Project no. 314277

STEEP PROJECT

Systems Thinking for Comprehensive City Efficient Energy Planning

Seventh Framework Programme

Theme Energy

D2.3 Guidelines for prioritising interventions

Due date of deliverable: 31/08/2014

Actual submission date: 28/08/2014

Start date of project: 01/10/2013 Duration: 24 months

Organisation name of lead contractor for this deliverable: Bristol City Council

Status (*Draft/Proposal/Accepted/Submitted*): Submitted

Revision [1]

Project co-funded by the European Commission within the 7th Framework Programme		
Dissemination Level		
PU	Public	x
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Index of contents

1. PURPOSE OF DELIVERABLE

The purpose of this document is to provide a set of guidelines and principles that can be applied in any city for prioritising interventions regarding energy efficiency. The document will set out a step-by-step guide which can be used by local municipalities to identify areas for prioritising action, based upon the methodology that has been developed in the first year of the STEEP project.

These guidelines will explain how the 'Systems thinking' aspect of the STEEP methodology and process modelling workshops, can be combined with strategic analysis tools such as PESTEL and SPeAR to gain an understanding of which 'interventions' should be prioritised.

The guide will include examples taken from the modelling workshop sessions in each of the three cities participating in STEEP (San Sebastián, Florence and Bristol) and will offer practical examples of what interventions have been prioritised as a result.

This document must be considered in context alongside previous deliverables D2.1, D2.2 and D3.2, which define the modelling process in detail, as well as how to engage with stakeholders in order to deliver successful problem-structuring sessions.

A flowchart reflecting the guide has been added as an annex, as has a 'Frequently Asked Questions' document which has been designed to answer some of the potential questions that other cities and individuals may have regarding this process of prioritisation. The strategic analysis tools: PESTEL spreadsheet and SPeAR have also been included.

2. STEP-BY-STEP GUIDE FOR PRIORITISATION OF INTERVENTIONS

This section will provide a linear process/approach which can be adopted by any city looking to identify areas to prioritise action regarding energy efficiency measures. It is important to note at this stage that the STEEP 'systems thinking' methodology adopts an 'holistic' approach to solving difficult or complex problems, (in this instance – achieving a city's carbon reduction targets) and therefore will identify the various non-technical interventions that should be taken as well as which technologies may be adopted. The STEEP methodology explicitly tries to explore the potential organisational and behavioural interventions that could/should be made in addition to new or innovative technological solutions.

It should also be considered that the problem structuring aspects of the following guide form part of an *iterative* process, subject to continual review based on feedback regarding the performance of the system as a whole. This will be further explored in Deliverable 2.4 'Guidelines for monitoring interventions'.

In-line with Deliverable 2.1 'Energy Master Plan Process Model', the guidelines articulate the 'intervening' aspects of the following process flow chart:

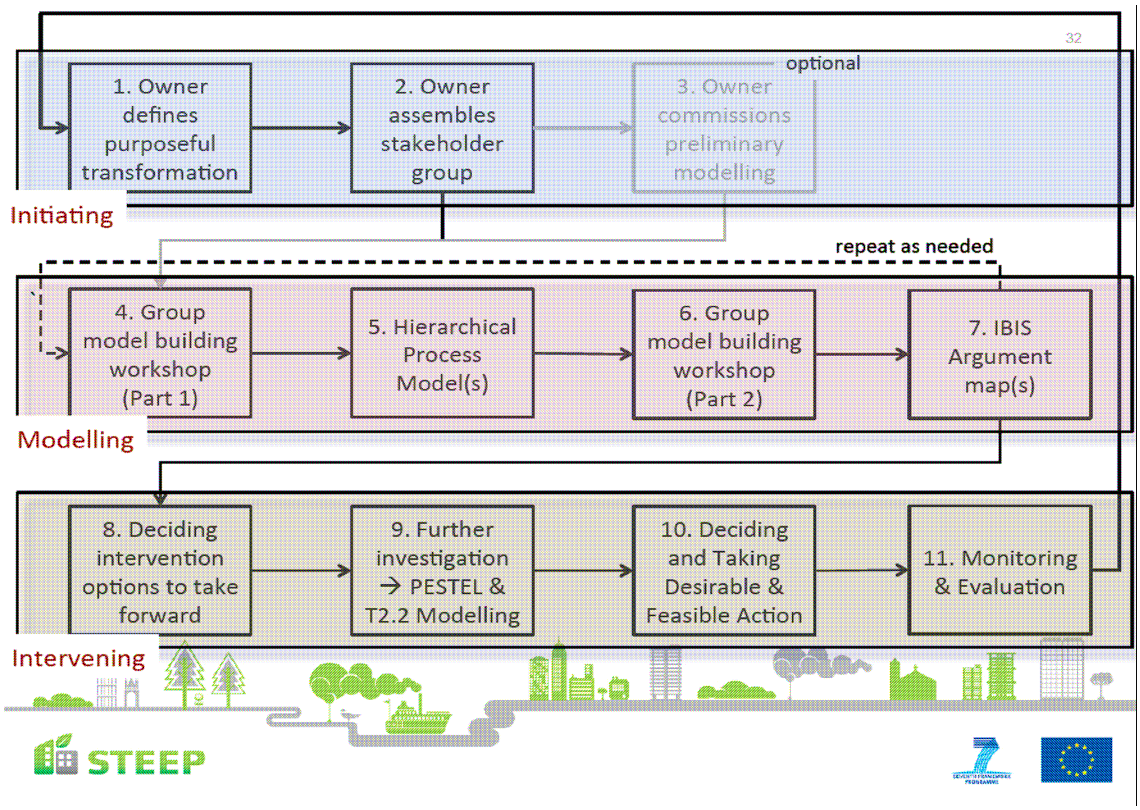


Figure 1: Modelling process flowchart – University of Bristol

In order to articulate this clearly however, a brief review of the 'modelling' aspects is also necessary. The first step in the prioritisation process therefore to conduct effective modelling sessions.

2.1 Step 1: Effective stakeholder workshops and production of detailed process models

According to the STEEP project methodology the first step in prioritising interventions, is the successful completion of stakeholder workshops in-line with the approach described in D2.1. Identification of appropriate stakeholders and the approach taken by Bristol, San Sebastian and Florence in this regard is explained in D3.2.

Once the stakeholder groups have been organised, consensus regarding a high-level objective for the modelling has to be achieved. This is essential in the process for prioritising interventions, as it allows a specific focus on what can plausibly achieved and who will own this process. According to the problem structuring methodology, this objective should be represented by a transformational statement structured using 'CATWOE', a technique that forms part of Soft Systems Methodology where C = Customers, A =Actors, T =Transformation Process, W = World View, O = Owner, E = Environmental constraints. Articulating the final objective in this way lends the modelling a specific focus rather than simply becoming a general conversation.

For example, the transformational 'CATWOE' statement outlined in the first workshop in Bristol was;

> "A system for the Smart City Group (A) at Bristol City Council (O) to achieve an operationally low-carbon TQEZ (T) for the Bristol community at large (C) by promoting a set of practices around open data and GIS modelling (W) and which is seen as essential activity to meet commitments to 2050 emission targets (E)"

The transformation statement is used as a top-level process description for the hierarchical process modelling which will be followed in the next steps of the methodology. As above, it is important to mention that the transformation statement is dynamic, in that it can be modified at different stages of the process if it is considered necessary.

Once the objective has been agreed, the next step will be the development of the conceptual model of the district or area of focus. This model will be developed by the different stakeholders in the model building workshops. It is recommended to have more than one workshop considering the limited time available in each one but this will depend upon the problem being considered and there is no minimum or maximum number of workshops (WS) that is recommended.

The methodology that must then be followed in the workshops is the 'Hierarchical Process Modelling' that has been described in detail in D2.1. This methodology allows the development of the model starting from the top level process, and breaking this down into a number of sub-processes by identifying what action needs to be taken to achieve each of these.

Although optional, we advise defining and presenting a preliminary model to stakeholders in the initial workshop for them to analyse and modify. This will serve as a starting point for discussion. For example:

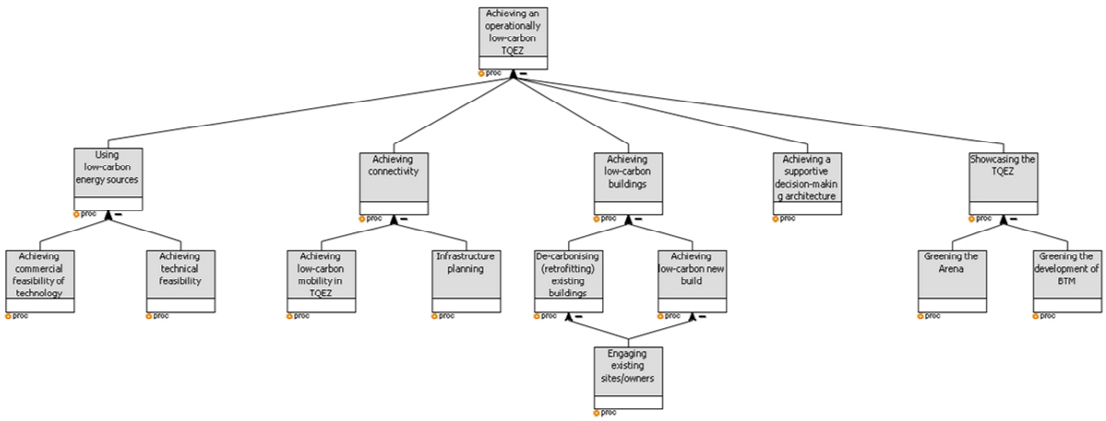


Figure 2. Preliminary model used as point of departure for the initial workshop in Bristol

The purpose of each workshop is therefore to deconstruct and refine each of the processes needed to achieve the ultimate objective, which can then be analysed in terms of how well they are currently performing. This also the point at which the connections between different processes are defined using the notions of '*sufficiency' and 'necessity'*, I.E is a sub-process sufficient for the overall process to be successful, or is necessary. **If a process is identified as not necessary then these processes can be**

excluded or de-prioritised as areas for further action. An example of a sub-process which has been broken into constitutive sub-processes is as follows:

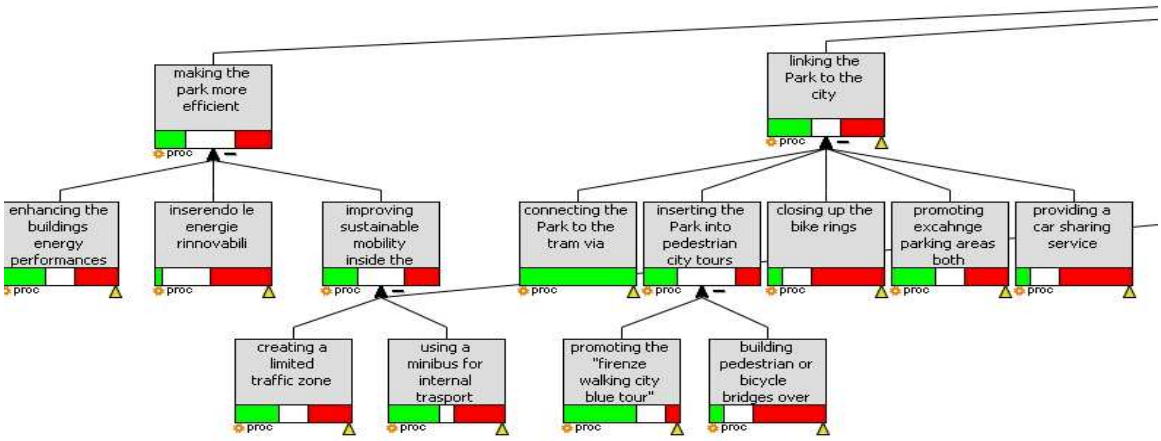


Figure 3. sub-process of "Achieving a Smart Cascine Park" as part of the outcome model of the first workshop in Florence

The blocks of colour beneath each sub-process here represent an initial judgement regarding how successful each process is currently performing. More detail is contained in D2.1, but essentially, green indicates that a process is performing well; red indicates poor performance and white indicates that there is a lack of evidence either way:

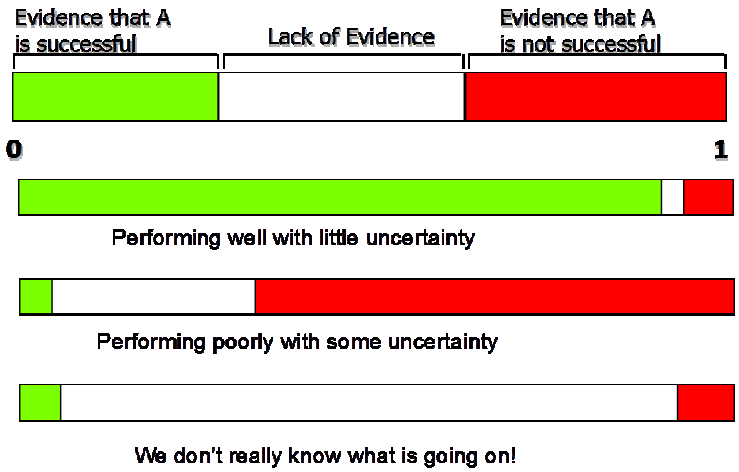


Figure 4. Explanation of 'Italian Flag notation' process performance – University of Bristol

When rating the performance of the various sub-processes, stakeholders can utilise quantitative as well as qualitative measures. **This initial assessment forms the first phase of prioritisation of interventions as it highlights where there is poor existing performance and therefore where further attention should be focussed.** This is important as it indicates where best to focus efforts and where not to waste time on activity that is already performing well.

In terms of modelling however, this is not the end of the process. By identifying a process which is underperforming, the workshop group should then consider the issues that are contributing to this poor performance, the options for solving these and the arguments for and against each option. It is helpful to use a template such as the following *Process Improvement Chart* developed by the University of Bristol:

Which process needs to be improved?					
Ensuring wide engagement with stakeholders					
What are the issues that are obstacles to process improvement?					
1. Lack of understanding who the stakeholders are/will be (area in development) 2. Lack of human resources to engage (identify, communicate with, liaise with, consult, and leverage resources) with stakeholders 3. Lack of creativity in identifying new ways to engage stakeholders					
Identify options to overcome the obstacle(s) to process improvement					
Option 1		Option 2		Option 3	
...relates to obstacle number: _3__		...relates to obstacle number: _3__		...relates to obstacle number: _1__	
Trial an online/web-based collaboration platform		Organise drop-in session with information displays accessible to people from different knowledge backgrounds		Project partners to identify existing stakeholders (existing businesses, developers, land owners, etc.) and ask them to identify further stakeholders (snowball effect) to reveal networks	
Identify the pros and cons for/against implementing each option					
Pros	Cons	Pros	Cons	Pros	Cons
- Can include a wide variety of stakeholders – geographical distances is no longer a problem - People can contribute when they have time available in their schedules /asynchronous debate contributions possible - Cheap once operational - Easy sharing of information/updates without delay	-doesn't exist yet/time&resources required to select/develop and appropriate system - does not reach community stakeholders without internet access/use of the internet	-Could reach community members that are hard to reach via other means - Can create face-to-face communication/grow local networks	- Expensive/time consuming to organise (date, venue, communication/advertisement), - Difficult to collect data and feedback for the project through this informal way of engagement - May engage interested and affected individuals, but may not be the most effective means of engaging businesses/commercial organisations	Will help to raise awareness of the STEEP project amongst existing organisations in BTQEZ	May identify existing networks rather than create new coalitions/identify those outside networks who would need to be engaged May be time consuming and we have already held a number of workshop with selected stakeholders

Figure 5. Example of the template used to gather issues, options and arguments as part of the Process Improvement Chart.

Once the process of identifying arguments for/against specific options is complete, there will be a resulting list of possible interventions that can be taken onto the next stage: sense-checking.

The development of successful hierarchical models which clearly describe the processes involved in achieving the high-level goal is therefore the *primary* method for prioritising interventions.

A question that can arise in relation to the Process Improvement Chart however, is how to determine which level to stop modelling the sub-processes themselves and to start to define the issues, options and arguments for the process.

It is important to recognise that there is no correct answer to this, as the moment to start to analyse issues can vary depending on the sub-models that are listed. In some cases common sense will determine which processes are specific enough to start with the next stage.

There is therefore an inherent risk at the end of the Model Building Workshops, that there will be a different level of definition for each sub-model and therefore the relevance of the identified interventions. We recommend therefore that only 'actionable' options and interventions should be taken forward to a strategic analysis. Generic options such as 'future proofing' in the model above are unsuitable as they do not (yet) contain enough detail for exploration of possible options.

An example of a relevant intervention which could be considered as appropriate for strategic analysis for district-level energy planning is *'installation of a smart-grid network'*. This is a suitable process for exploration of issues and options as it could consider (amongst other things) the number of electric charging points that are going to be implemented in the area, promotion of Electric Vehicle usage, decentralized renewable and low-carbon generation, photovoltaic solar panels, micro-cogeneration technologies etc. etc. In each instance, these options are 'actionable' and suited to further exploration once the issues and arguments have been exhausted.

Before moving on to the next step of prioritisation, it is important to highlight that one difficulty identified in conducting this process in Bristol, was securing the necessary stakeholders attend the session and contribute in the optimum way based upon their expertise. For example, a worker in the field of energy, that is used to design/simulate buildings in detail and to define strategies for the improvement of their energy performance, is a specialized professional that can be very helpful for defining part of the model focused on low carbon buildings. But this kind of stakeholder may feel more comfortable working in detail at this level and may not have expertise across all areas or hold a deep understanding of the interactions between top level processes.

That is why it is important to involve a variety of different technical experts and professionals with a mixture of expertise and experience. In mitigation, we recommend that the modelling sessions are broken down by technical area, with a number of modelling sessions held with sub-groups who specialise in each of the process areas. If this is not feasible, we recommend that the main group is subdivided after the initial modelling process, with individuals with specialisms in relevant areas developing the sub-processes further. This will ensure that during the exploration of issues, options and arguments, the most appropriate individuals will be concentrating on the relevant aspects of the model.

2.2 Step 2: Sense-checking "actionable" processes

Although the modelling process is the main vehicle for prioritising interventions, it must be considered that the outputs from this process will be the products of -only- the individuals who took part within the workshop discussions. At this stage of the methodology therefore, the 'actionable' options should be subject to a 'sense-checking' process whereby they are considered by the 'owners' of the transformational statement and other experts external to the workshop process itself. This sense-checking will provide a list of options that are both feasible and desirable in the particular context of the city involved. This is intended to be a first phase of a quality assurance process that helps refine the list of potential interventions.

We can assume that as a result of the modelling stage, all the identified interventions will contribute to the reduction of the operational carbon footprint of the district but there are qualitative as well as quantitative ways in which this could be measured.

In the case of the **interventions with an indirect impact** on emission reduction, the decision making will have a distinctly subjective component. Decisions to take forward interventions of this type can be supported by the sufficiency and necessity characteristics of the initiative within the developed model and understanding how important the implementation of the intervention is in comparison with the rest of interventions.

In the case of the more **technological interventions with direct impact** on emission reduction, a different approach can be adopted. In order to support the prioritisation of interventions a quantitative analysis is recommended in which the comparison of one technology with the others in terms of environmental impacts (reduction of emissions) can be done.

For example, a comparison regarding the Global Warming Potential (Kg equivalent of CO2) of various interventions could be made. For this to happen, a simulated modelling process could be used predict the effect of the different technologies. This modelling would consider (among other aspects) the renewable source potential, the integration capacity of the technology at building and district and the efficiency of each technology. With this information the generated energy could be predicted for both types of technologies as well as the energy consumed in their operational stage (pumps, etc.). Comparing this net renewable energy generation with a 'control' scenario, the reduction of non-renewable energy and emissions can be evaluated. The control scenario is used to model the technology that would have been used if this intervention was not implemented. This control scenario needs to be the same for the two technologies.

This type of quantitative analysis is – however- a very time consuming process to include at this stage of the prioritisation, and should only be considered at the end of the process (see step 5 below).

2.3 Step 3: Applying strategic analyses to interventions: PESTEL and SPeAR

In line with step 9 of the process flowchart above, once the modelling process has been developed sufficiently to produce 'actionable' interventions and these have been sense-checked and subject to evaluation by individuals external to this process, the

next step to prioritising interventions is to apply a strategic analysis. In the STEEP methodology, we have adopted the PESTEL analysis.

The objective of the PESTEL analysis is to evaluate the feasibility of each initiative considering the different Political, Economic, Social, Technological, Legal and Environmental implications for each.

One of the key issues before applying the PESTEL analysis is to define which initiatives will be passed through the tool. Several initial questions arise;

- *What level of the processes of the model should PESTEL be applied to?*
- *What is the most useful level?*
- *Can the PESTEL analysis be applied on processes at any level?*
- *Do all the initiatives for the PESTEL analysis need to be processes of the same level?*
- *Is there any restriction regarding the type of process that can be analysed?*

A first impression from the point of view of 'technological interventions' would suggest that a high level of detail is needed in order to apply a PESTEL analysis (e.g. implementing solar PV in 50 residential buildings of a specific district zone). It is evidently more difficult to conduct a 'technical' analysis for general high-level processes considering the wide range of options that could help contribute toward this.

However, this is only one purpose of the PESTEL. The PESTEL analysis can be used to both **provide a framework for detailed technical analysis in conjunction with deliverable D3.1**, but **also to provide a more qualitative analysis of the feasibility of each initiative beforehand.**

A good example of such a 'general processes' described above could be the "Greening the Arena" sub-process that was identified in the first workshop in Bristol:

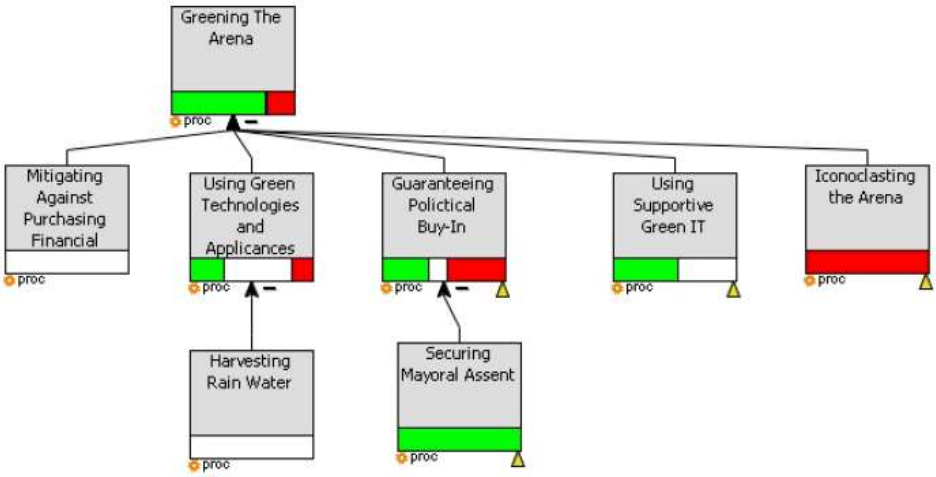


Figure 6. Example of sub-process taken from Bristol Workshop

Within this sub-process, various types of actions and strategies could be studied, from harvesting water to installing solar PV or using bioclimatic design for decreasing the energy demand of the building. All of these actions are suitable for 'Greening the Arena' but each has different implications for the different dimensions within the PESTEL analysis. In these situations the result of the PESTEL will therefore be 'high-level' and generic.

Different levels of processes can also be selected from the model depending on the level of acceptance amongst stakeholders. Using the example of the sub-process "Greening the Arena"; if the PESTEL analysis is applied at this level, it suggests that the process itself has secured consensus when this may not be the case. In the case of each of the cities sub-processes therefore, an initial decision or needs to occur to determine if a process is viable in terms of stakeholder *agreement*.

Finally, it needs to be taken into account that the number of processes to study will increase according to the selected level of detail. Therefore, a balance needs to be reached between the level of the actionable processes and the amount of processes to which the PESTEL analysis is applied.

Another aspect that needs to be considered in the PESTEL analysis in addition to the level of detail is whether all *type of processes* can be passed through the tool. As a result of the participation of different stakeholders in the Bristol Model-Building workshop, very different types of processes have been included in the model, from processes related to *implementable interventions* to other processes related to *planning process interventions*.

Here is an outline of some different type of processes that were found in the model;

- *Implementable general processes*: e.g. Greening the Arena
- *Implementable technological detailed processes*: e.g. Installing micro-cogeneration in EZ buildings
- *Implementable non technological detailed processes*: e.g. Development of a Community Ideas Forum
- *Planning process interventions*: e.g. Gaining Buy-In of Council Departments to Zero Carbon Vision for Enterprise Zone

The difficulties of passing those processes through the PESTEL, is that they will be different for each type of process and the level of detail of the evidence provided will also vary. In principle, the analysis could be applied to most types of process but each city needs to decide if it is valuable or not to apply the PESTEL analysis given their own timescales and capacity.

Explanation for PESTEL analysis spreadsheet developed for STEEP project:

The PESTEL analysis is guided by a series of questions that help to assess the strategic viability of the different initiatives. Two sections have been defined by our project partner ARUP for each dimension. The table below shows the framework for the PESTEL analysis.

PESTLE Framework	Consideration
Political	Is the proposal likely to attract significant criticism from a section of the political spectrum, pressure groups, or the local populace? Is there a risk of substantial growing criticism in the future? To what extent have stakeholders been involved in the development of the proposal?
	Is there existing political support for the proposal? Is there cross-party support and is this likely to be maintained by successive governments or local political institutions?
Economic	Have potential public or private financing mechanisms been identified for the project, does it offer a return on capital and are mechanisms likely to be lost or new ones created in the future?
	Does the proposal offer the opportunity for wider local economic benefits, such as a local supply chain or other benefits for local businesses?
Social	Does the proposal promote equality? I.e. Does a wide cross-section of society benefit from the intervention, or only a specific group? Has the ability of vulnerable groups to participate been considered?
	Does the proposal promote healthy lifestyles, wellbeing and happiness within the general populace? Does it promote community cohesion?
Technological	Has the proposal ever been proven as an effective energy intervention before, and is it 'future proofed' against changes in technology, and can it be adapted and improved over time?
	Will the proposal significantly restrict, or support, other interventions (including those less concerned with technology) that help to meet the same objective?
Legal	If any new legal frameworks or policies need to be put in place, does the city government have the power to implement these?

	Does the intervention comply with existing policy and legislation (including planning regulations) and is it 'future proofed' against changing government or European policy, new legislation and top-down targets?
Environmental	What are key environmental factors over the lifetime of the intervention such as: - Waste and Resources - Air quality - Water environment, including quality and use - Biodiversity and ecosystems - Noise - Landscape and townscape - Soil and land - Heritage
	Is the intervention likely to contribute to a net atmospheric greenhouse gas (GHG) reduction?

Additionally, an explanation of each section is included in the tool in order to clarify the type of issues that need to be addressed to obtain the necessary evidence. For example:

Environmental	What are key environmental factors over the lifetime of the intervention such as: - Waste and Resources - Air quality - Water environment, including quality and use - Biodiversity and ecosystems - Noise - Landscape and townscape - Soil and land - Heritage	Understanding environmental effects of energy interventions may require detailed analysis or modelling. However, an early consideration of all impacts, including the sources and receptors of environmental effects, is essential.
	Is the intervention likely to contribute to a net atmospheric greenhouse gas (GHG) reduction?	Sinks and sources of carbon in an intervention include: - Embedded carbon during extraction, manufacture and transport; - Predicted lifetime emissions; - Opportunities for carbon sequestration (natural or man-made); - Emissions during deconstruction, disposal, and re-use; - Influences on lifestyles and associated activities

In short, all of the interventions that have successfully passed through steps one and two above should be subject to this analysis. Based upon the answers that are given, the intervention will be given a corresponding 'likelihood of success rating' (see below for further details) which will further define which interventions to take forward.

How to use the PESTEL analysis spreadsheet

A copy of the PESTEL spreadsheet has been provided as an annex to this document, but in order to support your understanding and application of the PESTEL tool, we have taken a specific example from the Bristol model and will now demonstrate how this can be analyzed.

The sub-process identified as 'actionable' and subject to PESTEL is:

"Installation of Solar PV panels on building's roofs in TQEZ"

1. In the first part of the analysis, aspects related to heritage and townscape will be important (installation of solar panels on listed buildings roofs, etc.).

Other aspects which should be taken into account in the case of solar PV (considering that the emissions in the operational stage are negligible) is the evaluation of the environmental impacts related to other stages of the life cycle. For example, the extraction of the raw material needed to create the panels and disposal of the same material. The emissions related to the manufacturing stage of the Solar PV technology are more important that in the case of other renewable technologies. The environmental impacts of the installations vary also depending on the type of technology (Single-Si, multi-Si, thin film, etc.). More concisely, the production of the silicon wafers is a very energy intensive process and is the main cause of the emissions that contribute to the GWP. Hence, the environmental impacts related to the solar PV installations are largely dependent upon the emissions of the electricity mix of the country where those wafers have been produced.

In any case, the environmental impacts related to this technology are usually low in comparison to the environmental impacts of the option that may be replaced. Further analysis is needed if the replaced technology is a renewable electricity generation technology. In this case, studies like the *Renewable Energy Sources and Climate Change Mitigation. Special Report of the Intergovernmental Panel on Climate Change (2012)* can be consulted. For example, the next figure shows the life cycle Greenhouse Gas Emissions of different energy supply technologies.

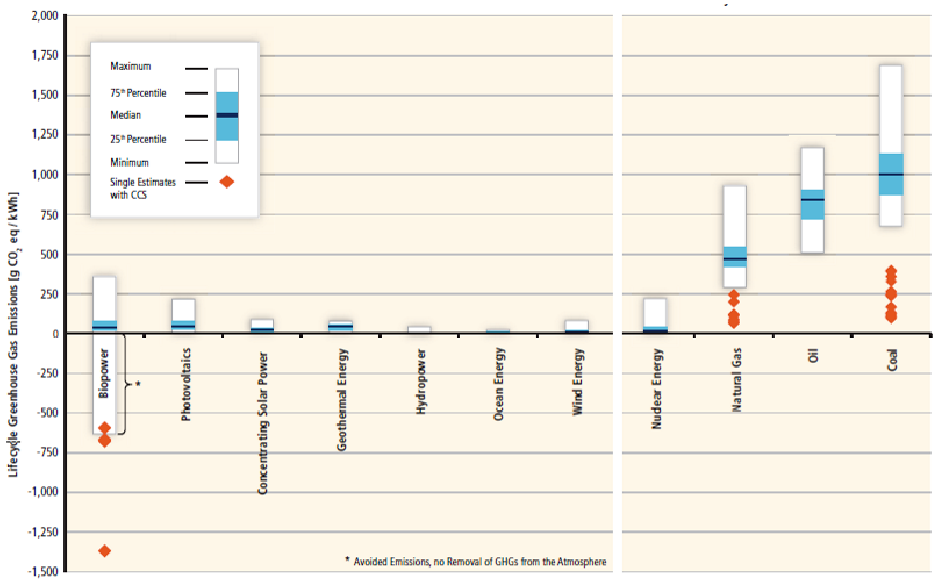


Figure 7. Life cycle Greenhouse Gas Emissions for different energy technologies. (Source: Renewable Energy Sources and Climate Change Mitigation. Special Report of the Intergovernmental Panel on Climate Change (2012))

2. In the second part of the PESTEL analysis the contribution of the possible intervention to the net atmospheric greenhouse gas (GHG) reduction needs to be studied. A comparison needs to be made between the emissions related to the installation process and the reduction of emissions obtained in the operation stage due to the replacement of existing technology.

Considering the above, a 'success rating' or 'likelihood of success rating' should then be given to each section of the PESTEL. This is represented with a color (green/amber/red). For example:

Environmental	What are key environmental factors over the lifetime of the intervention such as: - Waste and Resources - Air quality - Water environment, including quality and use - Biodiversity and ecosystems	Heritage and townscape will be important considerations; there may be issues with the installation of solar panels on listed structures in and around the EZ site. Other issues would be of relevance in considering the supply chain.	
	Is the intervention likely to contribute to a net atmospheric greenhouse gas (GHG) reduction?	Solar energy is a renewable energy form with zero GHG emissions in operation. However, other effects at the point of manufacture are an important consideration, and thus the supply chain is an important consideration.	

With this kind of evidence, the PESTEL analysis can be done for each dimension. The overall result will provide a visual understanding of the strengths and weaknesses of each initiative, giving a basis upon which to priortise interventions.

The main point to bear in mind when completing the PESTEL analysis is that it is a strategic tool which should ***supplement and not replace your*** decision-making process regarding interventions. The key points to remember are:

- There is no single specific level at which PESTEL analysis should be applied.
- The point of application will depend upon the level of detail you require regarding each sub-process.
- Sub-processes can only feed into a PESTEL analysis if they are (or contain) 'actionable' statements. I.E consists of a specific action that can be defined and taken, and not a generic non-actionable noun such as 'Finance'.

- Sub-processes must have consensus in order to be feasible.
- Always sense-check these 'actionable' interventions before applying PESTEL.

SPeAR (Sustainable Project Appraisal Routine)

STEEP partner ARUP has also developed a further strategic analysis tool using SPeAR software, a version of which is available to download via the STEEP website. The SPeAR tool has been developed so that it can be used to monitor and evaluate the performance of a project and support informed decision-making throughout the project life cycle.

It can therefore serve as a supplementary assessment tool when prioritising interventions.

The tool includes a library with set of indicator and sub-indicators for the evaluation of the sustainability of different interventions from different dimensions; environmental, economic, social, energetic, etc.:

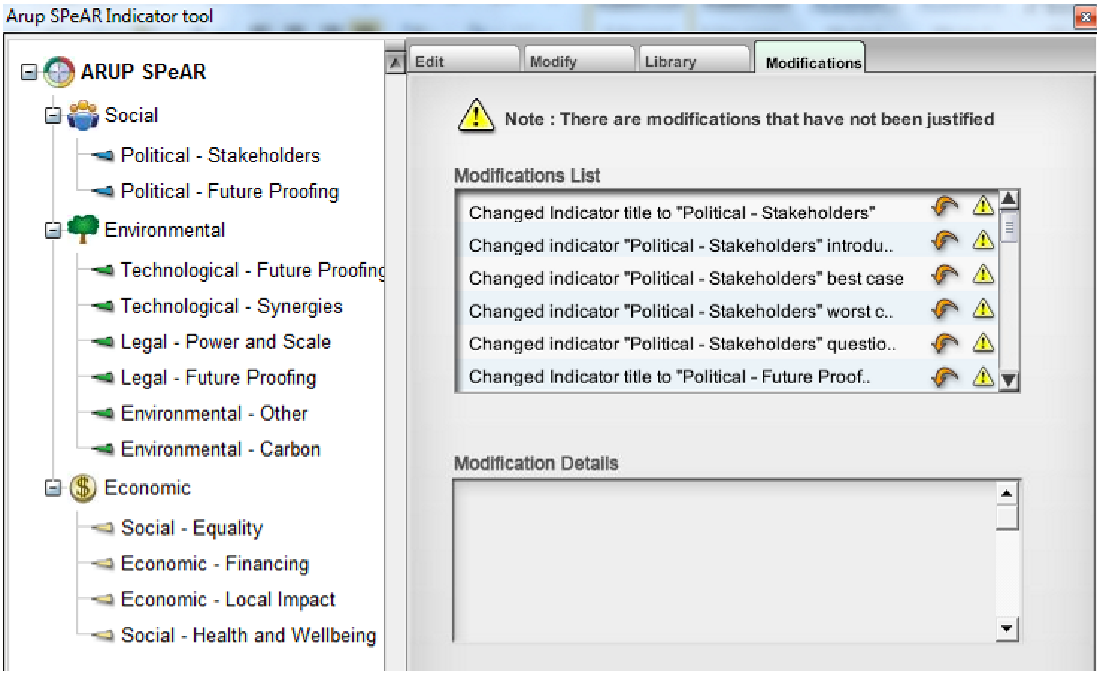


Figure 8. Interface of the indicator library of the SPeAR tool.

As part of the methodology of the STEEP project, ARUP has adapted these indicators in a way that reflects the dimensions and the questions previously developed for the PESTEL analysis. In this way, the initiatives passed through the PESTEL tool can be directly integrated in the SPeAR tool in order to obtain a visual representation of the feasibility of each initiative that can help in the prioritisation stage.

In the case of initiatives that *have not been evaluated using PESTEL*, these can be directly evaluated using the SPeAR tool. The tool also includes some additional guidance for the specific case of the evaluation of initiatives in an energy planning process in relation to the scoring.

Applying SPeAR

In this part of the document we will demonstrate how to apply SPeAR using the same example as above: the installation of Photovoltaic solar panels. As shown in the next figure, each indicator reflects one of the questions of the PESTEL tool:

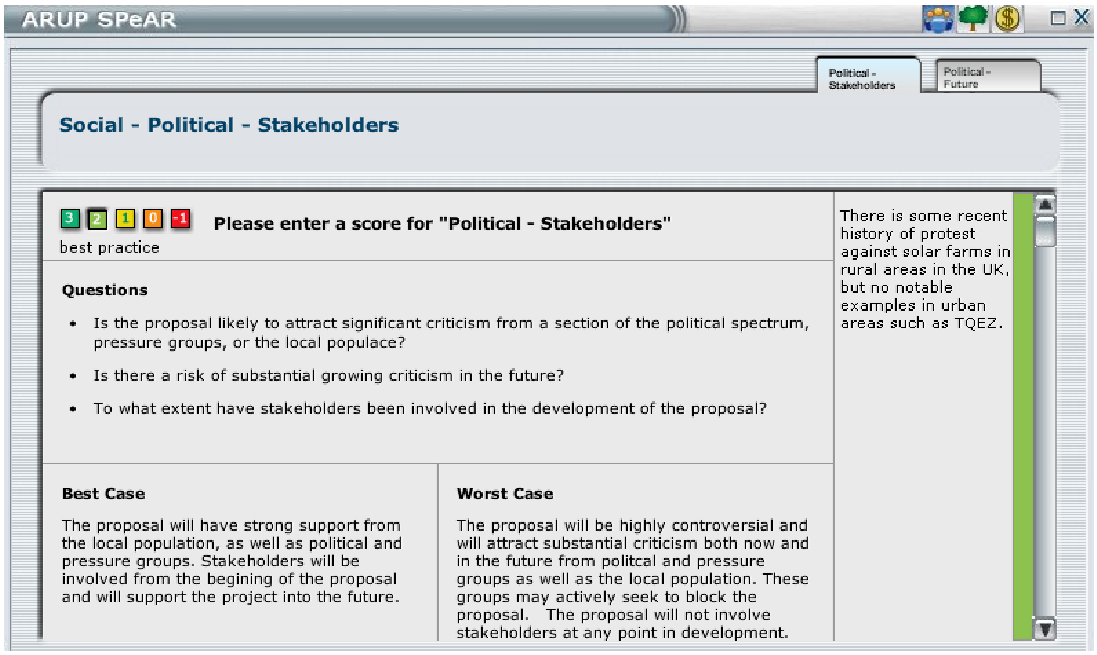


Figure 9. Characteristic definition module of the SPeAR tool.

As you can see in the right-hand section of the screen, you will be required to provide evidence regarding the success of this particular intervention to give this a 'score'. Instead of using the 3 level assessment which forms part of the PESTEL (green/amber/red) a 5 level score is used in this case also represented with a specific colour. Performance of a given action is rated from 'exemplary' to 'best practice', 'good practice', 'minimum standard' and finally the 'sub-standard'.

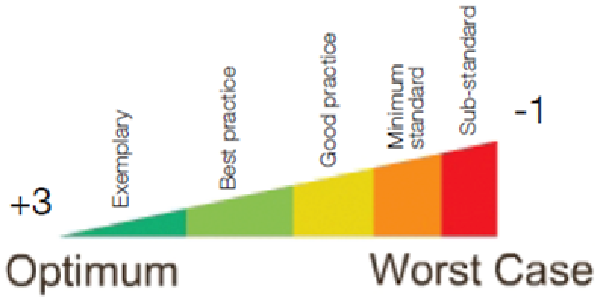


Figure 10. Scoring method of SPeAR tool.

Therefore, translating the score of the PESTEL analysis to this 5 level scoring for each of the dimensions, we obtain a visual representation of performance in a SPeAR diagram. In the case of the 'installation of solar photovoltaic panels', the result is showed in the next figure.

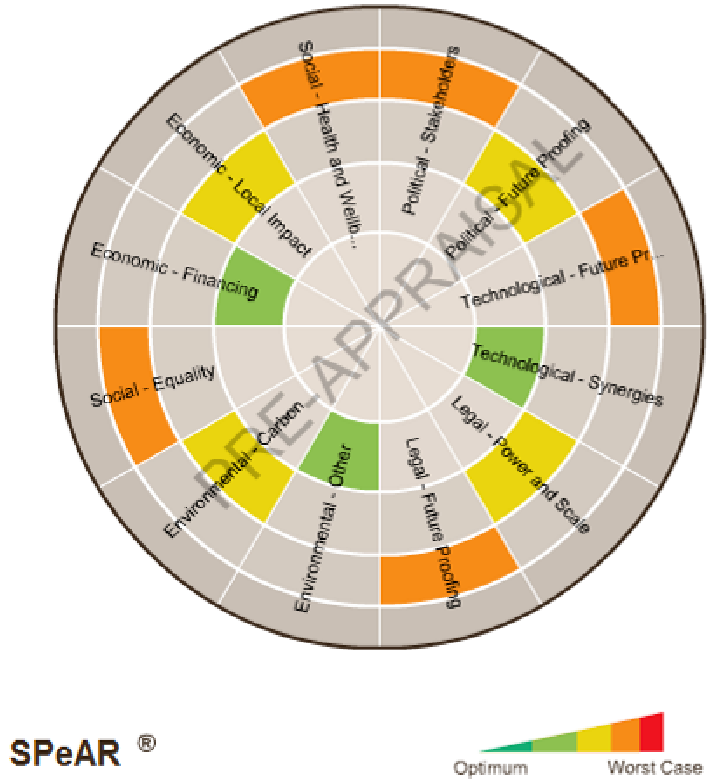


Figure 11. Example graph with the results obtained with the SPeAR tool.

Both the PESTEL analysis and the SPeAR tool are designed to provide a strategic long-term analysis of the interventions which were identified following the modelling and sense-checking processes. Of the various interventions that come through this, only those which score highly in the PESTEL and SPeAR scoring systems should be prioritised. This is because only these actions stand a chance of being successfully implemented based upon the variety of contextual factors which can affect the adoption of an intervention.

2.4 Step 4: Utilising alternative/complimentary data

We have already seen how both the modelling process and the two strategic assessment tools can be used to prioritise interventions. These processes are analytical in nature and should be complimented by a parallel process of data-modelling that will indicate where best to implement certain solutions.

As part of the STEEP open-methodology, project partner CSE has developed an online 'Stakeholder platform' which is available via the STEEP website. This platform will include visualisation of existing energy data sets as described in D2.2:

> *"Visualising an energy plan geographically is useful because it allows us to see patterns which may not be obvious from the raw data. It allows us to target areas more intelligently, and to identify regions where additional interventions may be required.*
> *We can also use maps, for example, to identify groups of people who will be affected by our plan, allowing us to actively engage them as stakeholders.*
>
> *The mapping tool being developed combines geographical and tabular display of data. This enables a user to simultaneously see both the spatial arrangement of things, and compare those things in terms of numerical or categorical properties".*

As we see here, the visualisation element of this platform is a vital element of prioritisation of interventions as it allows the effects of a number of possible actions to be visualised prior to adoption. This could be via the use of existing data sets that support the adoption of a technology (i.e. current heat demand profiles), or via data modelling which can be used to predict the effects of an intervention. Although more suited to the possible 'technological' interventions, the open-source nature of the STEEP stakeholder platform can be utilised by any city or district to display information to help inform the prioritisation of specific actions. For example, geographical information systems (GIS) have been used to visualise the feasibility of producing energy crops in Bristol:

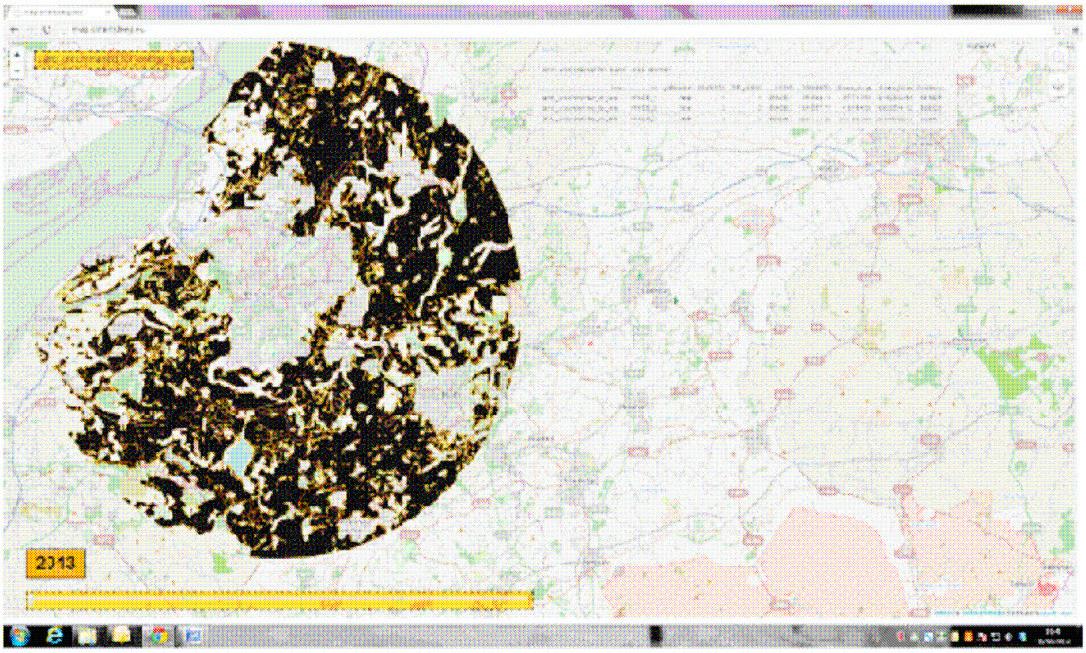


Figure 12. Example of GIS mapping on STEEP stakeholder platform: Area of Bristol suitable for energy crops

The geographical visualisation of data in this way forms part of an essential component of the analysis for potential interventions, as it can simulate the effects or highlight potential issues.

In addition to the GIS data-mapping provided on the platform, project partner CSE has also developed an open-source version of the hierarchical structure modelling and accompanying performance assessment. Again, this is available via our project website. As explained in D2.2:

> *"The web-based tool implements a version of the hierarchical process modelling used in the project and its code will be released under an open-source licence. The models may be built by hand, or by inspecting a web page which contains the relevant Information in a table".*

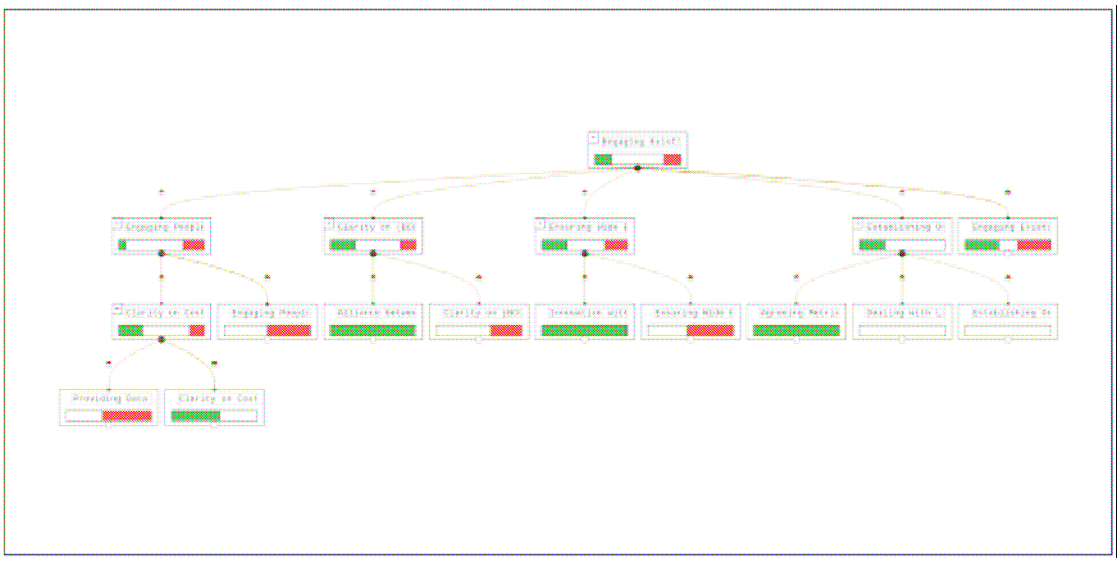


Figure 13: Example of a draft Process Model hierarchy for 'Engaging stakeholders'

In combination with data visualisation, the STEEP stakeholder platform represents an essential part of the prioritisation of interventions. If a city or organisation is unable to access this platform, they should use whatever GIS modelling system is available to them. Visualisation in this way helps supplement the modelling process by facilitating scenario planning and predicting the potential effects of interventions.

2.5 Step 5: Revisiting the systems' model

Taken together, the steps outlined above will provide a sound framework for prioritising interventions of any kind in a given problem situation. The specific focus of STEEP however, was to refrain from traditional methods of (specifically) energy masterplanning and adopting a more holistic approach which can facilitate a discussion regarding the organisational and behavioural interventions that may be necessary to achieve this complex objective. As above, we aimed to achieve this by adopting a 'systems thinking' approach to problem-structuring and engaging in a discursive process that is by nature iterative and which involves a 'causal loop'.

With reference to the modelling process outlined above, it is important to consider that interventions can and should be made at a number of points during a particular period of activity, constantly monitored and assessed against their overall objective. This process of monitoring and evaluation will be explained in deliverable D2.4 'Guidelines for monitoring interventions' but it is important when following the STEEP project methodology to revisit the original 'transformational statement' that was set out at the start of the project, to see how the interventions that have been prioritised have altered the performance of the model itself etc. As described in deliverable D2.1, the problem structuring method is simply a conceptual framework by which to approach a difficult issue and as such, all interventions should be considered part of this framework:

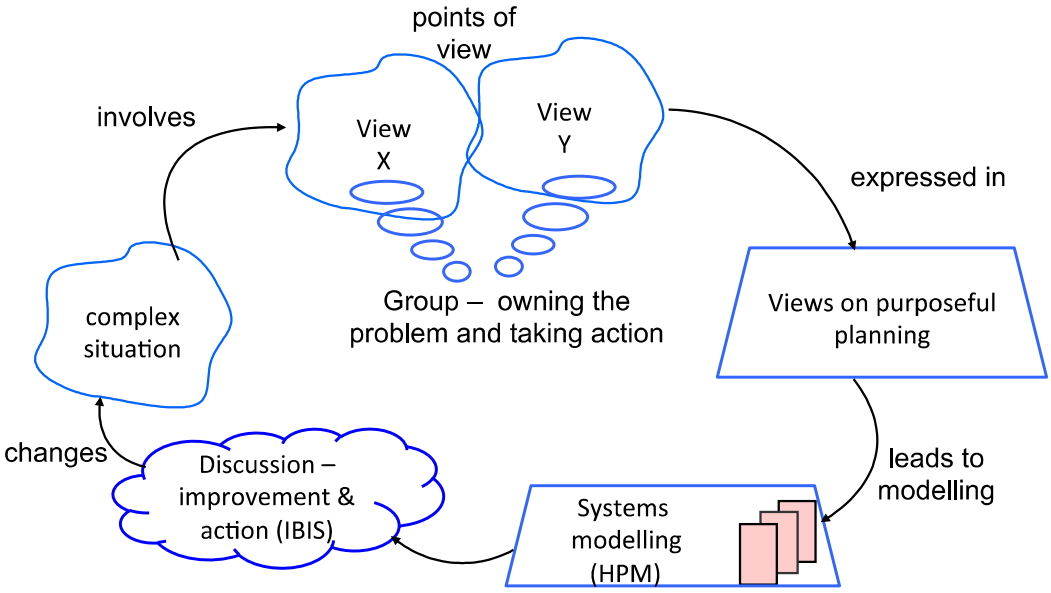


Figure 14. Diagrammatic view of the problem structuring method. Adapted from (Hindle, 2011).

The final step therefore in prioritising interventions is closing the 'causal loop' whereby any action taken should be fed-back into the process to see if this has altered the operation of the model in anyway. If not, then these interventions should be either reviewed or discounted in the next phase of activity to achieve the ultimate goal.

3. CONCLUSIONS & LESSONS LEARNED

The STEEP project has been highly effective in adopting the above step-by-step guide to prioritising interventions, but it is important to recognise that energy masterplanning (all types of planning in fact) are heavily reliant on the specific context in which a city is operating. For this reason, we offer the following conclusions/lessons learned to assist each city in satisfying the key elements of prioritisation:

- The first conclusion is that it is critical that a full stakeholder analysis is conducted prior to modelling workshops, in order to involve the most appropriate people in the process. The main difficulty encountered by project partners in STEEP was being able to engage large energy/ utility companies and developers that will participate in the planning process and that (in most cases) will be the ones that can make final decisions regarding interventions.

- The process of energy planning has several stages that can be extended considerably in the time, and in the case of this methodology several workshops have to be organized. It is important to ensure the continuity of stakeholders through the different workshops in order to be able to maintain coherence of the process. At the same time however, it can be beneficial to include some new stakeholders to the workshop (in some cases more specialized) in order to incorporate new perspectives that could have been missed previously.

- Regarding the prioritisation of initiatives, it needs to be pointed out that the previous stages of the process have a big influence in the final interventions prioritised. A proper definition of the transformational statement, the guidance provided to the attenders within the workshops for the model building, and the definition of the sufficiency and necessity parameters are vital to the prioritisation process.

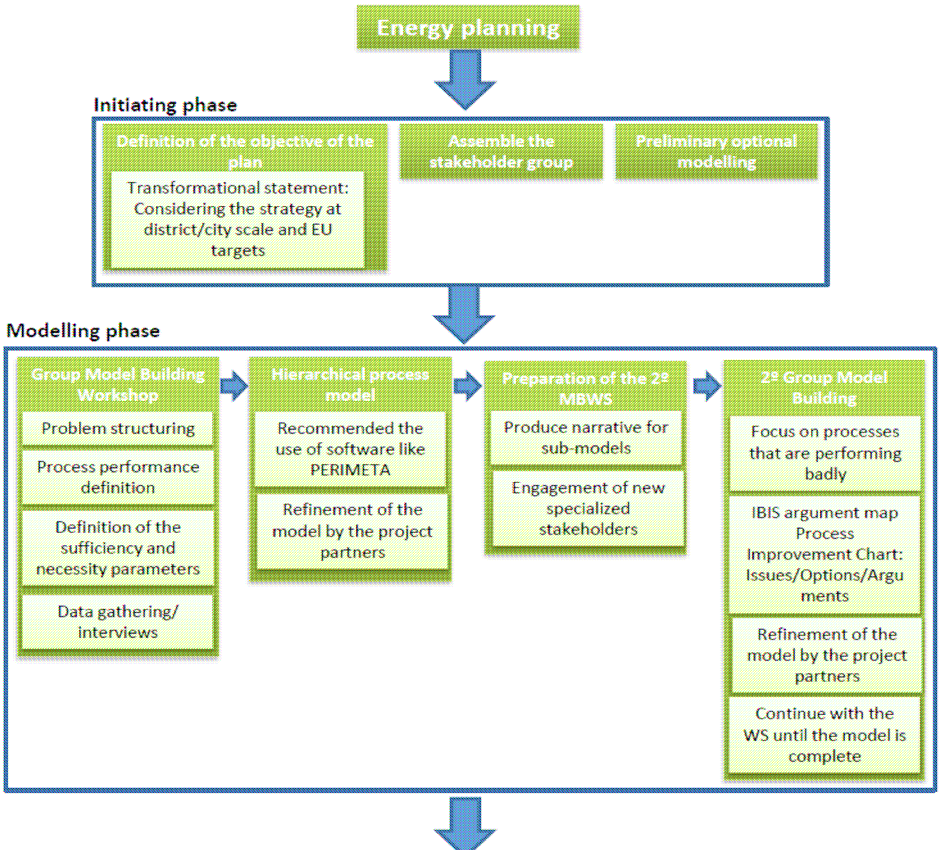
- There is always a subjective component in the prioritisation phase, especially in the case of the identified processes that are more strategic, non-technological

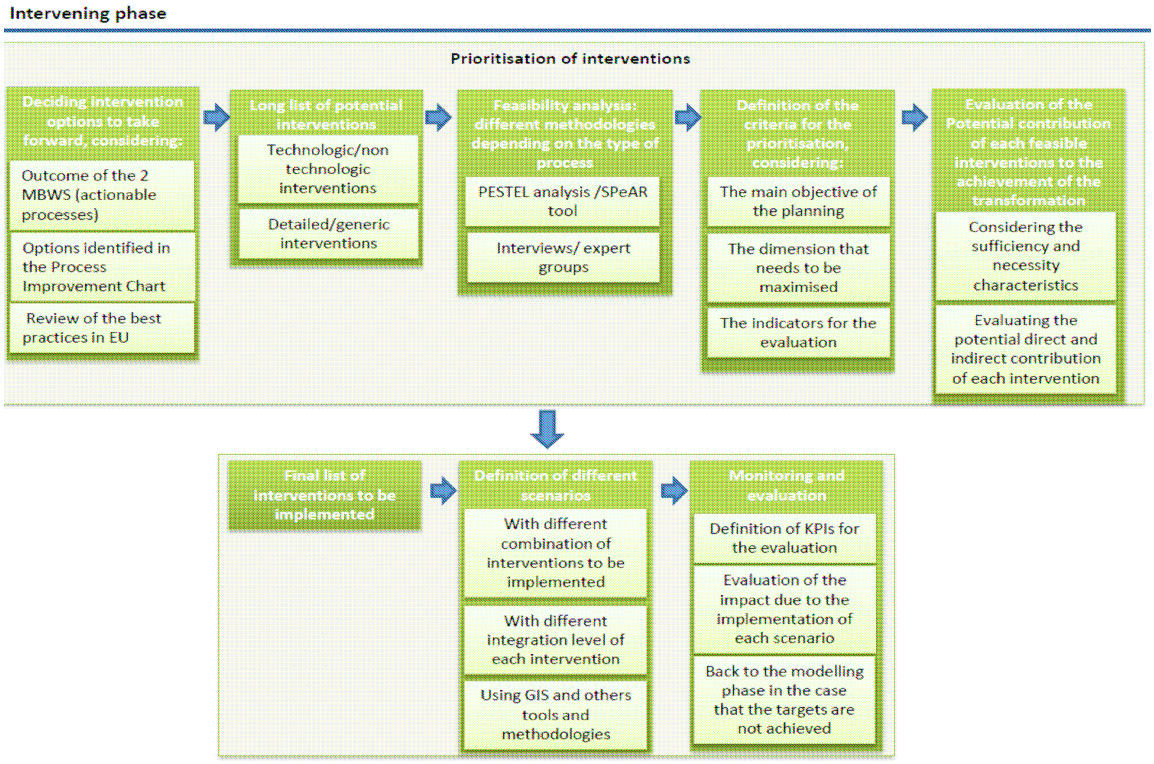
or have an indirect contribution to the achievement of the desired transformation. In these cases it is recommended to consult a variety of different groups of experts in the relevant field in order to minimize risk.

- Finally, another important difficulty is related to ensuring that the interventions identified in the structure of each of the top-level processes have similar grade of relevance to the overall objective, as well as each other. Working in different subgroups in the workshops can make it difficult for those in attendance to propose integrated interventions that respond to a high-level transversal strategy for the district. Conscious effort needs to be made to transmit this view and interest to all the stakeholders to ensure consensus regarding future interventions.

4. ANNEXES

ANNEX 1 – PROCESS FLOW CHART




Intervening phase
Prioritisation of interventions
Deciding intervention options to take forward, considering:
Outcome of the 2 MBWS (actionable processes)
Options identified in the Process Improvement Chart
Review of the best practices in EU
Long list of potential interventions
Technologic/non technologic interventions
Detailed/generic interventions
Feasibility analysis: different methodologies depending on the type of process
PESTEL analysis /SPeAR tool
Interviews/ expert groups
Definition of the criteria for the prioritisation, considering:
The main objective of the planning
The dimension that needs to be maximised
The indicators for the evaluation
Evaluation of the Potential contribution of each feasible interventions to the achievement of the transformation
Considering the sufficiency and necessity characteristics
Evaluating the potential direct and indirect contribution of each intervention
Final list of interventions to be implemented
Definition of different scenarios
With different combination of interventions to be implemented
With different integration level of each intervention
Using GIS and others tools and methodologies
Monitoring and evaluation
Definition of KPIs for the evaluation
Evaluation of the impact due to the implementation of each scenario
Back to the modelling phase in the case that the targets are not achieved

ANNEX 2- FREQUENTLY ASKED QUESTIONS

1. What is the transformational statement and what role plays in the intervening process?
2. What is the PERIMETA software? Is it necessary for the energy planning?
3. What are the sufficiency and necessity parameters and what are used for in this methodology for energy planning?
4. What is and how is used the “Italian flag”?
5. What is a PESTEL analysis and what is used for in this process?
6. What is the SPeAR tool and what is used for in this process?
7. What is the IBIS argument map?
8. What is a GIS and what is used for?
9. What are the energy scenarios?
10. This methodology can be used only for the energy planning at a district scale?
11. Which kind of stakeholders should be involved in this type of processes?
12. What are KPIs?

1. The transformational statement is a narrative that describes the main purpose or the expected transformation due to the implementation of an activity (in this case an energy planning process). It can also describe the context of the transformation and the actors involved among other optional aspects. This statement provides implicitly some guidance for the definition of the criteria for the prioritisation of interventions that will be implemented in order to achieve this transformation.

2. The "performance through intelligent management" (PERIMETA) software is a tool developed in the Systems group of the University of Bristol in order to support evidence based reasoning under uncertainty. The software tool allows the processes, representing the system being modelled, to be drawn as a connected graph of nodes. It is not necessary to use this kind of tools in this type of projects but in any case it is recommended. For energy planning problems it can be used for the definition and visualization of the structure of the problem, the interaction between processes and performance of the model.

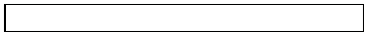
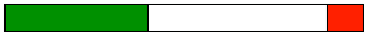
3. The sufficiency and necessity parameters are used in PERIMETA software to capture the dependency conditions between the processes of the model. Here we make use of the following definitions;

i. Sufficiency – How much of the evidence is directly relevant to the parent process?

ii. Necessity – Will the parent fail if the sub-process fails? Takes over if evidence against is large.

iii. In this type of projects these parameters can be used as evidences for the prioritisation of interventions phase.

4. The Italian flag is a colloquial name that can be used to describe the method based on internal numbers that is used in the PERIMETA tool to express knowledge about process performance. The result can usually contain the colours green, red and white. The green indicates that the process is certainly true, the red indicates that the process is certainly false and the white indicates the belief that the process is unknown.

- P(E)=[1.0,1.0] 
- P(E)=[0.0,0.0] 
- P(E)=[0.0,1.0] 
- P(E)=[0.4,0.9] 

5. The objective of the PESTEL analysis is to evaluate the feasibility of each initiative considering the different dimensions; Political, Economic, Social, Technological, Legal and Environmental. The PESTEL analysis in this case is part of the methodology for energy planning, more precisely is part of the prioritisation of initiatives phase.

6. The SPeAR is a tool developed so that it can be used to monitor and evaluate project performance and support informed decision making throughout the project life cycle. For this methodology the indicators that are used in the tool have been defined in a way that can reflect the dimensions and the questions developed for the PESTEL analysis.

7. The Issue-Based Information System (IBIS), was developed to provide a simple yet formal structure for the discussion and exploration of "wicked" problems. The IBIS

approach makes the argumentation visible i.e. provides documentation/reporting. In this case PERIMETA supports:

-Issues: a point of discussion to be resolved about the performance or state of knowledge about a process

-Options: a possible intervention to resolve the issue

-Arguments: support or refute an option and they appear as elements in the process map under processes in the order

8. The Geographical information systems (GIS) is a computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface. Many different kinds of data can be shown on one map. This enables people understand patterns and relationships. In the case of energy planning can be used to show energy demands, energy generation points, renewable energy availability, etc.

9. An energy scenario is a model developed considering a set of assumptions that allow the estimation of for example the evolution of the energy demands and consumptions depending on the fulfilment of these assumptions. In this case it can be used to evaluate the adequacy of different strategies (different combination of renewables, etc.) to meet the objectives of the energy planning.

10. The described methodology has been tested for the case of energy planning problems at a district scale but in any case the methodology is flexible enough to be adapted for a bigger scale. In both type of problems energy planning of district scale and city scale there is a need of a prioritisation of interventions.

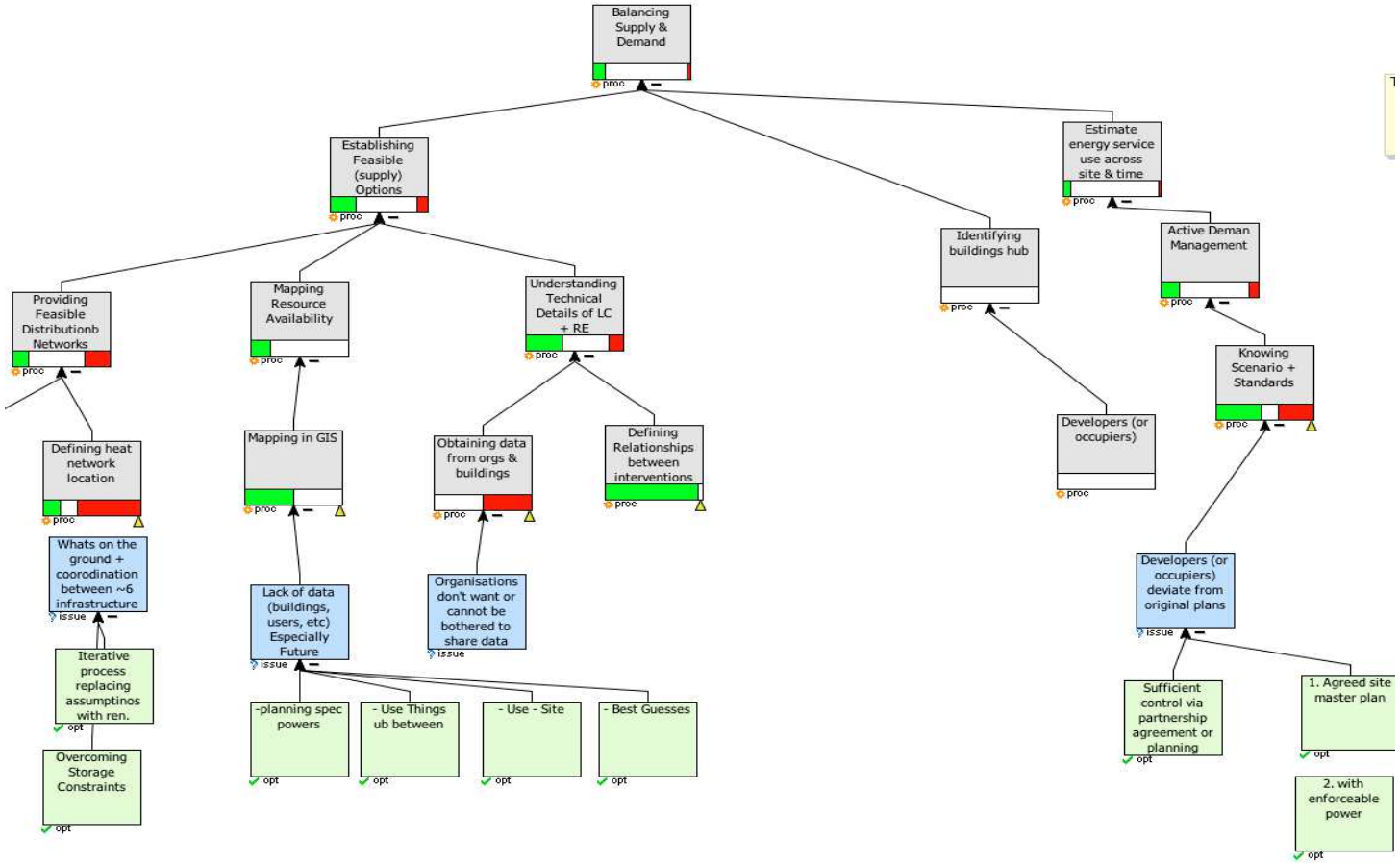
11. The stakeholders that can be involved to attend and participate in the Model Building Workshops are among others, developers, community groups, local council representatives, businesses, trade associations, supply chain, utility companies and government agencies.

12. The Key Performance Indicators (KPI) are a set of quantifiable measures that are used to evaluate the success of a particular activity.

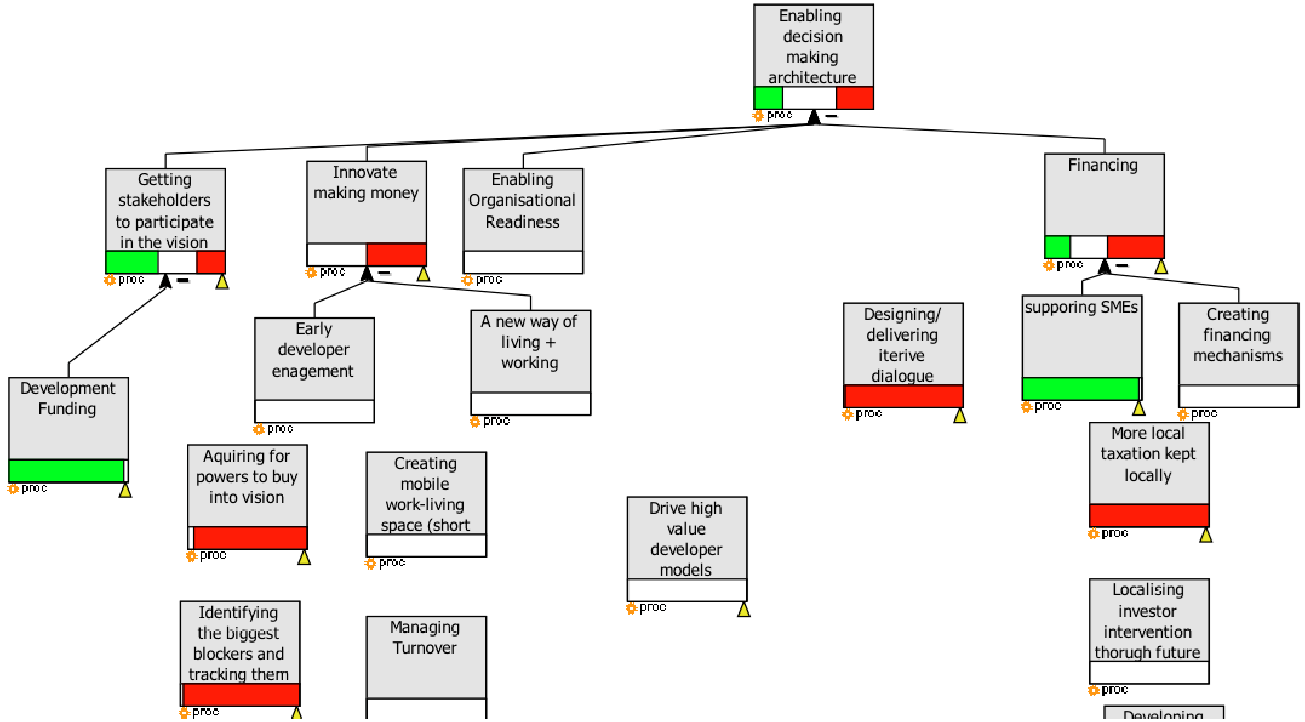
ANNEX 3- LIST OF FIGURES

ANNEX 4 – EXAMPLES OF HIERARCHY MODELS FROME EACH PARTNER CITY

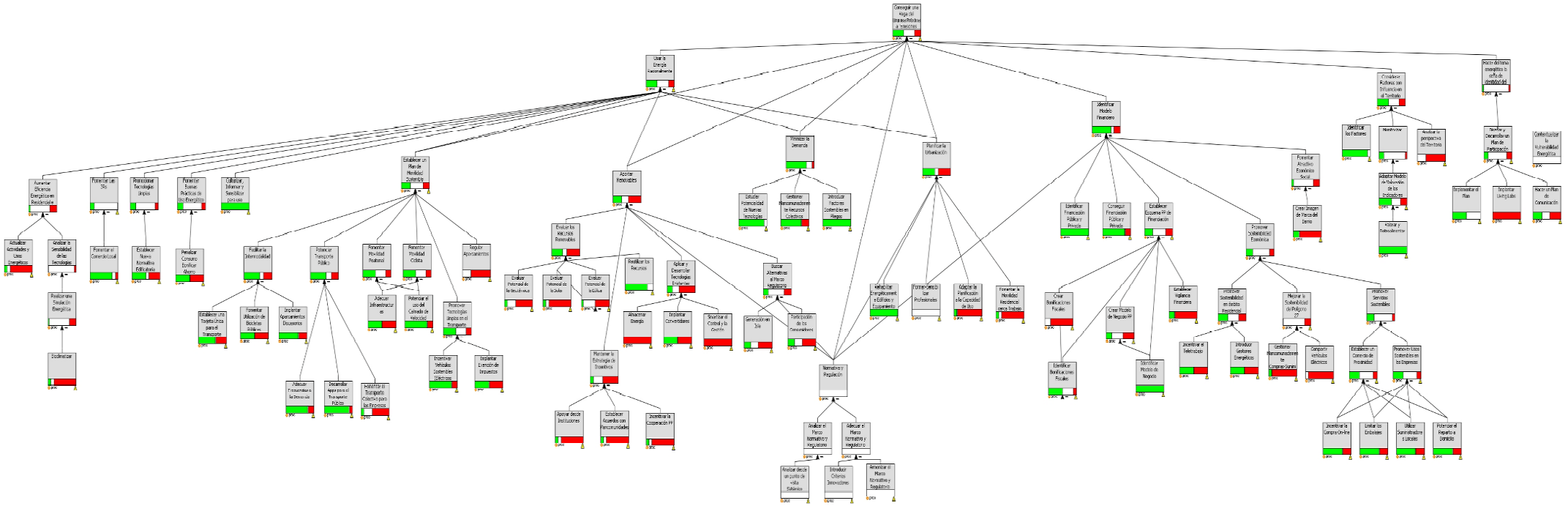
Bristol (Temple Quarter Enterprise Zone)



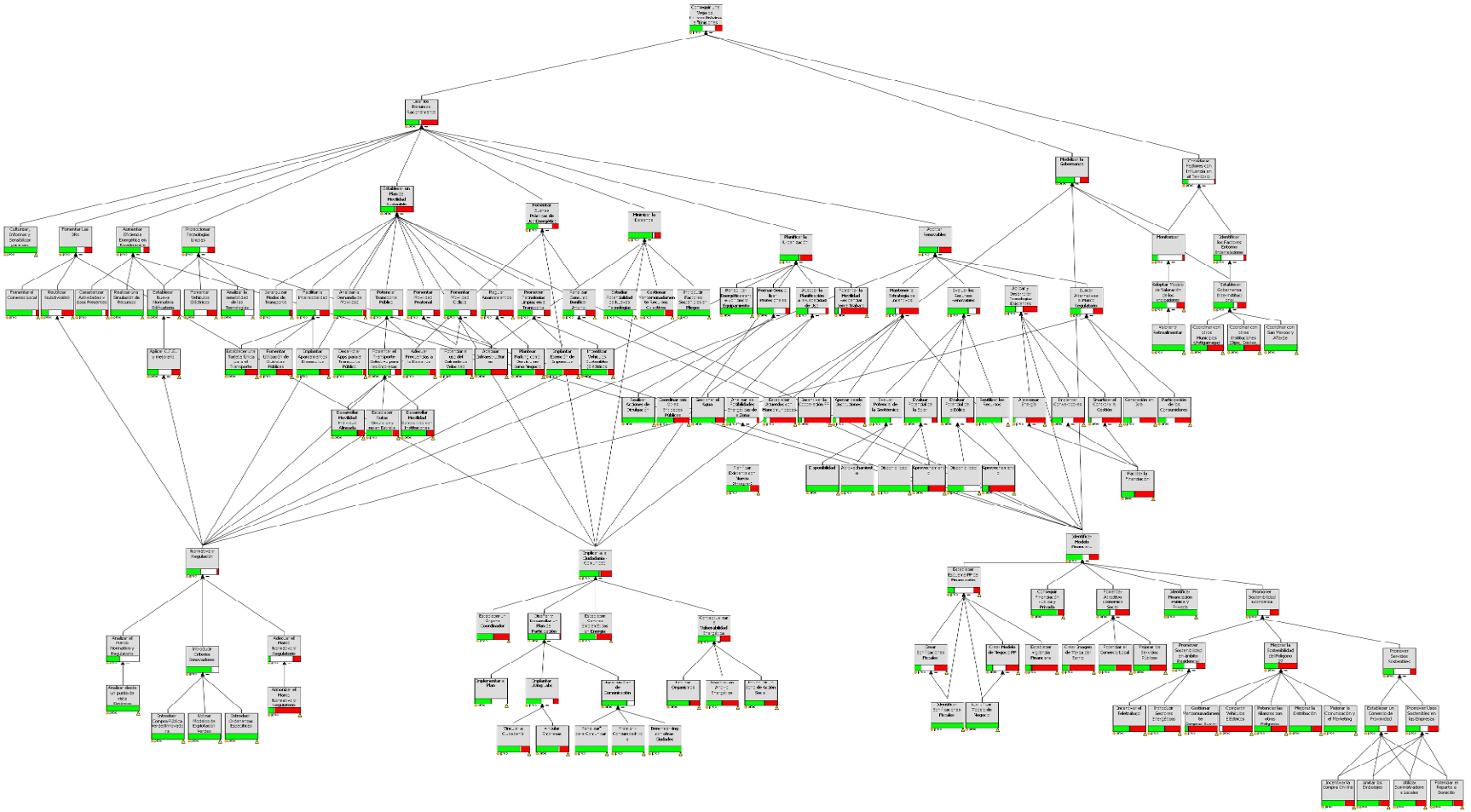
Bristol (Temple Quarter Enterprise Zone)



Donostia-San Sebastian (Urumea Riverside)



Donostia-San Sebastian (Urumea Riverside)



Florence (Cascine Park)