



**Consumption-based Carbon Accounting (Carbon –CAP)
Workshop 7th and 8th October 2014, Cambridge**

Report on Session 3 Part 2 on: Scenario Planning

Prepared for

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Introduction

SAMI Consulting is pleased to have been asked to provide support for this workshop for the project on Consumption-based Accounting and Policy (Carbon-CAP); funded from the European Union's Seventh Programme for research, technological development and demonstration, (grant agreement no. 603386.)

The overall objectives of this project are to:

- Stimulate innovative European and international climate policies and services due to improved shared knowledge base on consumption emissions.
- Realise a more effective policy mix for achieving the objectives of the EU Climate and Energy package and the Roadmap for moving to a competitive low carbon-economy in 2050.

The aim of the workshop was to initiate stakeholder engagement, share initial results and receive valuable feedback to help guide the future direction of the project. The workshop was divided into three sessions over two days. This report covers part of the third session on interactive modelling of transformation scenarios. This was the final session and followed a different approach, taking the form of an interactive workshop led by Cambridge Econometrics.

The session aimed to assist CARBON-CAP policy impact modelling exercise (Work package 7) with the task on defining baseline and policy scenarios. Using the experts in the room it provided an initial analysis of the key drivers and uncertainties related to future climate policies and the future political and economic situation. It also helped to define an initial list of economic and/or environmental indicators that might be of interest to policymakers.

This report covers the second half of this session on scenario building. It includes an introduction to scenarios and the link to modelling; the data from the workshop; and recommendations on the next steps.

The presentation used to introduce the session is included in Appendix 1.

Introduction to scenarios

Scenarios describe how the future may look and they are based on an analysis of the critical uncertainties. It is important to recognise that scenarios are not predictions or forecasts of the future. They should be engaging and credible and have internal logic and consistency. However, they should also be challenging and stretch thinks about the range of possible futures. If a robust set of scenarios has been developed, it is likely that the actual future will contain elements of each of them. What cannot be predicted is the combination of outcomes from each of the scenarios.

Scenario should also contain a path from the present to a future point in time. This 'timeline' tells the story of how the scenario evolves and the critical events that shape it. It also indicates possible points to influence the future and early warning signs of future potential developments. If it is not possible to construct a robust 'timeline' the credibility of scenario should be questioned.

Most of the value of scenarios comes from the opportunity they create for discussion about the future and the potential opportunities and challenges. They can also provide a neutral space (the future) for different groups of stakeholders to have an open discussion in a safe environment. This gives a framework for strategic thinking, more robust policies that take account of a range of potential futures; and an understanding of potential risks.

Before developing a set of scenarios it is often useful to review the past, going back typically twice as far as the time horizon of the scenarios. This ensures a good understanding of what has shaped the current position and the potential rate of change, which in most cases will be accelerating

There are a wide of potential methods for developing scenario. Most methods are based around the following stages:

1 Defining the scope

It is important to have a ‘focal question’ for the scenarios. This needs to define the scope of the scenarios and the timescale into the future. It should not be too broad but it needs to cover all relevant interaction with the issues being addressed.

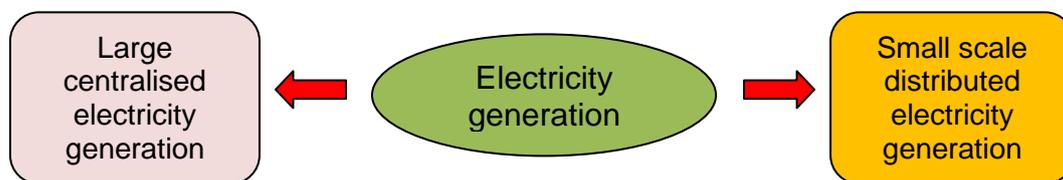
2 Identification of drivers

Drivers of change are the main building blocks for scenarios. Strategic drivers are major forces or trends that will shape the future environment within which an organization or a policy needs to operate. High level drivers of change include issues such as globalisation, demographic change and technology.

Horizon scanning is often an important input into the generation of potential drivers of change. It is important that these cover all categories of driver, such as STEEP (Societal, Technological, Economic, Environmental, Political) or a similar categorization.

3 Identification of predictable elements and critical uncertainties

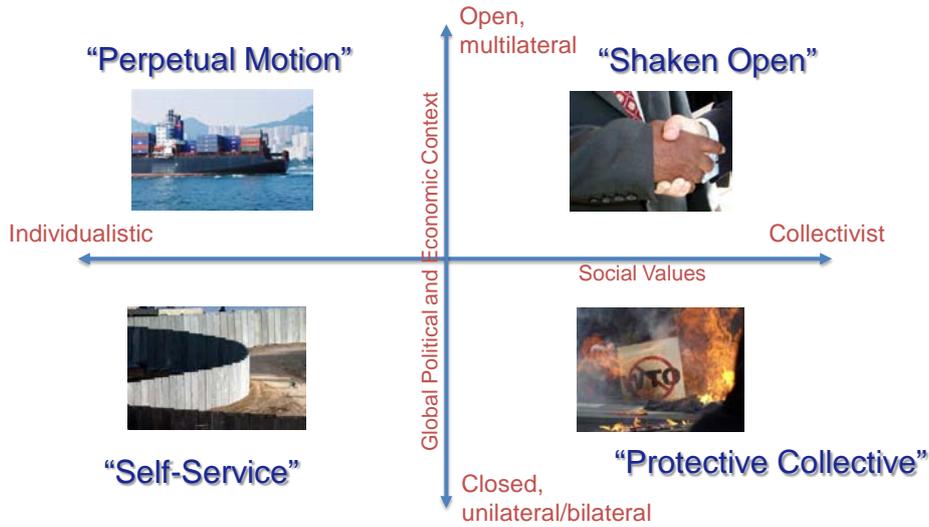
Some aspects of the future are reasonably predictable and will be common to each scenario, although caution is needed in assuming predictability. Other drivers will result in a range of different outcomes, which together result in the different futures in each scenario. The critical uncertainties are the drivers that have the biggest impact on the ‘focal question’ and have a range of different outcomes, such as the example below:



4 Constructing the scenario space

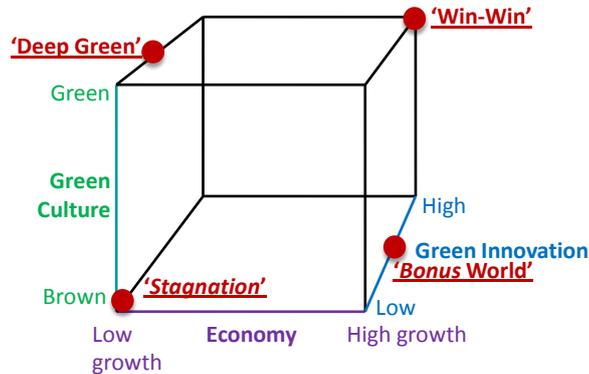
The scenario space is defined by the critical uncertainties. It is space that contains all the potential scenarios. Two critical uncertainties result in a scenario cross and a two dimensional scenario space such as the Horizon Scanning Centre’s scenarios for UK Futures and Society 2030.

Scenario cross



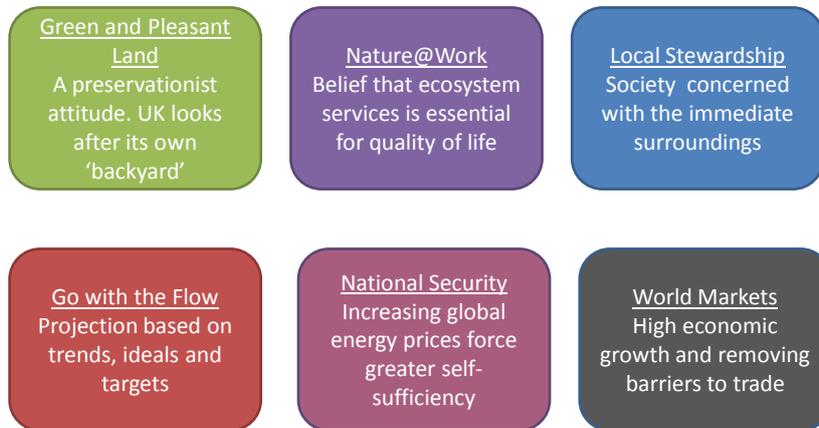
If there are three critical uncertainties the scenario space has three dimension, such as the scenarios for new and emerging risks for health and safety in green jobs developed for the European Agency for Safety and Health at Work (<http://www.samiconsulting.co.uk/4EUOSHAreport2013.pdf>)

3 dimensional scenario space



If there are more than three critical uncertainties it is not possible to graphically present the scenario space. The different combinations of the critical uncertainties can then be tabulated. An example of scenarios with five critical uncertainties (environmental awareness; human well-being; governance and intervention; overseas ecological footprint; and adaptation capacity) is the UK National Ecosystem Assessment (<http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx>).

UK National Ecosystem Assessment



5 Selecting the scenarios

Any scenario space can contain a significant number of scenarios and these become potentially more complex as the number of critical uncertainties increases. The selection of the scenarios is usually conducted by reviewing the potential scenarios and their value in addressing the focal questions. For example, in the case of three critical uncertainties you may start by looking at the eight potential scenarios formed by each corner of the cube. Each potential scenario would then be considered against a range of questions, such as the following:

- Does it address the critical issues associated with the focal question?
- Is it plausible and internally consistent?
- Does it allow both negative and positive aspects to emerge?
- Is there a plausible path to the scenario?
- Does it stretch current thinking?

The selected scenarios should be kept under active review as they are developed and it is not uncommon to revisit the original selection.

6 Scenario and timeline generation

There are many ways to generate scenarios and timelines and the process can be done by a small team or involve large number of participants, typically via workshops. Consideration should be given to the engagement of stakeholders in the process as this can help to encourage ownership of the scenarios; and many valuable insights are generally gained during the process.

The scenario generation can range from the use of tools commonly associated with facilitated workshops, to technology based approaches for which there are a number of software packages. The software approach enables a wide range of interactions between critical uncertainties to be handled and a large number of scenarios to be efficiently generated.

If scenarios are to be generated without software, a common approach is prepare a brief description of the end point of a scenario and then start constructing the path to this, taking into account the potential driver of change, the associated events and how the key stakeholders will respond. This is usually an iterative process to progressively build the pathway and the end point.

7 Communicating the scenarios

It is important that the communications of the scenarios is tailored to the audience. This is helped by having a distinctive scenario name, appropriate imagery and memorable events in the timeline. To objective is to not only to communicate the facts about the scenario but also the emotions, so that the audience for them can 'live' the scenarios. Some of the approaches that can assist with this include:

Imagery

World Markets



Story Boards

"Hello - how may I help you??"

*(...I used to work just in retail...
Now I am expected to be a manufacturer as well. I just press the buttons and hope it is OK!)*



I'll have a Zpad4.2 ... in lime green and purple ... and a cup of coffee while I wait please

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Interactive multi-media



© SAMI Consulting

Actors



© The Garnet Foundation

Case Study

A following is a report that described the scenario generations process and the data associated with each stage <http://www.samiconsulting.co.uk/4EUOSHAreport2013.pdf>)

Introduction to modelling with scenarios and simulation

Scenarios can be used to determine the assumptions to be used for models, such as the three examples presented in the first part of session three. Scenarios can now be linked to 'Business Modelling.' This is one of the most interesting recent advances in the art of modelling, creating a language capable of describing and manipulating business models to create new strategic alternatives¹. There usually covering the areas of customer, offer, infrastructure and financial viability.

Although scenarios and modelling were once seen as the province of two distinct (and rarely overlapping) communities, advances in simulation modelling have significantly increased the potential of an integrated approach. Their integration is a powerful tool to develop a modern strategy for organisations or high impact area, such as consumption based policies.

Simulation modelling has been applied to complex decisions across a wide range of sectors. Simulations seek to create replicas of complex systems under a wide variety of real or imagined conditions. Scenario planning is the systematic discussion and development of a range of plausible futures based on analysis of the key drivers of future change. Putting these tools together can offer the following advantages:

1. The simulation ensures that the scenarios and their implications are also data-rich, not simply qualitative.
2. A simulation model can very quickly calculate the implications of a scenario – that allows the team to consider a wider range of scenarios, even those at the “tails” of the distribution (extreme conditions).
3. A simulation model can provide dynamic imagery that can ‘bring the scenarios to life.’
4. Running many more scenarios can show where there are “inflection points” in circumstances – for example, were a small change in the ‘market’ may double (or half) the value of an asset.
5. A more complex set of interventions/insurance against “perfect storm” scenarios might be developed, given the speed at which a model may identify and assess such conditions.
6. Combining simulation with scenario planning respects the bare economic fact that computing power is cheap and human talent is expensive. An integrated approach provides the maximum leverage of expensive human talent.
7. By codifying the scenario information in the form of a model, more stakeholders can be participants in its design and participate in the research across a broad range of policy options.

Scenario analysis can help determine the variables to be explored in the models. The model can be used to test, visualize and quantify a range of futures. It is not possible to remove the uncertainty of the future but a combination of scenarios and modelling will enable these uncertainties to be better understood and managed. This will lead to more robust policy decisions.

It is also important to recognize that, to varying degrees, we can influence the future. Those that have a better understanding of the future are better placed to influence it and be leading events, rather than reacting to them.

¹ Business Model Generation: Osterwalder and Pigneur Wiley 2010

Workshop exercise results

The time for the exercise was compressed, so it was restricted to collecting data from participants on the high impact drivers of change. The 'focal question' for this exercise was as follows:

What are the key factors that will impact European and international demand side orientated policies and services; and the success of achieving the EU Climate Change and Energy target of a competitive low carbon economy by 2050?

There was some debate about this question and it is recommended that further consideration is given to it as part of taking forward the scenario planning process.

Participants spent about thirty minutes in small groups discussing the key drivers. These were put on the wall and grouped into ten categories. A vote was held on which groups that were considered to have the highest potential impact on the 'focal question.' The results of this are in the following tables:

Business: 0 votes (but linked with technology)
How quickly can business adopt new business models? What do the new models look like; do they fit with the 2°C target?
Business positioning Will retailers and green consumers lead supply chains?

Demographics: 1 vote
Population Size Composition How this affects consumption policies? Ages Income/wealth.
Changes in structure of generations

Lifestyles and consumers: 26 votes
How quickly can customers' behaviours be changed? Willingness to change? Is it possible to develop an attractive vision to motivate customers to change?
How to promote demand side eco-innovation use when there are no economic incentives (e.g. electric cars)

<p>Changing consumption patterns</p> <ul style="list-style-type: none"> Service based consumption High-tech goods Switching to more env-friendly goods and clean products
<p>Addressing waste and recycling</p>
<p>Access of households to financial resources</p>
<p>Change of social norms. Non-acceptance of carbon intensive goods and services</p>
<p>Socio-economics</p> <ul style="list-style-type: none"> Ageing Consequences of climate change – variability in weather – natural disasters (droughts, flooding etc) Health Consumer attitudes
<p>How can consumption-based carbon accounting be leveraged to develop policies with co-benefits for development objectives?</p>
<p>Changing lifestyle preferences or notions of human progress</p> <ul style="list-style-type: none"> Looking beyond GDP growth

<p>Technology: 15 votes</p>
<p>Technology progress</p> <ul style="list-style-type: none"> Electrification (effects on demand) Diffusion of technology Robotics (effects on labour demand) Interaction between technology and consumption
<p>Technology development and innovation</p> <ul style="list-style-type: none"> Very different combinations of technologies available to the consumer

Policy Framework: 2 votes
Factors affecting EU and international demand side orientated policies? Global value chains and international supply chains Extension of mitigation and adaptation regulations to more developing countries (competitiveness)
Assuming carbon content becomes a driver of developed world consumption (not just price) – how will developing nation’s access to ‘clean’ manufacturing (i.e. renewables) be affected and how will their special needs be addressed?
Policy framework International agreement Regional ambition Trade agreements
Rise of policies that do not prioritise economic performance or growth (e.g. a Caliphate)
Uncertainties related to demand driven policies: Policy to control emission intensive products in the domestic economy would lead to fall in trade flows from the country of origin. On the other hand exports of the domestic country would fall as a revenge for fall in imports (international politics) Trade volumes fall → fall in flow of funds → financial crisis
Personal interests of policy makers.
Large countries/emitters’ do not want to implement policies

Outside EU: 3 votes
State of Asian economies
What happens outside EU In terms of economies/trade In terms of environmental policies

Global economies: 2 votes
Governments' not managing alternative revenue sources from fossil fuel taxes → leading to economic crisis.
Missing projections on global warming targets, leading to failure of multinationalism → move to discrete balkanised blocks.
Border adjustment measures on environmental pretexts lead to disruption of world trade flows.
Changes in the structure of economy.
Changes in the structure of international trade
China scenarios Success in carbon transformation 10 years Slow transformation 30 years
What happens to economy if we reduce trade with China and developing countries?
Saturation of global trade e.g. slowing down or reversal of global supply chains
Growth and patterns of global production and trade.
Change in China e.g. Currency reserves – increased domestic consumption
Completion of Doha round – reinvigoration of WTO Bilateral trade agreements dominate.
Economic growth Low Medium High
Penetration of clean technologies – world-wide technology transfer

Global conflict/security: 3 votes
<i>Raised in discussion but no individual drivers submitted</i>

Climate agreements: 6 votes
Success of global climate agreements
Uncertainties related to the future of the global climate governance systems? Will there be one? Only bilateral deals,?
How will climate change fare in terms of priority compared to other major global concerns going forward? e.g. water provision/food security
Global agreement CBDR? Carbon intense final producers vs. consumers
Direction of international climate negotiations and formation of new negotiation groupings.
Global carbon price (minimum price)

Resources: 6 votes
International commodity prices e.g. oil, gas, food
Water stress
Stress on availability of rare earth minerals and lack of alternatives
Role of uncertainties around peak oil and depletion/availability of other fossil fuels
Uncertainties around resource availability (especially metals) to develop alternative energy systems?
Water security – Growing population and erratic climate will cause serious water security issues.
Resource security – Growing affluence of emerging markets will increase demand for goods and precipitate conflict over the control of dwindling resources.
Access to and control of resources (energy/materials) e.g. oil, gas, rare earths.

Time did not allow for an analysis of the levels of uncertainty of the outcomes for the above drivers of change. This should be undertaken before the potential scenario axes are considered.

An example for a range of uncertainty is below:

People very much live for now and have little regard for longer term sustainable use of resources and meeting a 2°C temperate rise due to climate change. They are not prepared to pay higher prices for low carbon goods and services	Lifestyle and consumers	People recognise the importance of meeting the 2°C target and are prepared to modify their behaviour; and where necessary pay the higher costs associated with this.
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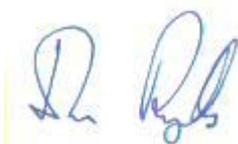
Conclusions and recommendations

I offer the following thoughts based on my attendance for part of this workshop:

1. The 'focal question' for the scenarios should be reviewed;
2. The drivers need further analysis. This could include interviews, for which the '7 Questions' <http://www.samiconsulting.co.uk/training/sevenquestions.html> is a proven approach;
3. Following further analysis of the drivers, the scenario axes should be developed. This can be done by a small team (typically 4 or 5) drawn from the project, with a couple of additional experts;
4. The scenario generation process could be built into a future Carbon-CAP workshop. This should include the generation of timelines from now to 2050. This would require about 2.5 hours;
5. The scenario generation will need to take care to avoid an inbuilt bias in the group. This can be helped by including 'externals' in the process;
6. It would be useful to map the drivers of change against the models; and
7. The discussion suggests that the scenarios and models proposed for work package 7 are complementary Together they should a powerful tool for policy analysis..

I would be happy to discuss any of the above points and give further guidance on the scenario planning process.

It was a pleasure to contribute to a workshop on such an important policy issue!



John Reynolds
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Appendix 1: Workshop presentation

Objectives

- Assist CARBON-CAP policy impact modelling (Work package 7)
- Consider use of future scenarios
- Identify the key drivers and uncertainties that will influence future climate policies
- Make an initial assessment of the key uncertainties to be used for future scenario building



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Need for foresight and scenarios



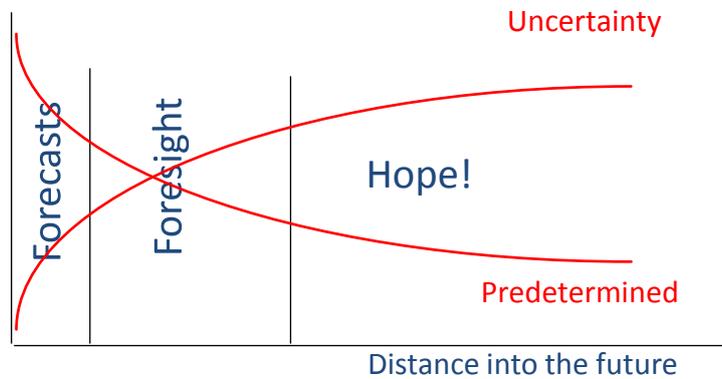
- We are in a world of uncertainty
- Policies are too often driven by an 'official' view of the future
- Scenarios enable a wider range of potential opportunities to be assessed
- Foresight enables risks to be identified and managed
- In some cases we can influence the future



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Introduction to scenarios

- Descriptions of how 'the world' might look in the future
- Possible 'paths' to the future
- Based on an analysis of drivers of change
- Should be engaging, compelling and credible
- Must have internal logic and consistency
- Allow critical uncertainties and predetermined elements to be separated
- Not predictions or forecasts
- Future will contain elements of each scenario
- *Tool to support strategic conversations and insights*



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Scenario planning process

- Stage 1:** defining the scope of the scenarios (focal question)
- Stage 2:** identification and analysis of drivers
- Stage 3:** identification of predictable elements and critical uncertainties
- Stage 4:** construction of the scenario axis, 'space' or 'cone'
- Stage 5:** selection of the scenarios
- Stage 6:** creation of the scenario narratives.
- Stage 7:** communication of the scenarios

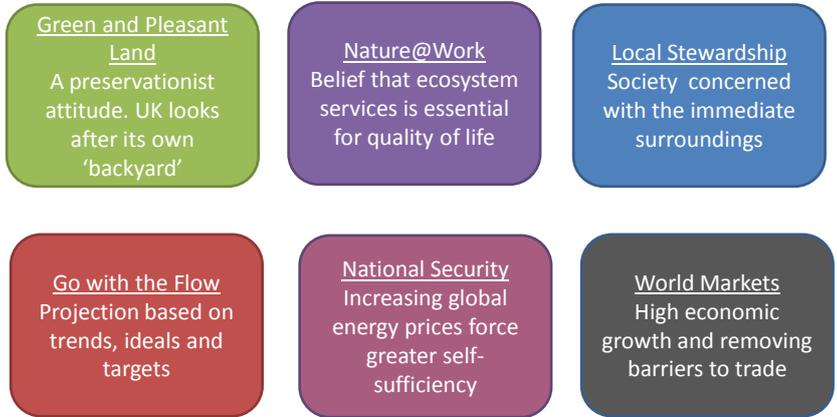


UK National Ecosystem Assessment

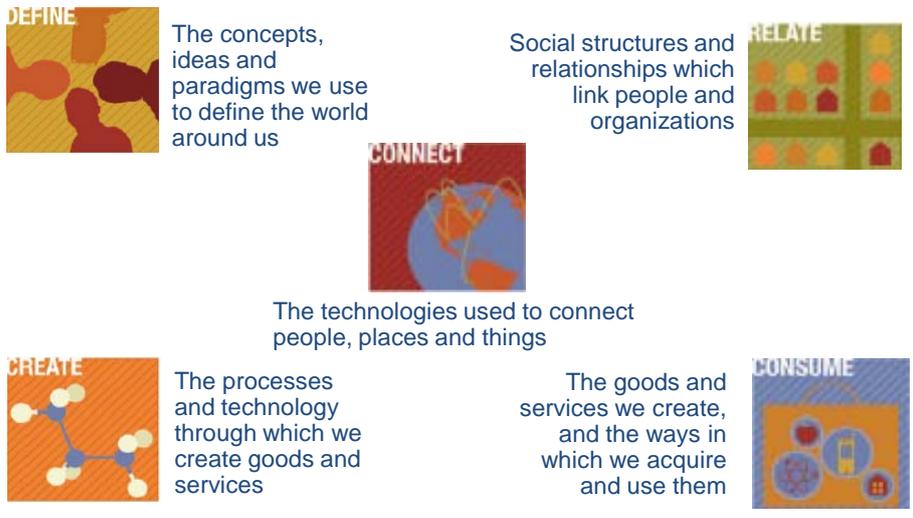
- 2 common scenario characteristics
 - Decline in global resource availability
 - Aging UK population
- 5 key socio-economic key uncertainties (drivers)
 - Environmental awareness
 - Human well-being
 - Governance and intervention
 - Overseas ecological footprint
 - Adaptation capacity
- 6 scenarios



UK National Ecosystem Assessment



'Ethnographic' Scenario framework

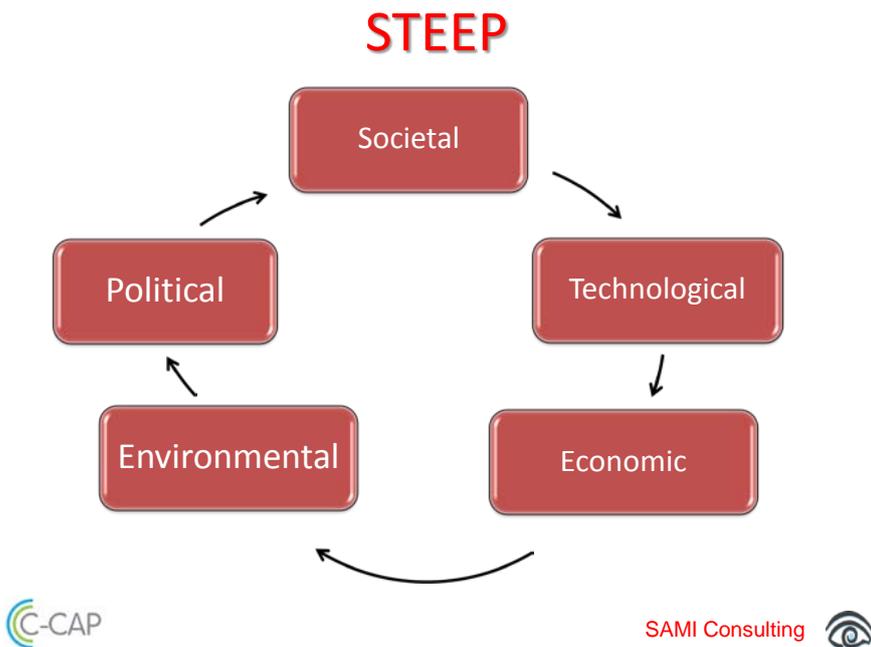


The Focal Question

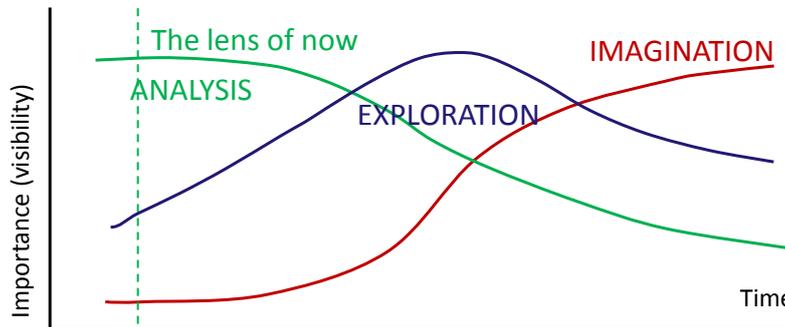
What are the key factors that will impact European and international demand side orientated policies and services; and the success of achieving the EU Climate Change and Energy target of a competitive low carbon economy by 2050?



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Think about – 3 Time Horizons



Horizon 1: e.g. Current drivers and trends

Horizon 2: e.g. Emerging drivers of change

Horizon 3: e.g. Weak signals of emerging drivers of change



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High impact drivers of change

- Review drivers on table and consider which drivers will have the biggest impact on the 'CARBON-CAP'
- Write on post-it and put on wall
- Position the high impact ones on the right of the horizontal axis.

Environmental concerns

The level of interest of the general population in climate change and having a sustainable future. Including willingness to accept associated costs and restrictions.



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Highest uncertainty drivers of change

- Consider the uncertainty of high impact drivers – move high uncertainty up and low uncertainty down.
- Group the high impact high uncertainty drivers into clusters (typically 3 to 5)



Uncertainty of driver of change

