Transition management approach applied in Sintra municipality energy planning context

Pilot Study

3rd Semester Master “Sustainable Energy Planning and Management”

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Sintra municipality, has been define local energy policies to promote renewable energy sources and energy efficiency. In 2016 the municipality became a Covenant of Mayors signatory. In 2017 legislation was adopted which adds power to the local political structure in energy planning process. Municipal energy plans aspire and define as crucial for the implementation of the energy policies the engagement of the stakeholders. This pilot study tries to present a solution for establish stakeholder involved in municipal energy policies making and execution process. Some of the findings of this work show that the "transition management" approach could be appropriate, as a complementary approach to actual municipal energy planning process. The question posed to the municipality is how to implement this measure and appropriately frame it in view of the complex reality where the municipal energy system is embedded.
**Abbreviations**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>AdC</td>
<td>Portuguese Competition Authority</td>
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<tr>
<td>CCDR</td>
<td>Coordination Commission of Regional and Development</td>
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<tr>
<td>CHP</td>
<td>Combined Heat and Power (cogeneration)</td>
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<td>CM</td>
<td>Covenant of Mayors</td>
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<td>DGES</td>
<td>Directorate General for Energy and Geology</td>
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<td>EDP</td>
<td>Energies of Portugal</td>
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<tr>
<td>EDP Comercial</td>
<td>Commercial Energies of Portugal</td>
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<tr>
<td>EDP Distribuição</td>
<td>Distribution Energies of Portugal</td>
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<tr>
<td>ERSE</td>
<td>Electricity Services Entity Regulator</td>
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<td>EU</td>
<td>European Union</td>
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<td>MAOTE</td>
<td>Ministry of Environment, Urban Planning and Energy</td>
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<td>NMP 4</td>
<td>National Plan of Dutch Environment Policy</td>
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<td>RE</td>
<td>Renewable Energy</td>
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<td>RES</td>
<td>Renewable Energy Source</td>
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<td>SEAP</td>
<td>Sustainable Energy Action Plan</td>
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Introduction

The Intensification of climate change has caused damage in recent years costs to Sintra municipality. Sintra is an European municipality, located in the district of Lisbon, being limited to the west by the Atlantic Ocean, it is situated on Portugal. It is predicted that until 2100 the temperatures in Portugal will continue to increase, from 3° to 7°degrees in the summer period and the precipitation should decrease to 40% [1], [2].

The European Union (EU) has a key role in the definition of objectives for the future of all member states. In the energy sector through the “2030 Climate and energy framework”, the EU objectives for the future are present, in general, to reduce greenhouse gases emissions by 2030, to contribute to the reduction of energy prices and to reduce fuel imports [3].

This vision of energy in relation to the future by the EU, guided and influenced the energy strategy defined in Portugal. At the national level was approved, in the Republic Assembly, the national vision for the future of energy defined in the National Strategy for Energy (approved by the resolution of the Council of Ministers N. ° 29/2010 of 15 April 2010), and is based on 5 general axes. The competitiveness, growth and energy and financial independence, promote renewable energies, promote energy efficiency, ensure supply security and ultimately implement measures of economic and environmental sustainability [4].

Recently in 2016, Sintra became CM signature, where the municipality established the goal to reduce 20% of CO2 emissions before 2020. In the last decade, at the national level, there has been a major concern about climate change. Probably in response to the international community’s concern about this issue the municipality of Sintra adhered to these plans, to contribute to the preservation of their heritage, moving forward in recent years towards energy sustainability transition. There is a local political will to promote reduction of CO2 emissions from the local energy system. These political goals have been translated in recent years, with municipality’s commitment to taking part of national and international projects. Now, with CM signature, there is a clear commitment between Sintra and remain signatories, to reduce 20% of greenhouse gases emissions by the year 2020. The CM is already implementing and promoting new ambitious plans to reduce CO2 emissions. More than 800 signatories are already committed to reducing their greenhouse gases emissions by 40% by 2040.

Actual Sintra electricity system

In the following chapter is characterized to generically the consumption of total energy, electricity and consequent CO2 emissions of Sintra municipality. In this municipality the total energy consumption is roughly 3 TWh/year in Sintra, the transport sector represents a very large weight in energy consumption, and representing more than half of the total energy consumed at municipal level. After transport the residential sector, industry and services are those that represent a larger percentage of the total consumption of energy consumed [5], [6].
The consumption of electric energy in the municipality is featured by the high domestic consumption that represents 41% of the total electricity consumption of about 1 TWh/year[6]. The electricity consumption of the industrial sector represented 21% and that of services about 28%. It should also be noted that with regard to the electrical consumptions of municipal buildings and public illumination they represent 6% of the total consumption of electricity, as can be seen in the following figure.

Sintra’s energetic system is also featured because there are no municipal energy production units. Exception to the Almargem wind farm which has an installed power capacity of 20 MWh/year. Despite the proliferation of solar power production units, which were installed on a domestic or business scale, it was not possible to ascertain the current capacity of production installed from this technology. About the emissions of the municipality, these are mainly from transport, this sector is responsible roughly the same amount of CO2 emissions as
all the other sectors of activity in Sintra added. The use of electricity in the transport sector is irrelevant to municipal scale. Still, currently, around 30% of CO2 emissions are the result of electricity consumption. It is possible to identify after the transport sector the weight of the residential and industrial sector in the municipal CO2 emissions matrix.

![Figure 3: Greenhouse gas emissions per sector in Sintra](image)

The energy system of Sintra is possible to characterize, as dependent on fossil fuels. The energy consumed at municipal level is produced outside the municipality, making this fragile in relation to possible increases in the prices of energy sources and pollutant. In addition, part of the concept of energy sustainability is related to energy dependence from renewable energy sources. Renewable energy production is now irrelevant in view of total energy consumption. However, legislation and municipal plans have been encouraging the use of renewable energy sources for residential consumers.

**Sintra energy policies today**

In last year, Sintra municipality has been made an effort to introduce policies and laws that promote the of RES sources and energy efficiency. Political visions for the future has been translated in municipal energy plans and legislation.

Sintra Municipal Urbanization and Building Regulation law, approved in 2017, dictate the rules of the game in relation to the local energy sector, which is embedded in the set of sectors covered by this regulation. This regulation is specific for each portuguese municipality, but Sintra made a review of this legislation in order to put in clear administrative procedures. However, these rules apply only to activities that the local authority has power. These activities are related to territory planning policies, they are urbanistic and focus on new infrastructures construction legislation. It was defined as one of the axes and developed the promotion of environmental sustainability solutions in the field of renewable energy (RE) production. This regulation, which has a top-down approach, establishes as mandatory that all new constructed buildings should introduce renewable energy production units for auto consumption, emphasizing the use of solar-thermal technology. However, in relation to the production of energy through cogeneration plans, the local authority just intends to accept projects to produce energy, using this technology only when producers operate autonomously from local distribution grid. The municipality does not operate transmission stations from the National electricity grid, and therefore municipal electricity distribution is made by a private energy company concession[7].
The Municipal Director's Plan (PDM) is the most relevant local planning tool because it is mandatory for all Portuguese municipalities. Through the PDM is defined the strategic framework for municipal territorial development. This plan consists of:

- Regulation: lays down the rules and parameters for the occupation, use, and transformation of the soil in relation to public and private identities.
- Planning plan: Representation of the municipal space organization
- Conditioner plan: Identifies public utility restrictions that may inhibit or prevent the transformation of soil use.

However, the PDM is in practice in Sintra since 1999, it is considered by the municipality itself as misfit, considering the strategic and policy options currently intended. Thus in 2014, in the sequence of the approval of the proposal No. 548-P/2014 municipality initiated the process of renewal of the PDM. In the "framework of reference of the PDM" is established the view of the municipality up to 2025, where the objectives are the promotion of economic, social and environmental development. The specific objectives for the energy sector are setted in following municipal plans:

- Sintra's Energy Plan (2004), makes an analysis of the history of energy consumption and assesses the potential of endogenous resources. The defined energy strategy for the municipality has other plans aimed at the rational use of energy, to value the endogenous resources of the municipality, to cooperate regionally and to create the energy observatory of Sintra.
- Municipal Environment Plan (2004), defines the view of the municipality in relation to the environment, which was perceived as more sustainable and in greater harmony with the community and national guidelines in relation to the environment and territorial planning.
- Sintra's Strategic Climate Change approach (2009), defines short and medium-term visions that aims at reducing GHG emissions.
- Sintra Strategic Development Plan (2015), identifies the appropriate development vectors for the county. Among others, it defines how essential it is to promote environmental sustainability and to achieve better management of the territory.
- Sustainable Energy Action Plan - Sintra (2016), configures the local energy strategy of the municipality with the objective of streamlining the use of energy and reducing GHG emissions, valuing endogenous energy resources and promoting regional cooperation.

Sintra Municipal Assembly on 5 of July 2016, approved the execution of SEAP. This document is mandatory for all CM signatories. In the first chapters, the SEAP has the purpose to characterize CO2 emissions from energy consumption. In the second part are established the objectives of the municipality and the concrete measures to achieve the goal of reducing emissions by 20%. Despite this, there are other plans in Sintra municipality, that have relevance to energy sector.

The energy sustainability measures proposed in the SEAP were a list of suggestions for methods and technologies, identified by the authors as being appropriate for implementation. Aligned with the CM office recommendation this document should be implemented with a public base-support. It is possible to read in SEAP “The key concept that supports the
maximization of possible implementation of solutions with energy and environmental benefits is based on the mobilization of the public and private initiative around the objectives of improving energy and climate sustainability (...)”. SEAP solutions were drawn up after the possibilities for implementation and energy needs were analyzed [6]. In this document the view of the municipality is clear, encouraging solutions of higher energy efficiency, to build units of energy production of renewable source and to implement an active management system [6]. The actual energy planning process is mainly focused on day to day actions. As announced in SEAP it is essential to create specific municipal structures to deal with SEAP implementation. Related to this, in December 2017 organic municipal structure changed, giving more relevance to departments focused on energy planning. CM is an initiative based on social intervention. This because, in the beginning of the process the aim was for the population to have an effective intervention adopting environmentally conscious behaviors and engaging the transition process. Then, the measures made by the political power in order to reduce CO2 emissions should have the support and participation of the municipality population. Following the guiding principles given by EU covenant of mayor’s reports, it is mandatory to inform and engage public around SEAP. Relevant stakeholders and population are crucial in a transition regarding energy sustainability. Solutions drawn in SEAP include sectors and activities outside municipality influence. These ideas and suggestions from SEAP included considerations and objectives regarding tertiary sector, public transportation, private housing and public habits [6]. From the list of ideas that SEAP purposed to engage stakeholders and population around energy goals, it was just possible to identify the creation promoted by the municipality of a “Plant of entrepreneurs” with the purpose to encourage economic activities focused on sustainability. Due an inquiry made it was possible to get some data related with Sintra citizens perception about municipal energy planning process. The results showed that the biggest part of the population does not know that Sintra is now a CM signatory. Also during municipal internship, it was not possible to identify approaches to achieve stakeholders and public support regarding energy sector. Municipal energy planning process could develop a strategy that would lead to stakeholders engagement and to a better informed population.

**Portugal and municipal energy planning context**

Portugal was the European country, which later saw the industrial sector surpass the sector Agricultural In terms of weight in the Portuguese economy. The industrialization of the country was linked to the evolution of Portuguese energy mix. At the beginning of the 20th century, the main fuel to produce electricity was coal, aided by new investment in large hydroelectric power plants. Only at the end of the 20th century, also driven by a phase of increased growth in the industrial sector in Portugal, the use of oil has gained considerable relevance. In 1973, in the aftermath of the first global oil shock that led to a drastic price increase of this fuel. After 70’s oil shock, is discussed for the first time on a political level, the question of high energy dependence [8]. It is in this decade that starts to be developed politically, on a central scale in the energy sector. After 50 years, the Portuguese energy sector continues to be featured by a high energy dependence (the country imports 75% of the energy it consumes). The Portuguese energy matrix is also highly dominated by the consumption of fossil fuels, in the electric sector, the large hydroelectric and coal are the most potent energy sources installed. However, the trend, since the beginning of the year 2000, has been to consume less energy from fossil sources and increase the use of renewable energies. Energy planning process in public policy definition has been conceptualizing at a central level. Perhaps, public participation has not
been stimulated and most of the projects implemented in the Portuguese landscape, related to renewable energies, have been large parks with high power installed and operated by private companies. However, public measures must be optimized since, so far, this method of planning has proven to be not enough, given the high energy importation and the use of fossil fuels for energy production, which characterizes the energy matrix since the industrial revolution. Portugal today faces a problem resulting from its high dependence on centralized electricity production from large hydroelectric plants. The year 2017 was one of the driest in the history of Portugal, and this was reflected in the amount of water available in the reservoirs for electric energy production. EDP, the main energy producer in Portugal and which holds the production rights of Portuguese large-scale hydroelectric, increased its capacity at 7.8%, but its production in 2017 was 3% lower compared with previous year. The economic and financial crisis that affected Portugal the last ten years did not help. The economic and social impacts, during a time when policies were only focused on economic agenda, were negative. The current low diversification of RES in the Portuguese energy sector can also be a consequence of the lack of investment in innovation and science during this period. The environment and energy policies should be promoted and properly included in the Portuguese economy because they are sectors that add value and are indispensable in the creation of resilience. [8] Also despite national, and even municipal, plans give emphasis to ambitious goals regarding energy sustainability, as already said, energy final user consumption is dominated by a fossil fuels regime. Moreover, in recent municipal plans as SEAP, it was assumed as crucial, to the implementation of that document, the development by municipal structure approaches and strategies to engage population and relevant stakeholders. Once again, even though SEAP considered as crucial the creation of a population base support for optimized results in SEAP implementation, the reality is that is not possible to find a strategy working inside municipality energy planning process to engage stakeholders. After 2010, several Portuguese municipalities (including Sintra) became signatories to the CM. These municipalities have been seen as a concrete energy-planning exercise. In the past, reports and plans were already produced by municipalities aiming to promote the implementation of energy sustainable options, however, these plans were mainly technical. They were focusing on the characterization of the energy matrix and the description of endogenous resources and technological possibilities for municipal territories. Following the CM signing, municipalities updated their energy matrix and traced the measures to promote the reduction of CO2 emissions in local energy system.

Being the history of the Portuguese energy policies characterized by decisions taken in a centralized level, this type of approach has been harming policies integration, and the management between different political levels seem to be insufficient. Regarding local power, it is mainly driven by municipal governments. Local energy policies were established in Sintra by municipal plans. These plans were made mainly by private companies, universities and the already extinguished Sintra municipal agency. The outcome from these reports is a mix of visions and goals to the future, that somehow are related. The specific problem is that the energy planning process seem to be embedded in day to day operation. The focus of the extinguished Sintra municipal energy efficiency and urban planning department were mainly focused on tasks related with municipal public lighting system, and the energy planning process should have a holistic view. Following recommendations from EU CM office and national government, the municipal structure that is responsible for energy planning process, could introduce new and more effective methods to achieve stakeholders’ engagement. There
is now a gap between the objectives defined in the municipal policies and the public participation, that benefits and accelerates the implementation of these objectives [9].

**Transition management approach, Dutch experience**

Transition management literature shows the effectiveness of this approach as a planning tool, that seek to developments due stakeholders engagement. In 2001, In the National Plan of Dutch Environment Policy (NMP 4) was Introduced “Transition Management” as an official policy. This because it was concluded with the previous plans that problems such as climate change would not be resolved by just accentuating energy policies. Thus, it has been understood that to actually promote environmental sustainability is necessary innovation in the system, long-term vision and promote technological, social, economic and institutional transformations [10]. In this new approach to "transition management", the initial focus was to create a multidisciplinary debate that would promote new visions in research and the community sense. The NMP 4 were not defined concrete objectives, but rather created corporate desires that represented concrete changes in the system of the energy regime to promote the transition.

In national plan, it is proposed that in order to properly apply the "transition management" policy it is necessary (i) to take into account the uncertainty, through the use of scenarios, (ii) Dealing with policies Disaggregated, (iii) to devise a long-term vision based on short policy term, (iv) take into account the processes of the international community and find solutions on the right scale, (v) Establish concrete tasks for the Government, to promote The execution of their laws and guide in the intended direction. These axes were translated into the implementation model called "Transition management cycle". Thus, taking into account the behavior of the different Stakeholders in the context of transition, four different governance activities were identified. The strategic sphere (i), related to activities that long-term vision framed in a corporate problem and finding solutions for the future; (ii) Tactical, activities that change in the regime change in force; (iii) operational, daily activities. In this field, the Stakeholders contribute or to perpetuate the dominant regime or change it, (iv) Monitoring and evaluation activities of the situation of the different levels and how they operate regarding each other [11], [12].

"Transition Management" is now defined as a determining process for influencing governance activities in the path of Sustainable goals, helping in “how” to induce, structure and bring actors and their activities up to this new niche if they begin to reproduce itself by proving changes to the dominant activities and practices. Thus, the concept implied in this approach to transition theory is to create a corporate movement, based on new alliances and networks between the Stakeholders Created in the arenas of debate.

**Transition management in practice**

At a regional level, the first experience of “transition theory” using transition management framework, was in Parkstad Limburg, which was an ancient Dutch mining region, consisting of eight municipalities. This region had the ambition to promote cooperation between municipalities given their common goals for the future, but they were struggling to guide the transition. The first phase was producing the system analysis, focusing mainly on existing energy sources, allied with a series of interviews. This analysis of the system was made
considering the perspective of the transition by establishing the difference between exogenous guidelines and endogenous developments, and different transition scenarios have been drawn up [13].

In the next phase, the concept of transition arena is introduced. Basically, arenas are forums, outside the political sphere, to promote the social process of creating a vision in the long-term, with a schedule created by the participants. The selection process of the arena participants in Parkstad Limburg promoted the inclusion of actors with very distinct know-how. The main function of the participants who composed the "Transition Arena" was to identify a joint problem and define an articulated strategy between sectors, based on the necessary measures and guiding principles for achieving the envisaged transition. It was also established that in the discussion of the subthemes, arenas would be created with lower working groups to include specialists, for the work produced to be concrete. In the report that resulted from the work of the transition arenas, the analysis and definition of the problem were made, the sharing of guiding principles, the subtopics took into account and the transition modeled for each of them. Finally, the projects to be carried out in each of the subtopics were established[10]. The general results of this new approach in Parkstad Limburg, indicated that actors included in the indirect or direct process of the "transition arena" induced perception and promoted the debate of the population in line with the transition envisaged. In addition, the conviction of the actors involved was that it was urgent to act and that there were real opportunities to be able to change the region. The negative spirit and the fatalistic mindset seems to have been altered by a more resilient and adaptive vision [11].

A different example of transition management implementation is the so called “roof transition”. Related with new business opportunities promotion and societal innovation contribute from a company point of view. Even that this approach is not a governmental approach, any case certainly could provide relevant insights.

Transition management approach was initiated by a producer of bituminous, which is a product used for roofs. This material traditionally is only use for buildings protection. The CEO of a company called ESHA initiate a new approach to define day to day operation in the company, called roof transition. The strategy was to join a variety of actors, like policy makers, scientist, technology experts to create a new vision for roof uses. The vision drawn from this group, was that the roofs should be seen as an important resource that contribute to local sustainability. The final purpose of this new approach regarding roof use was to transform every rooftop in Netherlands active in CO2 reduction and thus promote RE and efficiency. It was understood to achieve this structural change, it is needed to include a wide variety of actors from roof sector (tactical phase). The ESHA’s CEO launched a platform called Recovery Open Platform (EROP) in 2007, which can be seen as transition arena. This platform intended to be an aggregation a variety of actors that was representative and had influence on rooftop sector, as municipalities boards, education institutions, environmental NGOs, energy companies, urban planners and others. The vision drawn in strategic phase was roughly discussed, and so the efforts were putted on how they, as actors with power and interest in this sector could boost this transition. In this phase were purpose different solutions regarding rooftops uses, that finally led to the implementation of “roof development companies”, that basically scan rooftops available in municipalities that can be used for future uses. These companies add value to municipalities by promotion of roofs capable to be used as water storage, to produce energy and contribute to CO2 diminution. The platform has been developing transition experiments due some projects in different Dutch cities. Agenda set by
rooftop transition reframed not only sector but also national government orientation. This transition was adopted as a national policy because was framed with political debate around climate change and energy sustainability[12].

Looking to Dutch experience, it was possible to conclude that the involve a large number of participants in the arenas encouraged the convergence of actors, stimulated strong dynamics of innovation and awareness of change. In the initial phase of the transition, the Government should promote the innovations that fall into the vision for energy sustainability and discourage those who recreate the current dominant regime. The Dutch experience put in evidence the relevance of using transition management approaches for several reasons: (i) the "transition Management" is considered an evolution of the planning process, (ii) mainly implemented in the initial phase of the transition, (iii) promoting with concrete tools public participation, (iv) as the transitional arenas that fostered the actors involved in the more concrete perception of their contribution to the shared vision and (v) like this the results of the Dutch case revealed that visions created have resulted in the concrete implementation of projects and measurements. Therefore, allied with the work done in the municipal plans in place, local energy planning should focus on promoting public participation to legitimize, in the long-term political interventions made in order to promote environmental sustainability. Transition management approach, framed in the transition theory has been implemented in some countries to modernize the planning process and to produce policies. Promoting conditions for a favorable environment for innovations in short-term and create a long-term vision, linking the ambitions of the different stakeholders. This approach does not aim to define a rigid vision of the intended transition, but rather to create a basket of objectives identified by stakeholders as priority in the societal (sub)systems (e.g. electricity, heating, transportation) [11][13].

Research Question

Summarizing, it is clear municipal political goals regarding future energy sustainability for Sintra. Despite municipal regulation and plans looking for this it was clear the need to develop a method in order to achieve stakeholders engagement for energy transition. Transition management approach, shown useful in other contexts, to set a vision regarding the future, through a social process between actors that seek to develop short-time solutions framed with long term vision. The question that Sintra municipality is facing is how to create in the present the mobilization of the public and private stakeholders around SEAP implementation and energy political goals. Considering this, could be appropriate to find an approach for local energy policy making in Sintra, that allows to establish concrete steps in order to create stakeholder engagement and also to produce energy policies.

How can Sintra improve local energy planning, promoting stakeholder’s engagement and thus achieve energy objectives established by municipality plans, through transition management approach?

To answer to this question, it was drawn the follow sub questions.

● Which stakeholders have power and interest in Sintra electricity system?
● What is the population perception regarding climate change and Covenant of Mayors?
● How could be implemented transition management approach in Sintra?
“Improving” in the research question, is considered by the introduction of new approaches and methods for municipal energy planning. This approach does not intend to replace actual energy planning process, just introduce complementary method, that could represent in the end more appropriate local energy policies.

Methodology

Due the intention of this report, helping in the process of stakeholder’s engagement it was used different methods to be able to present a solution for this report research question.

The data used for this report come mainly from written sources and oral sources. These two approaches were used to achieve most correct data possible. In research early stages, was mainly obtained due my internship in Sintra municipality. In this phase, mainly due observation and interaction with municipal energy planners I started to develop this report problem definition. After this phase, information was acquired regarding current experiences and projects that lead to stakeholders engagement in a possible energy planning context. Being Sintra municipality a CM signatory, was made in this phase mainly due written sources, a research to understand CM purpose, goals and political approach.

Then, was considered relevant obtaining proper data regarding to identify stakeholders and understand if Sintra citizens are informed about CM initiative and general perception about climate-change issue. Firstly, tried to establish contact with different stakeholders, as parishes councils, local RE companies, citizens and political parties. Approach used was mainly informal, and tried different approaches to get in touch with these stakeholders. Regarding political parties my approach was by sending written letters, mainly via e-mail. Regarding local energy companies and parishes councils, the first contact was mainly due informal oral conversations. I had a list of questions specific for each stakeholder that I was making a contact. Regarding citizens approach, was developed a self-made inquiry, using as basis the report presented in 2009 by the European Parliament with the name "Europeans’ attitude towards climate change" [16], to obtain decent data regarding citizens climate-energy perceptions. During December 115 inhabitants of the municipality of Sintra answer., and respondents were contacted in an informal way, both in personal interviews and in the sending of the email inquiry link. The only condition to be admitted in this investigation was to live or to have lived within the limits of the municipality of Sintra, all those who responded negatively to this question were excluded from the analysis of the survey data. The questions made in the inquiry can be seen is follow table.

<table>
<thead>
<tr>
<th>Question</th>
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<tr>
<td>Do you live or lived in Sintra municipality?</td>
<td></td>
</tr>
<tr>
<td>How old are you?</td>
<td></td>
</tr>
<tr>
<td>How much you see as important, contribute to reduce climate change negative impacts?</td>
<td></td>
</tr>
<tr>
<td>Which is your contribution to reduce negative environmental impacts?</td>
<td></td>
</tr>
<tr>
<td>Which is your opinion regarding following sources to produce energy? (Wind, Nuclear, Solar, Coal, Hydric)</td>
<td></td>
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<tr>
<td>Do you know European program called Covenant of Mayors?</td>
<td></td>
</tr>
<tr>
<td>Do you know any program (national or international) that Sintra municipality is signatory related with climate-energy topic?</td>
<td></td>
</tr>
<tr>
<td>Did you observe some climate-energy policy implemented in Sintra municipality?</td>
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</tbody>
</table>
Success or failure of Sintra municipality in climate-energy policies implementation would have influence in your vote?

How much you see as important, Sintra municipality initiate a process to set up a long-term vision seeking stakeholders engagement and citizens support?

Figure 4: Questions in self-made municipal inquiry

An effort was also made to get answers from various age groups, but about 45% of the responses are coming from people between 26 and 39 years. In the EU report used as basis it was obtain 1000 inquiries answers to analyze a universe of roughly 8 000 000 citizens. In the inquiry here presented was considered valid 100 answers to observe a universe of roughly 300 000 citizens. Anyway, it is considered that 100 respondents are a small basis, nevertheless results drawn from this inquiry will be shown later on this report.

Then was the initiation of stakeholders proper identification and characterization. It was not possible to identify in previous plans, a relevant basis to be used in this report. To achieve better perception regarding stakeholder’s identification it is used a power/interest matrix. The power and influence considered in the power/interest matrix is regarding the actual energy system but trying to identify actors that seek stakeholders with shared visions regarding municipality energy goals. This matrix is divided in four quadrants, defining the categories for each stakeholder group.

<table>
<thead>
<tr>
<th>INTEREST</th>
<th>LOW</th>
<th>Meet their needs</th>
<th>Consult and engage on interest areas; Effort to increase interest.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW</td>
<td></td>
<td>Least important</td>
<td>Try to inform via general communication.</td>
</tr>
<tr>
<td>HIGH</td>
<td></td>
<td>Key player</td>
<td>engaged in energy process making policies; Focus on this group; Regularly consultation.</td>
</tr>
<tr>
<td>LOW</td>
<td></td>
<td>Show consideration</td>
<td>Efforts to keep informed these groups; Identify interest areas through engagement activities; Potential supporter.</td>
</tr>
</tbody>
</table>

Figure 5: Power/Interest model matrix

During the identification and characterization of stakeholders, was needed to understand how Portuguese and municipal energy systems interactions. The information provided during my internship was very helpful in systems conceptualization process, and to define which stakeholders operate on a national and municipal context. Also, to finish this task on the national level were consulted online documents, available in organizations as the Ministry of Environment, Territorial Planning, and Energy and ERSE. Regarding municipal stakeholders, it was also consulted written sources provided by Sintra Municipality policies plans. The final power/interest matrix proposed on this report was already made due a local energy transition perspective. Due written material, and also result from the research made in order to find
energy planning abroad examples, was identified as a solution for this report research question the transition management approach, framed in the general energy transition theory. In the next chapter, will be introduce these theories.

**Theoretical Approach**

Transition theory concepts, were used in this report to conceptualize actors’ dynamics of a complex specific context to boost structural change. Using concepts from this theory was essential to find an approach to draw actions for stakeholders’ engagement but also useful to set local energy policies.

**Transition theory**

Concepts like governance have been rising in the last years, showing the development of policies seeking for stakeholders’ engagement [15]. Transition theory reveals helpful understanding the stages and dynamics related to structural changes, also could be related to energy transitions. This theory is an aggregation of concepts and ideas related to the historical research on socio-technical transitions. A transition in the energy system is sociotechnical because energy system has the function of responding population basic needs using different technologies. A possible transition in this system implies changes in various sectors, such as transport, heating, electricity, waste management and so on. These sectors can be characterized as sub-systems from the energy system [16]. The transition theory reveals useful in order to provide relevant understanding about dynamics that lead to a transition.

Using this theory, it is possible to distinguish three levels of actors that operate in different levels:

- **Technological Niche**: Featured by innovation. In the case of an energy transition, this level is linked to the group of people who have environmentally conscious habits and innovate in the use of recent technologies, for example producing energy electricity to supply domestic consumption, using solar panels. This level is also characterized by sustainable communities, that is, groups of people who collaborate to produce innovation in the (sub)system[16][12].

- **Sociotechnical landscape**: Framed at the macro level, where global decisions are made. This is the level of international policy, macroeconomics, the global protocols aimed at tackling climate change among others. The processes that occur at this level are usually outside the influence of the other two levels. However, if this level changes drastically can cause instability and change in the dominant sociotechnical regime [16][12].
- Sociotechnical regime: Featured by resilience regarding structural changes because it is in a stable state. The regime reproduces itself, through the habits of the day to day and socially created perceptions, that obscure innovative visions through regulation and policy planning, the adaptation of social habits and type of entrepreneurship and investments made. However, this level, it has the ability to re-stabilize after a sociotechnological transition, and thus self-reproduce this new dominant regime structure [16][12].

Transition management approach, previously referenced, relates to this problem because using this model the goal is to guide and implement the sociotechnical transition. In the model to guide the path of the sociotechnical transition, four spheres of governance activities are considered:

- Strategic: Characterized by discussions about long-term vision, search for common interests among the stakeholders, set regulations and try to anticipate scenarios. At this stage, the purpose of TM is to integrate visions in the planning processes in the current policies [12].
- Tactical: Regarding the phase where the discussions of the strategic phase materialize, through the institutions and objectives of the network of stakeholders. In the tactical sphere, actors who deal directly with the current sociotechnical regime, usually companies, organizations, representatives politicians and NGO's. A Vision created in the previous stage is represented in four "Transition Paths" (technical, economic, social and governmental), trying to integrate all the governance activities in the (subsystem. This because stakeholders act in different frameworks although all are included in the same system, for example in the political sector, the division regarding public institutions (e.g. public ministries, municipal chambers and parishes departments) is one of the biggest obstacles to implementing long-term policies. The
private sector tends to define its objectives by focusing solely on its position in relation to its direct sphere of governance. In case this happens, the solutions to improve the system will not be optimal[12].

- **Operational:** Elusive to the implementation phase of the conclusions from strategic phase and “transitions paths” from the tactical phase. The dynamics at this level are created by entrepreneurial skill or by individual ambitions. These innovative experiments appear in the technological niche because at this level are out of the influence of the sociotechnical regime. In this context of sociotechnical transition, the concept of innovation takes into account all technological, institutional and behavioral practices that induce or operationalize new cultures, stakeholders or structures[12].

- **Reflexive:** It is a function of evaluating and monitoring the self-transition process, but also the operational effects of the transition tools. This level is indispensable in the governance activities, to prevent the lock-in of new ideas and paths[12].

![Figure 7: Transition management model](image)

Transition management approach intends, to develop measures that helps to guide transition, through the debate of ideas from actors and subsequently the creation of visions. The visions created by transition actors should come into conflict with the visions of current regime actors. Arenas that discuss actual vision, are composed by a mix of actors, from frontrunners to innovative regime actors. Moreover, agenda draw from arenas work create a struggle between “transition agent” and organization/groups own agendas. This discussion will guide de pathways drawn to achieve strategic vision.

**Municipal inhabitants’ inquiry**

The current energy system is changing in several dimensions, which intend to be a transition process from a centralized electrical production system to a new decentralized system [17], [18]. In Sintra for example, any citizen is in his day-to-day life with this transformation of the energy system. The increasingly common use of electric cars or the use of solar panels in buildings represent concrete examples of the change that is occurring in relation to the energy sector now in Sintra. Also, current national and local level policies include count with habits adaptation from population to achieve objective. On the other hand, the energy planning
process has also undergone changes in recent years in order to effectively respond to include and inform citizens about political goals and policies that have direct influence on the municipality inhabitants. In this sense, the inclusion of citizens in the planning process has been highly promoted by the EU. CM signatories make part of a bottom-up political approach, that tries to contribute to the promotion of public participation and stakeholder involvement[19]. Thus, the need to understand the current social perception in relation to the CM and municipal energy policies has resulted in the context of this report as a survey of the population.

At some point of this report development, it was intending to obtain some data regarding Sintra public perception regarding energy goals set by municipality. Results obtained are merely due statistical analyzes from answers obtained. Regarding climate change public awareness, it seems that the population considered as very important this topic.

Figure 8: Inquiry results from question “How much you see as important, contribute to reduce climate change negative impacts?”

Also, general perception regarding energy production is much positive regarding renewable sources. Due a list of options, inquiry results showed respondents opinion and solar and wind power are considered as the most positive, and coal as the most negative. Regarding public perception, but putting the focus on municipality policies. It was curious that more respondents knew about CM program than if the municipality is a CM signatory.

Figure 9: Inquiry results from question “Do you know any program (national or international) that Sintra municipality is signatory related with climate-energy topic?”
This shows a lack of information sharing from municipality to Sintra citizens. Also, when asked if respondents had observed policies implemented related with climate and energy answers showed negative. For the respondents, the success or failure from the implementation of policies that seeks to contribute against global warming, have influence when voting. Lastly, a large part of answers from this inquiry says that it is very important to establish a long-term vision, that seek to energy sustainability promoting stakeholder engagement. It is possible to see more statistic graphs in appendix chapter.

Figure 10: Inquiry results from question “How much you see as important, Sintra municipality initiate a process to set up a long-term vision seeking stakeholders engagement and citizens support?”

Despite possible error margin associated, it was relevant for this research to observe inquiry results. Some conclusions can be drawn, respondents have a general positive image regarding RES and consider as an important for Sintra energy system the collaboration between stakeholders. Also, it seems that municipal energy planning should find more forms to inform local citizens regarding CM initiative.

**Stakeholders identification**

Regarding energy transition processes, more than the citizens can perceive, there are other groups of actors operating in Sintra energy system. In this part of the report the focus is on identifying stakeholders that are affected by energy municipality policies, the groups that could bring expertise or relevant knowledge for SEAP implementation and the actors required for municipal energy policies implementation. The stakeholders taken into consideration were from local authority administration, economic, industry and agriculture sector. In this pilot study are identified some of the groups. Also, these stakeholders are just related to the electric part of the energy system, and it was not taken into account the heat or transportation sector.

Firstly, national scale stakeholders are introduced, which operate on the electricity system Energy and climate policy documents were made in the past in Sintra municipality context, and somehow looking for stakeholders engagement. Some measures were taken, but today there is not a real strategy working on a day to day basis promoting engagement between municipality and energy stakeholders. Identifying some stakeholders that have influence in local energy system, also can be seen as a step for later on in this report establish a transition management approach for Sintra municipality. The municipal political structure that holds operations related to the energy sector is materialized through departments. During the curricular internship I worked in Sintra municipality, in a department in which was included the
service of public lighting and energy efficiency. Meanwhile, this department was extinguished, had been replaced by the nucleus of public illumination, framed in the Department of municipal constructions and intervention of public space. The extinguished public lighting and energy efficiency service was mainly focused on tasks related to municipal public lighting, dealing with everyday problems that result from this service. Also, had been put in practice a lot of projects that are looking to use LED technology in the public illumination park. In December 2017, a new organizational chart of the municipal policy structure and new departments were implemented, with specific departments for energy and environmental sustainability. These new departments intend to respond to the need for local planning in relation to the energy objectives set out in the municipal plans.

Recently the local political structure created the Environmental Strategic Council, that promotes involvement between actors from local and national level, that seek environmental sustainability. However, this identity does not include actors from the energy system, despite the participation of national organizations as Portuguese Environment Agency, Conservation Institute of Nature and Forests and CCDR. From a municipal level were included Sintra municipality representatives from water and waste management service.

The municipality of Sintra is featured by high energy consumption and very low energy production. In fact, the production of electricity in Sintra comes from micro-producers, mainly using solar technology. These producers are mainly for consumption, thus producing the energy that is consumed by the building where the energy production unit is installed. Although in the electric power system of Sintra there are no energy producers at this time with high power installed, that does not make this system less complex. Sintra’s energetic system is built on the legislative and political framework defined on a national and European scale. The electricity sector in Portugal was the subject of a liberalization process that began in 1995 and ended in 2006. Even after the liberalization of the sector was made, the “EDP distribuição” group still had the monopoly of distribution. This change in the market, though, has enabled customers to negotiate directly with traders and opt for a wide variety of sales agents. Traders have now the power to access transmission and distribution networks by paying the regulatory tariffs, and are also free to buy and sell electricity [6].

National stakeholders

Regarding energy system, in particular Sintra municipal electricity system is embedded in national electricity market. Sintra electricity system did not operate autonomously from national grid and so, it is part of a larger national electricity system. This national framework reveals usefulness to identify stakeholders that oversee market regulation, who are responsible for the transmission lines that transport electricity, main producers, which institution is responsible for electricity distribution and which companies have commercial activities selling electricity for last end user consumers. Later on will be identified also some stakeholders but with power just in the municipal context.

The Directorate General for Energy and Geology (DGEG) embedded in the Ministry of Environment, Territorial Planning, and energy (MAOTE) has the function to create and implement policies for energy and geological resources, framed in the principles of sustainability and energy production security, defined in the National energy strategy. This institution provides support for governmental decisions in the event of an energy crisis or an emergency [20]. The Energy Services Regulatory Authority (ERSE) is the regulatory authority that oversees the Portuguese electrical system. This entity has the power to regulate the
infrastructures responsible for the transmission and distribution of electricity. The behaviors of electrical suppliers are also supervised by ERSE. This institution is funded through tariffs applied to consumers of electricity and natural gas through the network operators. The council composing the ERSE is appointed by the government in office [20]. The Portuguese Competition Authority (AdC) cooperates with ERSE in oversight of the wholesale and retail market. This entity has as its mission to ensure the appropriate length of market competition rules in all sectors, including the energy sector[18].

Energies Group of Portugal (EDP) is the only one in the Iberian Peninsula with activities of electricity production and distribution. This company produces, distributes and sells much of the electricity in Portugal, both in the ordinary and special regime. This company is responsible for the production of fence 27GWh in the ordinary regime, and 26% of this energy uses coal as fuel. Under special arrangements, this group produces about 4GWh from renewable sources, with about 90% of this value coming from wind power production units. The categorization of production by energy sources is divided into production under the ordinary regime and special regime. Briefly put, the ordinary scheme provides for energy production using sources of thermal origin or large hydro plants. Special-scheme production covers hydropower technologies and another RES or cogeneration. The strategy defined by this company involve the implementation of more hydro-energy production units in Portugal, and the expansion promotion for the use of renewable energies in the international expansion. In the municipality of Sintra, there are no electric energy production units that are exploited by the EDP group. However, this group is a Stakeholder With a lot of power in the Portuguese energy sector. They are the largest producers of wind and Hydroelectric power in Portugal [20], [21].

The National Electric Network (REN) has power, by an exclusive concession agreement, authorized by the Portuguese Government, that allow this institution to operate energy transport sector. REN’s goal is to connect the energy producers to the consumption in the territory. The balance between demand and energy supply is reached through the existing delivery points in the National Transport Network (RNT) operationalized by REN [21]. Energies of Portugal Distribution (EDP distribuição) is part of the EDP group, and is the Portuguese distribution network operator, through a concession contract to operationalize the National Distribution Network (RND) of middle and high electric voltage. It is this company that makes the distribution of electricity to Sintra. There are several commercial energy companies, in Portuguese territory, as EDP Comercial, Endesa and Iberdrola. EDP Comercial in 2016 had about 85% of the number of customers in free-market conditions. Endesa and Iberdrola have each one 5% of the market share. EDP Comercial is the main marketer for domestic customers in Portugal, but in relation to large consumers, market shares are more balanced. When verified market shares of traders, in relation to total electricity consumption, the commercial EDP has about 40% of the market share, Endesa has 20% and the Iberdrola About 15%. There is no specific data for the municipality of Sintra in relation to the quotas of traders, it is assumed that these three companies are the companies with the largest number of customers in the municipality. [7]
There are stakeholders, with a different power regarding energy sector. In a national context it is possible to identify some NGO’s that promote, mainly through discourse, RES and energy efficiency implementation. There was in the past some examples of NGO’s public manifests that contributed to raise awareness from population regarding energy sector. Due to this was identified **Quercus**, which is a non-governmental organization (NGO) that look to have intervention in environment national discussion. Quercus’s intervention in the environmental area is guided by the interest of the group of citizens who make up this organization for the conservation of nature and natural resources, and its main objective is to preserve and promote the environmental quality of the territories. Quercus operation in the environmental area is done through scientific work produced by the working groups of this NGO and by the collaborative projects. Despite the intervention of Quercus, operating on a national scale, there are eighteen regional cores distributed throughout the national territory that intend to inform and intervene on its territorial scale. This organization is identified due to the lack of NGO’s in Sintra focused on environment and energy issues. However, in recent years some other NGO’s have gained relevance by defending measures and policies that promote energy transition, such as Sustainable Terrestrial System Association -ZERO.

**Municipal stakeholders**

The local companies in the RE sector of Sintra, are linked to the trade and installation of RES production units, mostly to projects related to micro-energy production units. Nowadays these companies have working teams with high academic skills from the planning stage to the implementation of the projects. In recent years in the county, the local RE sector has been established some small companies by dozens spread throughout the municipality. These companies are great drivers for the implementation of RES production units due to its technical skills, these companies have a technical knowledge that are not possible to identify in another group of stakeholders. In addition, these companies are routinely developing tools that analyze the cost and economic viability of possible projects, even more these actors have experience of dealing on a day-to-day basis with the current Sintra energy regime. Despite the few, there are micro-sustainable communities, mainly dedicated to the food sector. However, some of these communities today implement small-scale innovations in the energy sector. It was possible to identify micro experiments in relation to innovative water storage techniques, installation of thermal solar panels and use of biomass for water heating. These communities can be particularly relevant because they can be framed at the niche level. Their day-to-day operations try to go against the current regime imposed by the electric system of Sintra. Also, these communities have been promoting meeting and workshops that help to inform Sintra citizens about the need to change energy consumption and production habits.
The **Agricultural and industrial sector of the municipality**, although they are only energy consumers, their economic activity has as a result high energy consumption. If the municipality attract some of these actors, it could be a way of informing and aggregating farmers and industries around the municipal energy objectives. In particular in the agricultural sector, it is relevant highlight "Sintra Agricultural Cooperative" which is an institution of support and preservation of agricultural activity in the municipality. This institution has about 18 000 associates. The network of contacts that this institution has is very relevant and can therefore be an ally to implement in this sector more sustainable energy measures. In the business sector, "Sintra Business Association", dedicated to the commercial, industrial and service sector. This association intends to support local businesses in order to promote technical, economic and social progress inside municipality. This platform aims to be a platform, where the business sector of Sintra resorts in the search for know-how that within its companies cannot find. Both the "Sintra Agricultural Cooperative" and the "Sintra Business Association" are organizations that promote somehow actors’ engagement. The inclusion of these groups of actors in the municipal energy transition management, could be useful given their ability in the management of networks of actors and for representing the agricultural and business sector of the municipality.

It is considered that to achieve energy transition it is fundamental to engage citizens. The traditional role given by national and local energy policies gave to Sintra inhabitants a mere role in energy consumption. Recent municipal plans have been highlighting the need to engage local citizens around energy transition. In recent years, this paradigm has been changing and the concept of “prosumers” have been raise. Basically, these prosumers are both consumers and producers, owning RES production unites. Citizens role can also be related with approaches that seek to include citizens participations in energy planning process. Also, there is now innovative forms that are ways for citizens to actively participate in project implementation of energy production units. As an example, promoted by energy sustainable communities and citizens groups have been develop financial schemes like crowdfunding. In other countries the role from citizens represented a significant part in RES production.
The table presented put in different power/interest groups preview stakeholders identified. It was intending to demonstrate the power of municipality regarding local energy transition. Recently approved new structural organization for local municipality. These new departments highlighted the need to have energy and climate issues represented by local departments, that have municipal technicians developing and implemented plans. The national stakeholders, that operate in Portuguese energy system, have power regarding their sphere of action. Even that some of these stakeholders have power their activities is related with current regime structure. It is predictable that sustainable energy visions represent a conflict regarding these institutions objectives for the future. There is still a wide range of stakeholders from municipal context that can be seen as fundamental to engage around energy transition. Local stakeholders gain a particular relevance, because local energy planning policies in Sintra take in consideration a change in wide variety of sectors that should be driven by local stakeholders.

It is concluded by power/interest matrix that municipal structure has the most power regarding local energy transition. Due local legislation and policies, municipal political structure make use of his power. Also, Sintra municipality is the most interest stakeholder regarding energy transition. In last decades municipality planning plans have been raising awareness regarding climate change. It was also concluded, that stakeholders from local context have more interest than power regarding energy transition. This because local electricity system is embedded in national electricity market. The power identified in this national energy market come from national stakeholders, with specific tasks to make this market working, from overseeing activities to electricity commercial companies. Also, despite national and municipal goals that seek to increase RES production units, the regime is dominated by multinational companies. Main strategy proposed by producers on national territory was driven by large scale hydroelectric plants. Energy paradigm is shifting, power given to local power regarding energy planning is now more than ever. Programs as CM, side by side with local actors that have sustainable visions can work together to emerge innovative experiments from niche to regime level. EU climate-energy, which can be identified as in landscape level also in recent years have been put pressure in the dominant fossil fuels dependent energy regime.

**Transition management Sintra approach**

After identifying some of the stakeholders in Sintra’s electrical system, to promote the involvement of these stakeholders around the objectives defined in municipal energy policies, the transition management approach to Sintra is made. The management of transition processes is not predictable. The Portuguese policies and institutions influenced the process of Portuguese and Municipal Energy planning, which is characterized by the conceptualization of
the short-term vision, with policies limited to specific sectors and without promoting in a concrete way the inclusion of perceptions and objectives of the electrical system actors. The idea is not, the local political power imposes its visions, but rather inspire and be part of the process of exchanging ideas with other actors, encouraging the creation of networks and attracting as many actors as possible to this large municipal discussion table [14]. Possible implementation of transition management in municipal energy planning approach, provide to the municipal local authority a tool that helps to create the support base needed by local actors, needed to optimize the implementation of SEAP, and perhaps open the possibility to create a long-term vision regarding municipality energy sector. This approach is also useful to establish a vision for Sintra, framed with the SEAP and that it is legitimacy by the local stakeholders. The "transition management" approach should be considered as a complementary policy, framed in the energy sector that can be a useful tool in the local energetic planning process of Sintra [12]. This strategy puts the focus on long-term insights, tries to anticipate scenarios and is sensitive to the new experiments developed by local actors. The change promoted in this approach is progressive, trying to minimize social resistance by promoting through "transition arenas", which are basically groups of stakeholders working together. Despite the suggestions and paths drawn up by the SEAP and other plans by the local authority, there is no long-term vision created (50 years). "Transition Management" seeks to encourage long-term screening at an early stage and then focus on promoting the discussion of ideas among local actors about possible innovations that might contribute to achieving that vision [10].

**Strategic transition arena**

After the identification of possible participants in the transition arena, it is necessary to create a concrete discussion space where innovation experiments can emerge in relation to the current system. To optimize this discussion, it is recommendable to attract innovative actors of the current regime and frontrunners that operate outside the municipality and local actors from niche level. Summarizing bringing to the discussion the frontrunners that operate or have influence in the current sociotechnical regime. In this process where the actors operate at the different levels, it is recommended to consider the groups of actors that promote visions of municipal sustainability or the actors who have a vision for energy sustainability. Invite all these actors to participate, could be a good practice to realize the availability and interest to participate in the transition arena. Finally, a group of 10-15 people should be selected to cooperate in the strategic transition arena. The actors of the strategic transition arena must involve their actors’ networks and invite other actors to form future tactical arenas. The identification and selection of the municipal actors is a very important step in the development of transition management approach. The group of people who compose the transition arena must highlight the diversity of visions and problems related to Sintra energy system future. Generally, this arena is composed of actors in the political sector, economic, education and NGOs. Include actors who represent in some way the current electrical system regime, it can be positive to ensure greater legitimacy in this process of transition. The transition arena is not a consulting group or an administrative platform, it pretends to be the network of the corporate system that promotes sustainability and innovation. The management means at this stage of the transition above all to guarantee the adequate space and conditions to attach frontrunners and relevant stakeholders around this process [11][12], [22].
In Sintra municipality, there are few actors from different sectors with discourse and ambition promoting environmental sustainability. Today there is a local RE economic sector with a lot of knowledge and experience in integrating sustainable solutions into the current Sintra energy system, mainly micro-scale RES production units for individual consumers and local companies. Small and medium-sized companies from rRE sector in Sintra can bring legitimacy and technical knowledge indispensable in the future formulation of the transition agenda. These actors operate on a day-to-day basis with the current dominant regime. Possible NGOs actors attached knowledge and visions predictable different when comparing with other groups. Also, today national NGO’s have development significant research work in RE sector to inform national population. However, there are several municipal associations, non-related with energy sustainability areas, but could be investigated in order to identify interest areas. Also, for better enrollment with local citizens should be considered local groups representatives and local associations. Regarding the education sector, there are no universities in Sintra municipality, despite in the past some Portuguese universities developed some municipal plans for the municipality (as the “Sintra Strategic Development Plan”), should be promote the engagement from this sector. However, some professional schools operate in the municipality that have been open over in past years courses that include RE issues. It was quite difficult to identify in the municipality a, actors who operate at the niche level. These groups in Sintra are identified as small ecological communities, which gain the form of “eco-villages”. These projects are quite relevant and important for approaches such as transition management, but in fact there are few examples. The recently created “plan of entrepreneurs” aim to promote projects that are related with energy sustainability, and so can in the future be useful to identify more niche stakeholders The main objective of transition management regarding these communities is to involve them in this process, so that their activities are more dedicated to new experiments and projects in energy sector.

In the end, the participants' matrix should be a mixture of actors with innovative ideas, communication skills and ability to create networks of actors. Participants must possess a set of skills, such as the ability to think the abstract and ability to communicate the visions created in the abstract. The ability to accept and aggregate different opinions is also important, as well as conceptualize ideas and visions in the long run (50 years). Intellectually the actors should have the ability to question the level which operates and move away from the influence of everyday speech. At this stage of the transition arena, the goal is to identify a common problem formulation and create a shared vision with an established direction. The process during this phase must be focused mainly on social learning, that is, to understand concretely what values and objectives that binds and departs the actors from the transition. The main objective is for the actors to obtain the most concrete perception of their contribution and the possible partnerships with other actors in order to overcome the uncertainty and complexity of fundamental changes in Sintra energy system. When a group of frontrunners works in partnership with a specific direction in mind, aiming to identify together the definition of the problem through an intense process of social interaction [12]. Using this highly focused approach to learning through social interaction, the perceptions of the problem can be structures and more easily understood. The visions created can be considered as a management tool. The process of creating vision is as important as the final definition of vision. The involvement of the stakeholders, allied with the course defined by the visions created tries to create the concrete space where the activities of the transition materialize. Based on the ideas of energy sustainability, the activities of the transition can be defined by "transition paths", designed through the "transition agenda".
Tactical transition arena

The networks of actors created in the "transition arena" materialize the visions created through the "transition pathways". These transition "paths" are the routes defined in the different sectors of the regime to overcome the obstacles created and to achieve vision goals. The motivations and interests of the different actors involved in this phase of the transition, gain relevance in the debate. Only actors who have power in the organizations they represent and who are willing to participate in the long-term should be involved in this phase. The capacity intended by the actors at this stage is that they translate the "transition agenda" measures into their organizations. The conflict between actor network and organization own agenda regarding the "transitional agenda", will promote the debate to re-evaluate the direction established in the strategic phase and if necessary create a new strategic transition arena with current actors and new ones. These transitional arenas, create a dynamic for reflection on the results of the measures possibly implemented, at this stage it is possible to return to reorganize transition arenas with strategic strand to redefine the visions more framed with the problems that Sintra stakeholders identified in tactical phase[12], [13]. At this stage, the long-term objectives are assisted with the "transition pathways" which are basically the axes of intervention through local energy sector, which direct the transition by setting goals in the short term. It must be clear and transparent what specific objectives each stakeholder group is responsible for executing. These “transition pathways” considering the complexity where Sintra energy system is embedded, can be drawn in a general asset as technological, social, governmental and economic. In the municipal SEAP, there is today a list of intervention scenarios combining RES implementation solutions with improvements in energy efficiency, some suggestions made in SEAP could act as a basis for brainstorming for the transition paths definition. It is foreseeable, as in the SEAP, that these proposed transition paths are mostly technological aspects. However, it could be reasonable to define comprehensive intervention axes that identify the diversity of sectors that the energy transition is built into.

Operational transition arena

This phase is formed by actors who are committed to the concrete implementation of niche-level projects. These projects are developed through the vision of sustainability for the municipality and framed by the "transition paths". The projects of the operational phase may be new experiments with high associated risk, trying to be innovative or can be experiments that already happen in the context of the current system, but which is framed in the preestablished vision. When a project proves to be successful, it can be repeated to promote this niche level experiment to the regime level. These projects may have associated costs and therefore the economic viability must be monitored. The goal of this phase is to create a list of innovative projects and experiments that strengthen each other and that can be scalable from the niche level to the regime[13].

In the municipal context, measures have been implemented that promote for the first at local level, the relation between energy consumption and possible environmental negative externalities. The use of thermal solar technology in new residential buildings has been proliferating. This technology was introduced via top-down approaches, but could be seen as a
policies with benefits for local energy sustainable vision. The municipal energy planning process was until now focused on the integration of LED technology in the municipal public lighting park. This happen, because municipal energy planners identified this technology as appropriate due municipal plans, and with proved benefits regarding the economic cost-benefit analysis made for municipal public lighting projects. This can be related as technological experiment, promote by municipality to achieve energy sustainability. The idea with tactical transition pathway, is to identify due proper analysis other experiments that could be replied in the actual system. Also, local RE companies could be a relevant participant in this stage of transition, in fact today energy policies require support given by the economic sector responsible to provide technical know-how.
Figure 13: Transition management approach model applied in Sintra context
Tactical pathways

The strategic vision must be guided through the "transition paths" that exist to guide the energy transition. These tactical pathways can be seen as activities and projects proposed in Sintra energy transition. There are some concrete challenges in relation to this transition, which have distinct natures. The aspect of this work is focused on the development of solutions to ensure a base of support by actors and population for municipal energy future. Political ambition of Sintra municipality, towards energy transition must be translated into a concrete contribution to the objectives of energy sustainability established at national and European level. The municipality, with the recent signature in the CM, committed to involving the citizens around the energy transition. The local authority must develop new strategies, which allow the sharing of information effectively to the inhabitants in order to instigate the need for change in each citizen. The municipal SEAP establishes a set of measures that are necessary to develop both by the local authority, but also by the tertiary sector, transport and individual consumers. Thus, integrating the municipal actors in the process of executing the SEAP, seems to be an appropriate approach to guarantee legitimacy and support from the community around the SEAP. The bottom-up approach, conceived in the European program – CM, aims to create a base support from local population to achieve municipal SEAP implementation. Thus, the development of strategies that allow to identify and involve stakeholders gain relevance in the context of municipal energy planning. In addition, it is necessary to find new ways to inform and sensitize the population around the objectives of energy sustainability for the Council. The approach of "transition management" formerly framed with the context of the municipality of Sintra, helps in the initial process of involvement of stakeholders. To implement this approach, it is necessary to identify which groups of actors that make up the municipal energy system and what their power and interest in relation to the energy transition. This approach also reveals a useful methodology for creating a strategy on how to aggregate the actors around the discussion about the energy future. In addition, with the development of the transition arena, the participating actors have created the dynamics of knowledge sharing, which in theory will take this energy ideas debate out of the transition arenas and encourage the population's awareness about the need to change. The "transition Arena" tactics have the objective of "dismembering" with specific work themes. The goal is to create work networks that promote knowledge sharing. This community learning process has an intrinsic social aspect. It is thus possible to consider the "transition arenas" as niches in the process of making municipal energy policies. In transition arenas, the focus is mainly driven to define future pathways to achieve energy transition. A transition in energy sector means a structural change in many aspects of societal reality. Thus, could be appropriate do divide transition arenas by sector. The purpose to do this, is to achieve a broadly range of “transition pathways” that take in consideration reality complexity. As a recommendation these arenas could be divided by social, economic, governmental and technological pathways. Social arenas could be represented by citizens, local sustainable communities. Activities drawn by this arena should be related in forms to engage and inform Sintra population about transition developments. Also, in the social pathway but in a different arena, could be engaged agriculture and industry sector, in order to bring to the discussion these big consumers in local energy system. These sectors, if mobilized around the commitment to be more active, in the energy system, could represent a significant input for energy efficiency and RES production from local companies' buildings. In technological arenas, stakeholders from local RE companies and manufacturers could, framed with strategic vision.
the development of research to inform other arenas about technological innovation. Regarding this topic, also local sustainable communities and frontrunners should be supported in order to promote experiments from these stakeholders. “Plant of entrepreneurs” already mentioned is the first municipal effort to the establishment inside municipality of local sustainable communities. This existent platform could be used as a basis to identify relevant projects for energy transition process. The governmental pathway could be driven by local municipality, but also from other administrative authority in municipal level, as parishes councils. In this arena municipality could discuss with parishes councils possible future developments from these identities. Focus from this arena is mainly to establish a political framework, at a local level that promote energy sustainability. So far, this work was exclusively made by municipality, but could be a good practice to bring to municipal discussion parishes councils visions, problems and solutions. In a different pathway, could be set an economic pathway. Mainly driven by consultants could be developed to extend local economic impacts driven by energy transition process. The municipality set up as priority the development of economic activities that are competitive. If municipality attract RE manufacturing sectors, this could reduce RE production unit’s components, labor and transportation. Sustainable energy transition, could increase job creation and as consequence economic boost in other activities. For example, if define as a strategy the use of biomass, agriculture sector could see this as an opportunity to get some revenues. It is important to clarify that Sintra municipality should be represented in each transition management step. Wide range of Sintra municipality departments provide for this process a proper support from municipal technicians in order to inspire and guide remain stakeholders.

Conclusions

The views, both at Europe an, national and local level regarding the energy sector, promote the idea around a fundamental change in energy system. At the local level and framed with other political levels, local authority plans have been developed to promote municipal energy sustainability. It was already concluded by all these governmental actors, that an energy transition demands more than technological improvements. The relevance of a public basis support has been raising in Sintra municipality, mainly due CM initiative. Sintra municipality need to introduce concrete approaches to achieve stakeholders engagement and citizens support. Transition management approach reveals as an appropriate method to guide an stakeholders engagement process, and to be used as a model to define energy transition stages. This report objective, it was to define “how” to establish a transition management approach in Sintra municipality. The goal never was to set a vision, but instead promote an environment to develop innovative long-term energy visions.

Being this said, transition management approach seems to me suitable to Sintra municipality context. After a complete stakeholder identification, municipality should invite all actors as possible to engage a general discussion about energy transition, and then define participants for strategic arena.

Due recent municipal structure adaptation, in order to incorporate departments with specific tasks related with energy and sustainability, this could be seen as an opportunity, with human resources available to create an approach, as transition management, to create the
momentum need by local stakeholders and citizens for a real change towards energy sustainability.

**Bibliography**


Appendix

Inquiry statistical information

Q2: How old are you?
Q4: Which is your opinion regarding following sources to produce energy? (graph sources order: wind, nuclear, solar, coal, hydropower and biogas)

Q5: Do you know European program called Covenant of Mayors?

Q7: Did you observe any climate-energy policy implemented in Sintra municipality? (1 None– 5 A lot)
Q8: Success or failure of Sintra municipality in climate-energy policies implementation would have influence in your vote?