarea de igualarse si es que se quiere en el desarrollo de proyectos hidroeléctricos importantes desde, Coca Codo Sinclair pasando por Sopladora luego vendrá bueno los 8 mega proyectos que tú los debes tener claros ahí, hay otros proyectos que están en carpeta, hablemos del proyecto Santiago un proyecto enorme de 3000, 3500 megas podría realizarse con inversión extranjera y otra partida igual que Cardenillo entre lo que conozco. Eso por el lado de que sí había que explotar el recurso potencial hidroeléctrico, por costos, por tecnología, por trayectoria por todo, pero ya el lado personal yo creo que si se descuidó un poco la parte de las renovables no convencionales, pese a que se le ha apostado todo a la hidroelectricidad no reduce la vulnerabilidad del sector, porque una buena sequía lo que va a hacer si es que no hay agua por más proyectos hidroeléctricos que tengamos simplemente no vamos a tener los suficientes capacidad de abastecer la demanda y recién, recién yo creo eso sí fue una buena señal haber creado un ministerio de electricidad y energía renovable para que, paulatinamente vayan implementando proyectos renovables no convencionales, pero sin duda no ha sido con la intensión de desapego, sin duda el tema de la hidroelectricidad se ha priorizado, se ha dado muchísima importancia en desmedro quizá un poquito de las otras fuentes, no es que no se haya invertido en Ecuador en otras fuentes, pero sin duda la electricidad y la hidroelectricidad se lleva en gran parte el pastel, no se por cuánto tiempo más se tenga esa visión de que es la hidroelectricidad la que nos puede sacar del hueco, del déficit de energía que tuvimos a finales del 2009 - 2010.

Mauricio:

Se puede prever que hay planes específicos para el

4

desarrollo de las energías renovables no convencionales ahora en el Ecuador o ya podemos presumir que de hecho esto es digamos casi una crisis en la que se tiene que pensar realmente en cómo hacer la diversificación de la matriz energética y darle un poco más de valor a las energías no convencionales, las renovables no convencionales digamos.

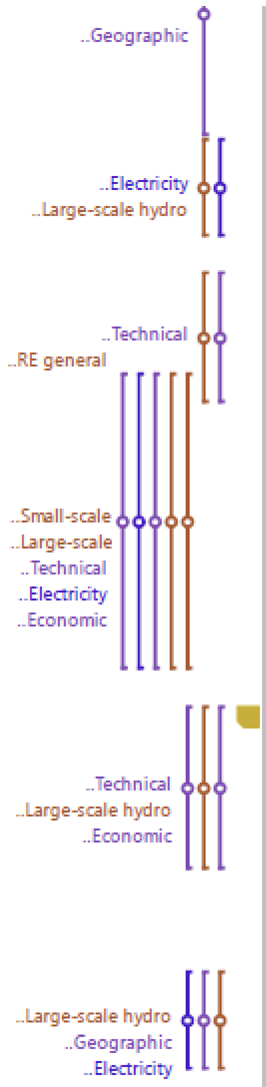
Juan:

A ver si se revisa la normativa en este caso la ley orgánica del servicio público de energía eléctrica se llama la ley aprobada no cierto, ahí se habla de fomentar la ciencia energética, las energías renovables no convencionales no cierto, es una teoría y eso está desde la misma constitución del 2008, la creación del ministerio como decía o sea en el papel en el nombre se está dando importancia a las energías renovables no convencionales, es en la práctica donde todavía falta una señal fuerte no cierto de inversiones en las otras tecnologías, el tema es de que mientras hayan proyectos desde el punto de vista económico sustentables hidroeléctricos es muy difícil que a esas escalas y porque ese es otro tema que hay que analizar, la escala de las hidroeléctricas frente a la escala de las renovables no convencionales, se puede hablar de la gran hidroeléctrica Coco Codo Sinclair de 500 megas y un gran parque fotovoltaico de 50 megas 100 megas eso si ya es grande. Las escales es un problema, los costos también es otro problema, pero si todavía tengo proyectos rentables hidroeléctricos, si tengo toda esa trayectoria de las que hablábamos lo que va hacer el estado seguramente es invertir en las hidroeléctricas porque el riesgo es menor desde el punto de vista tecnológico o al menos la percepción si es fuerte no. Entonces si bien se han dado señales, nosotros tenemos la regulación del Conelec hoy Arconel que venían desde año 2000 quizá me acuerdo siempre con las tarifas estas del feed in no cierto, tarifas preferenciales, despachos preferenciales, o sea siempre hubo ese incentivo para las renovables no convencionales pero la pregunta es y habiendo incentivos que parecían interesantes bueno por qué no se invertían, ahí entran otros factores no cierto riesgo país y todo lo que tú quieras, pero es a raíz de parece que es del 2011 no cierto creo que es la 0004 11 del Conelec que por alguna razón se vuelve atractivo, de un año al otro claro cambian y van cambiando los valores etc. pero en ese año se vuelve atractivo invertir en el Ecuador, habrá que analizar porque esa regulación en particular hizo que detone la inversión en ciertos proyectos

	renovables y no los otros años. En ese año al parecer el valor, la tarifa preferencial, el precio preferencial que se pagaba para la fotovoltaica estaba sobre 40 centavos me parece. Eso hace que detone una inversión tanto nacional como extranjera bueno al menos interés porque la inversión es otra cosa, muy pocos proyectos invirtieron de todos los que se calificaron, pero digamos que esa regulación lo que hace es detonar una fuerte inversión en proyectos fotovoltaicos, será porque ya había el acta no se muchos otras razones, pero se invierte en proyectos fotovoltaicos, la idea era que se llene un cupo de aproximado de 300 megas eso permitía la LOSPE no cierto? se llene un cupo de 300 megas en proyectos con energías no convencionales, con varias energías, la fotovoltaica, la eólica, la solar térmica, térmica, las pequeñas hidroeléctricas y resulta que esos 300 megas prácticamente todo ese valor se llena el cupo solo con fotovoltaicas y muy pocas por ahí de alguna otra tecnología. Entonces al parecer una de las razones de esas regulaciones es que el precio estuvo sumamente generoso no cierto y eso hizo que se deje de lado las otras tecnologías y se invierta solo en la fotovoltaica, pero ya era un avance, sin embargo por muchas otras razones también a través de seguridad jurídica, de seriedad en la inversión, de la tramitología hay un montón de esto, o sea que de esos 300 megas no se llegue ni a la décima parte, ni a 30 megas, se retiran permisos se retiran concesiones, entonces una señal no tan positiva hacia afuera lo que se llama a competir tanto hacia afuera como hacia adentro también no cierto, no es bueno que de 300 megas en la fotovoltaica quede en 30 MW en el mejor de los casos, entonces es eso en resumen no cierto la escala de las tecnologías con energías no renovables todavía no ... estaríamos hablando de otro paradigma, no cierto no caen en el paradigma convencional del sistema interconectado de las grandes centrales y más bien las renovables tienen otra visión, en pequeña escala, a nivel local etc. y eso a la final es una competencia un poquito difícil de hacerla si es que todavía tienes en la política energética nacional esa visión de las hidroeléctricas como gran actor. Repito no está mal, pero no nos reduce la vulnerabilidad en épocas de estiaje.
	Ahora es lo que se viene a futuro, yo creo que va a haber, eso como opinión personal, va a haber una segunda ola si es que se quiere de inversión en las energías renovables, porque se viene todo esto de las reded inteligentes de la generación distribuida, de afirmarse en el tema de protección ambiental y también obviamente ya se están acabando dos buenos proyectos hidroeléctricos que vengan

Coding of transcription example

11.08.2018 Juan Espinoza_EDU



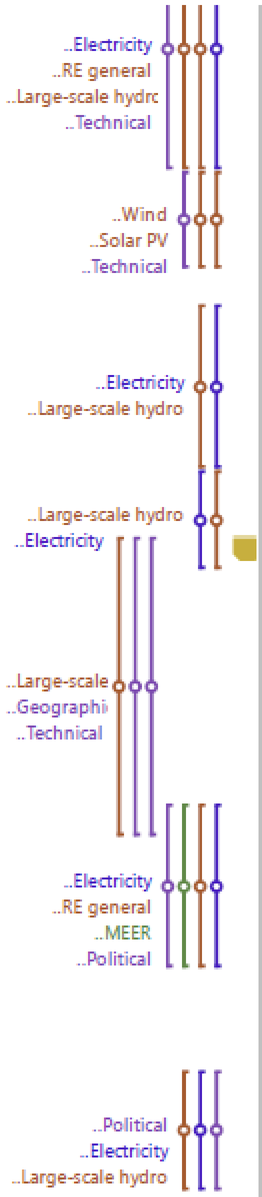
principalmente en la región donde la hidroelectricidad se impuso por trayectoria, por historia, se podría analizar muchísimas razones, porque la hidroelectricidad ha sido por costos también obviamente, por recurso, hay muchísimas razones por las que la hidroelectricidad se ha impuesto a nivel de región, pero el tema ya el caso específico ecuatoriano se da por una matriz fuertemente inclinada hacia dos fuentes, la una es la hidroelectricidad y la otra es la termoelectricidad. Ahora, el por qué ahora porque eso podríamos analizar por etapas. La primera etapa era totalmente justificable en el sentido de que no había todavía desarrollo de las renovables no convencionales desarrollado a escala comercial, la solar, eólica etc. para nuestro medio, estamos hablando de inicios del siglo XX no cierto? cuando empezó a llegar la hidroelectricidad, pequeñas centrales bueno algunas disputas también eso fue en Loja, o en Guayaquil, pero digamos que por esas fechas digo fue a Guayaquil a Loja, llegó Quito luego a Cuenca se fue atomizando el sector eléctrico con centrales hidroeléctricas pequeñas, eso ya marca una trayectoria tecnológica hacia esta tecnología y luego fue madurando en crecientes escalas también y a partir de los años 60 cuando ya aparece el Inecel y empiezan a aparecer las mega obras hidro eléctricas conectadas al sistema interconectado buena parte de esas inversiones, fruto del bum petrolero no cierto, lo que se hace es reforzar esa tecnología. Ahora, a medida que se iban implementando los proyectos también se iba avanzando en los estudios, entonces digamos que a la hidroelectricidad el estudio al Ecuador la mente de los últimos 50, 60 años es el potencial, entonces habiendo ese antecedente cuando llega el último gobierno que nos gobernó durante 10 años, me estoy refiriendo al gobierno de la denominada revolución ciudadana y lo que hace el gobierno es simplemente afianzar eso, reforzar eso, ver que es lo que se tenía en carpeta para invertir en los proyectos y obviamente la primera opción era explotar el enorme potencial, digo enorme comparado con el tamaño del país el enorme potencial hidroeléctrico que se tiene, que es lo que ya tenía como ampliar, habían proyectos rezagados que ya estaban bastante estudiados, es algo que tiene alguna lógica, una explicación de el por qué con la hidroelectricidad.

12 9.27

13 Ahora ese es el lado de la trayectoria y bien en los últimos 20, 25 años las otras tecnologías, hablemos de la fotovoltaica, eólica que han

3/30

11.08.2018 Juan Espinoza_EDU



avanzado muchísimo en el mundo, en el Ecuador no se le toma mucho en cuenta, porque esas son las barreras, primero porque con todo el levantamiento de la información que se hizo con fines energéticos se hizo la hidroelectricidad de recursos grandes y muy poco se había estudiado el recurso de renovables no convencionales. Hablemos de que el atlas solar con fines energéticos recién aparece por el 2008 por iniciativa del Conelec, el atlas eólico para fines energéticos recién aparece en el 2013, entonces tampoco es que había mucho estudiado, independientemente de que las tecnologías hayan estado estaban avanzado, pero ya si quieres mi punto de vista yo creo que en pocas palabras sí se ha hecho la tarea de igualarse si es que se quiere en el desarrollo de proyectos hidroeléctricos importantes desde, Coca Codo Sinclair pasando por Sopladora luego vendrá bueno los 8 mega proyectos que tú los debes tener claros ahí, hay otros proyectos que están en carpeta, hablemos del proyecto Santiago un proyecto enorme de 3000, 3500 megas podría realizarse con inversión extranjera y otra partida igual que Cardenillo entre lo que conozco. Eso por el lado de que sí había que explotar el recurso potencial hidroeléctrico, por costos, por tecnología, por trayectoria por todo, pero ya el lado personal yo creo que si se descuidó un poco la parte de las renovables no convencionales, pese a que se le ha apostado todo a la hidroelectricidad no reduce la vulnerabilidad del sector, porque una buena sequía lo que va a hacer si es que no hay agua por más proyectos hidroeléctricos que tengamos simplemente no vamos a tener los suficientes capacidad de abastecer la demanda y recién, recién yo creo eso sí fue una buena señal haber creado un ministerio de electricidad y energía renovable para que, paulatinamente vayan implementando proyectos renovables no convencionales, pero sin duda no ha sido con la intensión de desapego, sin duda el tema de la hidroelectricidad se ha priorizado, se ha dado muchísima importancia en desmedro quizá un poquito de las otras fuentes, no es que no se haya invertido en Ecuador en otras fuentes, pero sin duda la electricidad y la hidroelectricidad se lleva en gran parte el pastel, no se por cuánto tiempo más se tenga esa visión de que es la hidroelectricidad la que nos puede sacar del hueco, del déficit de energía que tuvimos a finales del 2009 - 2010.

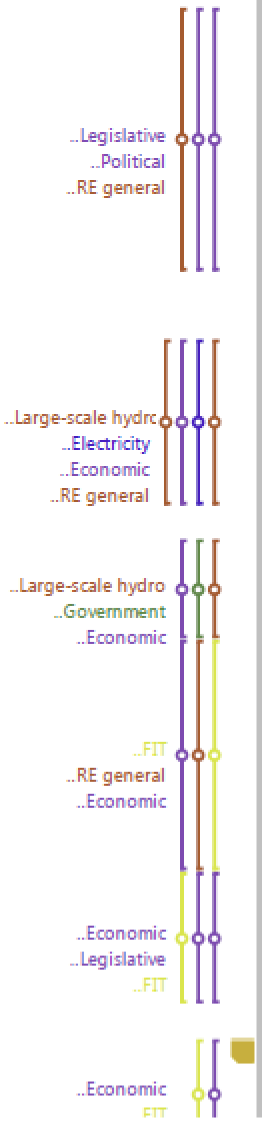
14 Mauricio:

15 Se puede prever que hay planes específicos para el desarrollo de las energías renovables no convencionales ahora en el Ecuador o ya

4/30

podemos presumir que de hecho esto es digamos casi una crisis en la que se tiene que pensar realmente en cómo hacer la diversificación de la matriz energética y darle un poco más de valor a las energías no convencionales, las renovables no convencionales digamos.

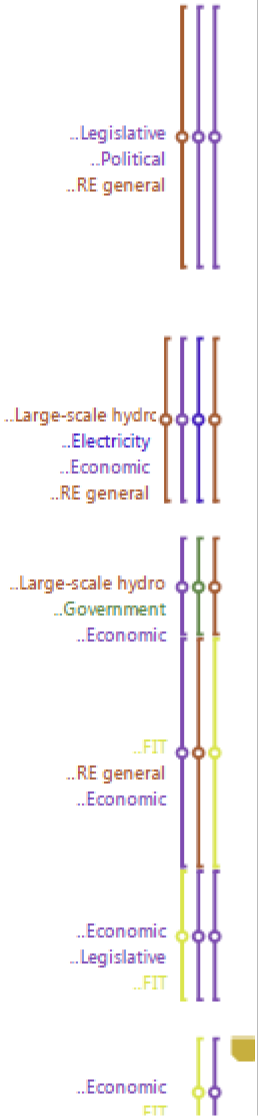
16 Juan:



17 A ver si se revisa la normativa en este caso la ley orgánica del servicio público de energía eléctrica se llama la ley aprobada no cierto, ahí se habla de fomentar la ciencia energética, las energías renovables no convencionales no cierto, es una teoría y eso está desde la misma constitución del 2008, la creación del ministerio como decía o sea en el papel en el nombre se está dando importancia a las energías renovables no convencionales, es en la práctica donde todavía falta una señal fuerte no cierto de inversiones en las otras tecnologías, el tema es de que mientras hayan proyectos desde el punto de vista económico sustentables hidroeléctricos es muy difícil que a esas escalas y porque ese es otro tema que hay que analizar, la escala de las hidroeléctricas frente a la escala de las renovables no convencionales, se puede hablar de la gran hidroeléctrica Coco Codo Sinclair de 500 megas y un gran parque fotovoltaico de 50 megas 100 megas eso si ya es grande. Las escales es un problema, los costos también es otro problema, pero si todavía tengo proyectos rentables hidroeléctricos, si tengo toda esa trayectoria de las que hablábamos lo que va hacer el estado seguramente es invertir en las hidroeléctricas porque el riesgo es menor desde el punto de vista tecnológico o al menos la percepción si es fuerte no. Entonces si bien se han dado señales, nosotros tenemos la regulación del Conelec hoy Arconel que venían desde año 2000 quizá me acuerdo siempre con las tarifas estas del feed in no cierto, tarifas preferenciales, despachos preferenciales, o sea siempre hubo ese incentivo para las renovables no convencionales pero la pregunta es y habiendo incentivos que parecían interesantes bueno por qué no se invertían, ahí entran otros factores no cierto riesgo país y todo lo que tú quieras, pero es a raíz de parece que es del 2011 no cierto creo que es la 0004 11 del Conelec que por alguna razón se vuelve atractivo, de un año al otro claro cambian y van cambiando los valores etc. pero en ese año se vuelve atractivo invertir en el Ecuador, habrá que analizar porque esa regulación en particular hizo que detone la inversión en ciertos proyectos renovables y no los otros años. En ese año al parecer el valor, la tarifa preferencial, el precio preferencial que se pagaba para

podemos presumir que de hecho esto es digamos casi una crisis en la que se tiene que pensar realmente en cómo hacer la diversificación de la matriz energética y darle un poco más de valor a las energías no convencionales, las renovables no convencionales digamos.

16 Juan:



17 A ver si se revisa la normativa en este caso la ley orgánica del servicio público de energía eléctrica se llama la ley aprobada no cierto, ahí se habla de fomentar la ciencia energética, las energías renovables no convencionales no cierto, es una teoría y eso está desde la misma constitución del 2008, la creación del ministerio como decía o sea en el papel en el nombre se está dando importancia a las energías renovables no convencionales, es en la práctica donde todavía falta una señal fuerte no cierto de inversiones en las otras tecnologías, el tema es de que mientras hayan proyectos desde el punto de vista económico sustentables hidroeléctricos es muy difícil que a esas escalas y porque ese es otro tema que hay que analizar, la escala de las hidroeléctricas frente a la escala de las renovables no convencionales, se puede hablar de la gran hidroeléctrica Coco Codo Sinclair de 500 megas y un gran parque fotovoltaico de 50 megas 100 megas eso si ya es grande. Las escales es un problema, los costos también es otro problema, pero si todavía tengo proyectos rentables hidroeléctricos, si tengo toda esa trayectoria de las que hablábamos lo que va hacer el estado seguramente es invertir en las hidroeléctricas porque el riesgo es menor desde el punto de vista tecnológico o al menos la percepción si es fuerte no. Entonces si bien se han dado señales, nosotros tenemos la regulación del Conelec hoy Arconel que venían desde año 2000 quizá me acuerdo siempre con las tarifas estas del feed in no cierto, tarifas preferenciales, despachos preferenciales, o sea siempre hubo ese incentivo para las renovables no convencionales pero la pregunta es y habiendo incentivos que parecían interesantes bueno por qué no se invertían, ahí entran otros factores no cierto riesgo país y todo lo que tú quieras, pero es a raíz de parece que es del 2011 no cierto creo que es la 0004 11 del Conelec que por alguna razón se vuelve atractivo, de un año al otro claro cambian y van cambiando los valores etc. pero en ese año se vuelve atractivo invertir en el Ecuador, habrá que analizar porque esa regulación en particular hizo que detone la inversión en ciertos proyectos renovables y no los otros años. En ese año al parecer el valor, la tarifa preferencial, el precio preferencial que se pagaba para

la fotovoltaica estaba sobre 40 centavos me parece. Eso hace que detone una inversión tanto nacional como extranjera bueno al menos interés porque la inversión es otra cosa, muy pocos proyectos invirtieron de todos los que se calificaron, pero digamos que esa regulación lo que hace es detonar una fuerte inversión en proyectos fotovoltaicos, será porque ya había el acta no se muchos otras razones, pero se invierte en proyectos fotovoltaicos, la idea era que se llene un cupo de aproximado de 300 megas eso permitía la LOSPE no cierto? se llene un cupo de 300 megas en proyectos con energías no convencionales, con varias energías, la fotovoltaica, la eólica, la solar térmica, térmica, las pequeñas hidroeléctricas y resulta que esos 300 megas prácticamente todo ese valor se llena el cupo solo con fotovoltaicas y muy pocas por ahí de alguna otra tecnología. Entonces al parecer una de las razones de esas regulaciones es que el precio estuvo sumamente generoso no cierto y eso hizo que se deje de lado las otras tecnologías y se invierta solo en la fotovoltaica, pero ya era un avance, sin embargo por muchas otras razones también a través de seguridad jurídica, de seriedad en la inversión, de la tramitología hay un montón de esto, o sea que de esos 300 megas no se llegue ni a la décima parte, ni a 30 megas, se retiran permisos se retiran concesiones, entonces una señal no tan positiva hacia afuera lo que se llama a competir tanto hacia afuera como hacia adentro también no cierto, no es bueno que de 300 megas en la fotovoltaica quede en 30 MW en el mejor de los casos, entonces es eso en resumen no cierto la escala de las tecnologías con energías no renovables todavía no ... estaríamos hablando de otro paradigma, no cierto no caen en el paradigma convencional del sistema interconectado de las grandes centrales y más bien las renovables tienen otra visión, en pequeña escala, a nivel local etc. y eso a la final es una competencia un poquito difícil de hacerla si es que todavía tienes en la política energética nacional esa visión de las hidroeléctricas como gran actor. Repito no está mal, pero no nos reduce la vulnerabilidad en épocas de estiaje.

18 Ahora es lo que se viene a futuro, yo creo que va a haber, eso como opinión personal, va a haber una segunda ola si es que se quiere de inversión en las energías renovables, porque se viene todo esto de las reded inteligentes de la generación distribuida, de afirmarse en el tema de protección ambiental y también obviamente ya se están acabando dos buenos proyectos hidroeléctricos que vengan a competir. A mí me