



Visual toolbox for system innovation

A resource book for practitioners
to map, analyse and facilitate
sustainability transitions.



Climate-KIC is supported by the
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Content

Introduction	06
---------------------------	----

Chapter 1

Introduction Stakeholder management	11
--	----

Tool 1

Pentagonal problem	16
--------------------------	----

Tool 2

Actor tree	22
------------------	----

Tool 3

Enlarged empathy map	28
----------------------------	----

Tool 4

Credential cards	34
------------------------	----

Tool 5

Skateholder mapping	42
---------------------------	----

Tool 6

Skateholder universe	54
----------------------------	----

Chapter 2

Introduction Multi-level perspective	63
---	----

Tool 7

The context map	70
-----------------------	----

Tool 8

Trajectories of change	78
------------------------------	----

Tool 9

Flourishing multi-level	86
-------------------------------	----

Tool 10

Fishing for barriers	96
----------------------------	----

Chapter 3

Introduction Visioning and backcasting	107
---	-----

Tool 11

Ocean of opportunities	112
------------------------------	-----

Tool 12

Visual story	118
--------------------	-----

Tool 13

Future radars	126
---------------------	-----

Tool 14

Sociotechnical roadmap	136
------------------------------	-----

Chapter 4

Introduction Niche management	147
--	-----

Tool 15

Transition waves	152
------------------------	-----

Tool 16

Six systemic strengths	162
------------------------------	-----

References

.....	168
-------	-----

Multi-level perspective

A Multi-level perspective helps you to look at and gain insights into the context of an innovation project or system. It can give you a better understanding of the relationships between the project and any other factor or element surrounding it.

Multi-level perspective

The Multi-level perspective (MLP) is an analytical approach to describe processes of innovation and transitions in socio-technical systems. It can be used to better understand the relevant context of system innovation projects.

To describe socio-technical systems and how transformative change takes place, the MLP breaks down the system into three levels: macro (landscape), meso (regimes) and micro (niches of innovation). The interplay between them, and within them, trigger non-linear changes in the systems. As a consequence of these changes; the transition happens.

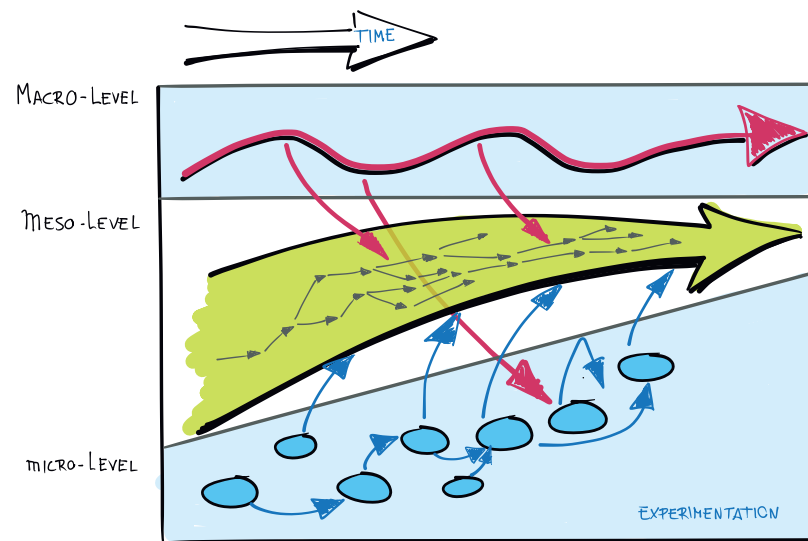
Regimes represent the current socio-economic systems, made up of social, technical, political and financial components. The co-evolution of the regime results in the current status quo. This evolution is affected by feedback loops coming from the macro-level (exogenous forces) and grassroots innovation (micro-level), resulting in different trajectories for change.

Components of a sociotechnical system:

- Landscape (macro-level)
- Regimes (meso-level)
- Niches (micro-level)
- Feedback loops between all levels



Green skills for boosting transition in water management Innovator Catalyst series. The Climate-KIC. Valencia, 2014 (Spain). <https://goo.gl/lq0o5>





Macro-level: Landscapes. Exogenous, autonomous, long-term trends and crises (demographic, environmental, macro-economic, macro-political, ...)



Meso-level: Regimes. Established, mainstream practices, structures and culture (rules and regulation, infrastructure, economic structures, technological lock-ins, incumbent stakeholders, behaviour, ...)



Micro-level: Niches. The 'incubation rooms' for radical innovations, shielding them from the mainstream. Niches could take the form of innovation projects or experiments in small-scale 'places' that are deviant from business as usual...

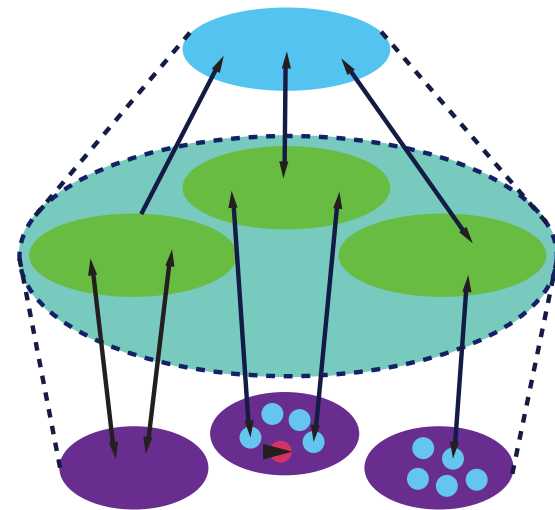


Figure: Multiple levels as a nested hierarchy. Adapted from Rip and Kemp, 1998 and Geels, 2002.



Macro-level. Landscape

Landscape can be seen as a source of drivers for transformative change in the long term.

It depicts exogenous, long-term and autonomous trends and major crises. At the same time, some of them can be a consequence of the long-term society behaviour (i.e. demography). Landscape developments are sources of pressure for change onto regimes and may end up as drivers for a major change. It represents a set of guiding principles to action.

Four sources of pressure stand out:

- Factors that do not change or change slowly, such as the climate.
- Long-term developments: industrialisation, urbanisation, demography, macro-economy, climate change, geopolitics, raw material stocks...
- Rapid and unexpected events / shocks such as a tsunami or an earthquake.
- Overarching world views, values and paradigms.

Landscape developments cannot directly be influenced. A way of dealing with them is to relate to them by using parameters within the system that can be influenced (directly or indirectly). For example, we can fight climate change (primary objective) via changing the energy system or transport system. These measures also have direct effects not linked to climate change (additional benefits that come on the way to the main objective):

Policies to reduce air pollution in cities, increasing life quality and reducing hospital bills. Electric transport initiatives could be related to that, and are 'sold' to the public as noise reduction/cost savings (daily life benefit for individuals), but it is a milestone on the way to your big target: fight global warming.

Zero energy houses: in the end, owners/renters save money. In times of financial crisis this is a compelling additional benefit that ultimately is a key step to main goal of fighting climate change.

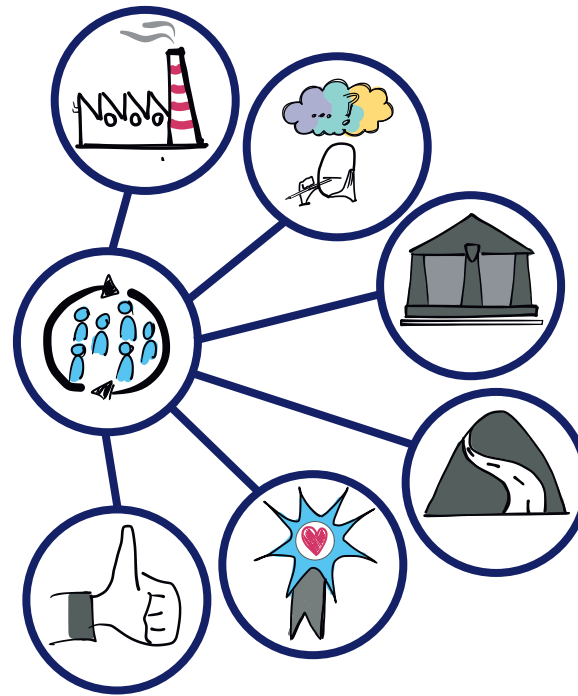
Meso-level. Regime

Regimes account for the current status quo, the social and economic system we perceive, and lead to self-stabilisation and optimisation.

Regimes are made up of current stakeholders, who hold a certain position or have power and interests in maintaining the status quo, the mainstream technology and knowledge. It is the way the stakeholders organize, the way they use resources, technology and knowledge and shape the current system in which we are embedded. As a result, the system is organized around different dimensions such as regulations, institutions (political, financial, social...), user behaviours and cultural values (i.e. the way we perceive and value cars).

All of these components have co-evolved for years in an incremental and steady way. As a consequence, the system usually tends to self-stabilise and some dimensions can act as actual barriers against novelty and radical innovation.

Different regimes co-exist at the same time, interacting with each other and with a similar context at the macro-level. For example: the mobility system, energy system, building system and healthcare system all have to deal with demographic developments and trends like urbanisation.



Socio-technical regimes are multi-dimensional. Depending on the sector, the number and type of dimensions can vary:

- Industry structures.
- Knowledge.
- Institutions, regulations.
- Mainstream technology and infrastructures.
- Actor configuration.
- Cultural values.
- Markets and dominant user practices.



An inventory of related innovation projects is useful as you can learn a lot from ‘fellow’ innovators, e.g. about regime barriers, such as cultural barriers, routines, innovative approaches and so on. Fellow innovators may also become fellow-lobbyers and activists for regime change.

Niches of innovation

At the micro-level, experiments and innovation projects takes place. It is the level of grassroots innovation and bottom-up initiatives, as well as the origin of radical changes and alternatives for the dominant system.

Niches can be understood as partly-protected spaces where radical innovation can take place with exemptions from the regular market rules, regulations and other pressures coming from regime dimensions.

Universities, R&D departments and the military are typical niches of innovation, but they can flourish anywhere. Some of the sectors in which radical innovation may happen are social and economic systems. New ways of consumption are being promoted from civil society organizations/NGOs, etc and are gaining momentum in the mainstream at local or regional level. At the same time, experiments for micro-financing and new business models are surfacing worldwide: PV systems

in rural areas, consumers as energy producers, low-carbon lifestyles, boom in vintage/second hand products, free cycling, car-sharing...

However, to break through the regime, Niches have impediments. Niches, by definition are outliers, they do not have popular acceptance. They have low levels of organization and have weak/narrow networks. Nascent niches are not very stable and lack the power to influence fundamental changes at the meso-level. Many niches may be a concerted effort/retaliation against regime barriers: punk, hippy communes, tattoos, private liberal/religious schools, etc. that may one day become mainstream as in the case of hippies and punks.



Multi-level perspective

Tool 7
The context map

Tool 8
Trajectories of change

Tool 9
Flourishing multi-level

Tool 10
Fishing for barriers



Tool 7 The context map

Systemic perspective

A project is not an island in an ocean. It exists in a specific location with a defined environment and within a broader system made up of stakeholders, competitors, regulations, institutions, etc. The Context map is a straightforward tool that helps you understand and analyse the external macro-environment around your project, business or challenge.

The context map

What it is

The Context Map is a visual tool for system analysis, based on the well-known technique PEST1 (Aguilar, 1967). It has been adapted to the system innovation context by increasing and modifying the factors included in PEST and focusing on trends as potential drivers for change, in addition to the factors characterising the system. The tool provides a soft approach to the threefold layer structure that is the base for the Multi-level perspective theory.

When to use

At the beginning of the project, when you need to get a quick idea about the system around the challenge and how it works. It should be done before making key decisions about the project, in order to spot threats and opportunities that might dramatically change your initial plans.

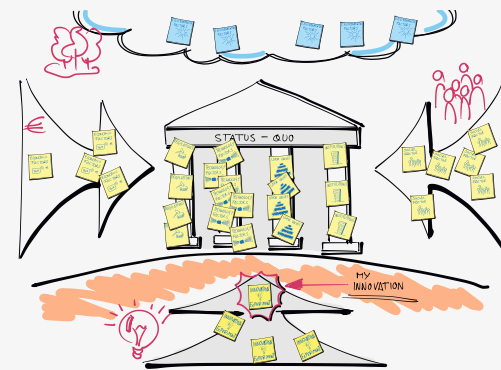
PEST is an analysis tool widely used in project management to analyse the Political, Economic, Socio-Cultural, and Technological changes in a business environment.

Why it is useful

One of the most important advantages of the Context Map is its simplicity. In contrast to the Flourishing multi-level, you don't need an in-depth understanding of system innovation or sociotechnical transitions.

The Context map helps you to understand how the system around your challenge works and consequently to spot opportunities or significant threats for your project. It gives you an idea about the current state and the direction of change within your project environment. It helps you to avoid being trapped by your unconscious assumptions when you enter a new country, region, or market.

Overall, the Context Map broadens your scope and increases your awareness of the all-embracing context, which puts you in a better position to make better decisions, adopt a strategy or navigate through the system.



HOW MANY From 1 person to groups of 10 people.

HOW LONG 40-60 min.

DIFFICULTY Low- Medium.

WHAT YOU GET A quick, visually appealing and comprehensive picture of the factors influencing and creating the system in which your project is embedded.

WHAT YOU NEED A clear idea of the socioeconomic framework that your project sits within, as well as the environmental context.

WHAT IS NEXT Equipped with the overall picture of the system, you may want to go for a deeper and more comprehensive understanding of that system by carrying out a proper Multi-Level Perspective analysis. If so, then go with the Flourishing MLP tool. If not, you can start planning future steps by envisioning what the system may look like in 10 or 20 years' time. Then you can see how to fit your innovation within the vision.

Steps

STEP 1. The canvas

First of all, take a large piece of paper and draw the canvas. As you see in the model, the canvas is made up of four parts.

The main system, what you might call the dominant market or status quo, takes up the centre of the canvas, it is depicted by a classical building with four columns supporting the building. These columns stand for regulations, the dominant technology, the network of institutions and the social values.

On both sides of this building there are two mega-trends also belonging to the status quo and with huge influence in its dynamics: social and economic (factors and trends).

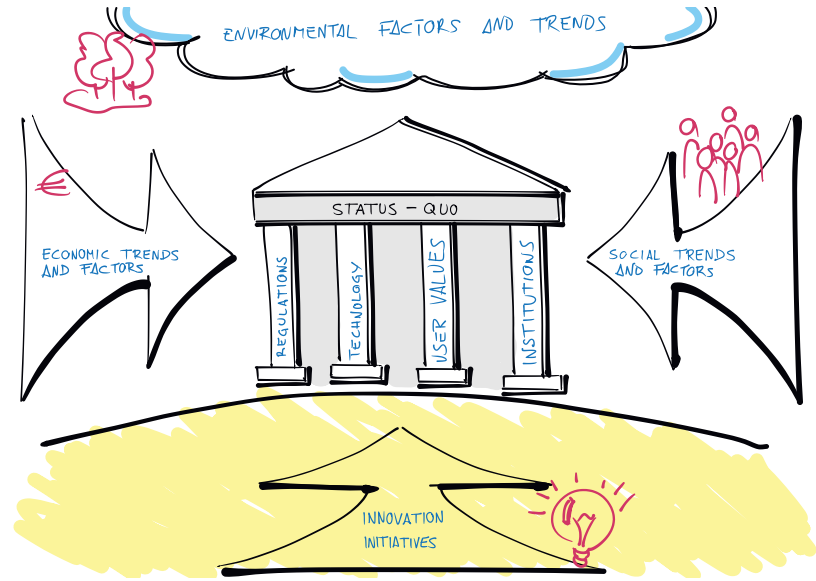
Innovations are at the bottom of the canvas and are depicted by the large arrow pointing upwards, to the dominant market.

The last part is the environment. It occupies the upper side of the canvas and is represented by a big cloud.

STEP 2. The starting point

Before starting with the canvas, you need to define a clear statement for your challenge. Is it an innovation (technological, social, economic)? Is it a project? Is it the development of a new product or service? If you used the Pentagonal problem or any other similar tool you can resort to their outcomes to clearly define the challenge.

Your project is located in a specific place. Whether it is a city, a region or even a country; environmental and geographical conditions will have an effect on your challenge. Therefore, after defining your challenge, you should spend some time discussing where the project is located and what the geographical and environmental limits are. Of course, you may think there are no boundaries for the environmental factors but you have to pin them down to be able to keep the analysis in a clear and manageable framework. Bear in mind both elements (the challenge and the system boundaries) for the rest of the steps, they will serve as a criterion to decide



whether a concrete factor is relevant for your project, or not.

STEP 3. Innovation initiatives

The large arrow pointing upwards accounts for the innovations in the process of breaking into the market. Individually, identify cutting-edge projects and experiments with the potential for breakthroughs. Use one post-it

for each initiative and put them on the canvas. While explaining them, new ideas can emerge. If so, write them down on another sticky note and place them on the arrow.

These initiatives may come from an university running an experiment, a start-up developing a new technology, a civil organization developing new ways for collaborative consumption,



Train the Trainers event.
Training coaches for the
Pioneers into Practice
programme. Utrecht,
2015 (The Netherlands)

from a large company R&D department, etc. These projects should be relevant for your own project, perhaps potential allies or competitors. Bear in mind that by monitoring new technologies and innovations, you will be able to capitalise more on changes.

Your project is likely to be one of these innovations. If that is the case place a post-it with it on the tip of the arrow.

The next step is to characterise the status quo. That is the current social and economic system, dominated by mainstream technologies, established institutions, rules and regulations, powerful players, etc. At the same time, there are socio-economic mega-trends within the system. All of these components relate to each other, combining to create the dynamic system we call status quo. This dynamic evolution tends to stay in the same direction, keeping new innovations out of the system and acting as real barriers for innovation. However, some elements might act as drivers for change and innovation. Think of a new

trend in market consumption (green consumers), a new trend for a greener policies including new regulations, etc.

Let's start with the building and identifying elements for the four columns: Technology, Regulations, User values and Institutions. Work individually for 10 minutes identifying as many elements as you can and then start a group discussion as you put your ideas on the canvas.

TECHNOLOGY.

Technology accounts for those factors and events that characterise the technological landscape in your system or status quo. Technology is constantly evolving and it is essential to have an up to date picture of it. Think of dominant technologies you need to compete for the same space in the market/society. At the same time, think of those trends and established innovations that can pose new opportunities.

REGULATIONS.

Current regulations establish the rules for the status quo perfor-

mance, including trading, technological norms, competition, environmental, etc. Newcomers and new innovations might not fit within the current regulation framework, which means that rules would be acting as barriers for those innovations. If that is the case, you may need a kind of protection or lobby for your innovation to succeed. At the same time, some regulations or recent changes might be opportunities for your project. Identify those regulatory factors relevant for your innovation whether they are considered as barriers or opportunities.

USER VALUES.

The range of social values provide the basis for what is right and what is not, shaping business behaviour. These values encompass, among others, cultural understanding of different technologies, and even the social ethical framework, which can be determining for your innovation to be adopted.

INSTITUTIONS.

The current and relevant players in your system are organised in a

way that affects how the system as a whole works. That means you should fit within this institutional interplay or be able to change it, if you want your innovation to break into the market. Therefore, try to identify those institutions, big players, as well as any explicit or implicit cluster characterising the system and potentially affecting your innovation.

The effects of the environmental factors and trends on the status quo, may act as barriers or drivers for change and more specifically for your innovation project.

STEP 4. Economic and social trends

Social/financial factors and trends are two of the most powerful elements within the status quo. They both pervade the other components of the system becoming key

drivers for its dynamics. In this step you are to work on them, identifying as many relevant factors as possible for your project.

ECONOMIC

Factors such as access to credit, inflation rates, consumer confidence, economic growth, etc. can make a big difference in the way a system works and how your project can fit within such a system. Business models, including those new approaches emerging in the market, can also be relevant for the future of your innovation.

SOCIAL

The second mega-trend is made up of the social and cultural conditions which take place in the dominant market. Customer habits and assumptions can keep your innovation off the market for years. For this tool you don't need to conduct a market research study, but pay attention to those factors that can impact your project opportunities: social perception of technologies, lifestyle trends, consumer habits, etc.

STEP 5. The environment

All businesses impact their environment and are impacted by it. The impacts coming from the environment are linked to the geographical context. Therefore, start by identifying the environmental factors on your innovation or on the status quo. These factors may act as barriers or drivers for change and more specifically for your innovation project. For instance, a water scarcity might be a great opportunity for your innovation to enter the market, or climate change might deplete the performance of your innovation because of heat waves or other force majeure/natural disasters/ large unforeseen societal changes. Conversely, identify how your innovation may impact the environment either negatively or positively. Again, these effects could work in favour of your innovation (your innovation could reduce the negative effects on the environment compared to the dominant technology) or as barrier to it.

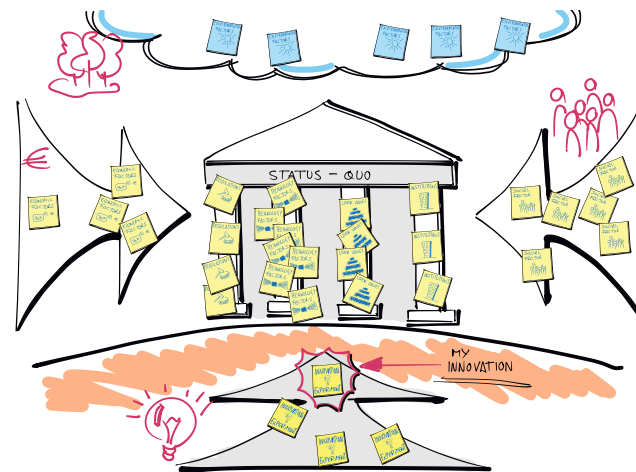
STEP 6. Debrief

After filling out the canvas reflect on the big picture that has arisen and try to come up with the main drivers and barriers for your project innovation, corresponding to the system features you identified.

Which status quo factors are affecting your innovation the most? In which way? Can you see evi-

dent strategies to get around the barriers and harness the potential opportunities? Is the environment a constraint or a driver for your project? Have you identified the big players and organisations you will have to compete with? Do you think society is ready for the change you propose with your innovation? Why?

These are some of the questions that can guide you to start reflection and closure discussions.



Find out more

<http://www.climate-kic.org/transitions-hub>



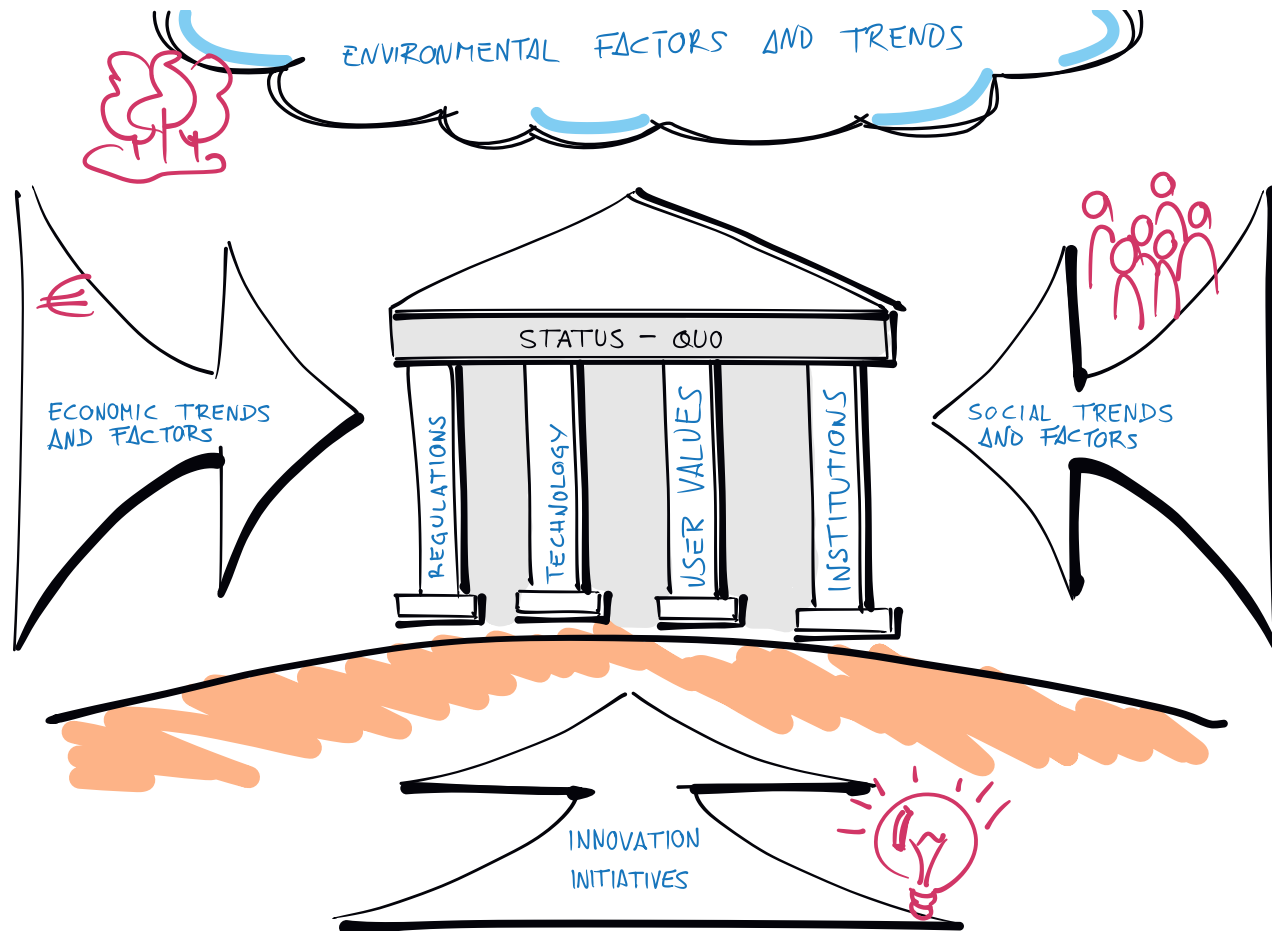
Broader context

STATUS - QUO



<https://learning.climate-kic.org/courses/system-innovation>

Screenshot from online materials. System innovation and Climate Change eModule. Climate-KIC, 2016.





Tool 8 Trajectories of change

Multi-level perspective

Trajectories of change looks at how a system evolves and where innovation comes from. It can help you to understand sources of resistance and resilience to changes in your system and the diversity of alternatives co-evolving at the same time in different trajectories.

Trajectories of change

What it is

Trajectories of change is a visual tool to depict how the system, or meso-level in which your challenge is embedded in, has evolved over time. This system evolves and changes as a consequence of incremental innovations and the effects coming from the other two levels, macro and micro. In this sense, Trajectories of change focuses on the horizontal evolution (temporal) of the system as a consequence of vertical relationships between levels and within them.

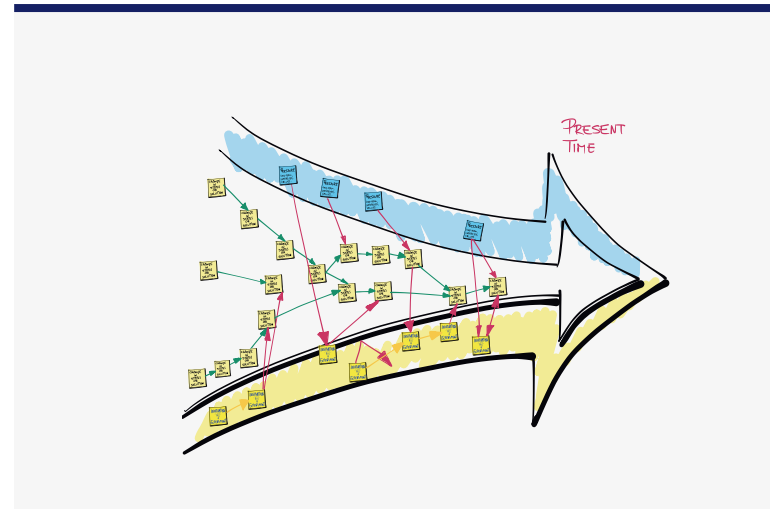
When to use

Whenever you need to know and analyse the evolution of the system over time, and the factors underlying such an evolution, in order to better understand the current dominant solutions that you probably want to change.

Why it is useful

By depicting a time line of changes happening in the system, you will gain insight into the dynamics of your system. You will learn the type of factors that traditionally have led the system to change and how it reacts to that change:

- Where the roots for innovation came from.
 - The resistance and resilience of your system against the transformative change.
 - The diversity of alternatives co-evolving at the same time in different trajectories.
- With this new knowledge you will be better prepared to come up with a strategy for your own innovation to elicit a transformative change in the system.



HOW MANY From 1 person to groups of 10 people.

HOW LONG 60-120 min. Depending on how deep and far you go with data collection and analysis.

DIFFICULTY Medium-High.

WHAT YOU GET A comprehensive and visual depiction of the main systemic components of your problem.

WHAT YOU NEED You need a clear picture of the system in which your challenge is embedded, as well as significant sources of information to dig deeper into the past and see how and why solutions changed over time.

WHAT IS NEXT Once you get the pathway that led your system to the current status quo, you may want to break down such a status quo into its different constituents. It will give you an accurate and fixed picture of the current system. You can go for either the Context map or the Flourishing multi-level canvas.

Steps

STEP 1. Drawing the canvas

Take a large piece of paper and sketch out a large version of the canvas. The big arrow depicts the evolution of the whole system including the three levels (macro/meso/micro), encompassing changes happened and relations or feedback loops between levels.

STEP 2. The starting point

Before starting with the elements of the canvas it is essential to have a clear idea about what your challenge is about and the system in which it is embedded. Is it about food, energy, building, water, mobility...? Whatever it is, make it as specific as possible before starting on the canvas. For example, if the challenge is mobility, specify if it is about mobility in cities or at a different scale. You need to provide enough context to the challenge and the system because it has probably changed so much over decades that now it would hardly be recognizable. For instance, mobility in cities might have morphed into sustainable

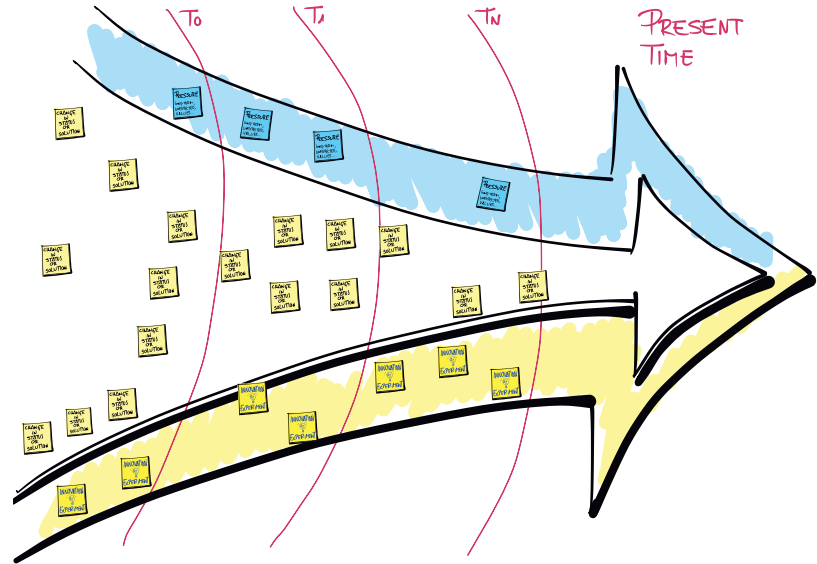
mobility with solutions and approaches miles apart from those 40 years ago.

Once you have singled out the specific topic and system, go backwards and pick out a date in the past. If possible a relevant date, maybe because a major change came about then, maybe because you have enough data, etc. This relevant date in the past, along with the system in which your challenge is embedded, will make up your starting point.

STEP 3. Identifying novelties and changes

From that date in the past, start moving forward to the present moment and identify any of the following events:

1. Any novelty, breakthrough and experiment at the micro-level, that was significant for the system at a certain moment. They could be a technological innovation, new financial arrangements, different social organisations, new business models, etc. Remember that the micro-level is somehow protected from



the standard regulations of the market. At this step, don't pay any heed to the effect that those innovations have been caused on the meso-level. You might even identify innovations that didn't cause any impact on the meso-level in the long run. In either case, you will go through cause-effect relations in the next step.

2. Any relevant change in the system (the meso-level, the current market/society, the re-

gime) over time. These changes form the dominant solution at any moment of the temporal sequence. Indeed, the sequence of changes will define the dominant trajectory as time passes by. The rate of these changes is usually incremental, yet every now and then a breakthrough can appear, causing a complete transformation of the system. Chances are, that you are thinking of technological innovations that changed the system to a certain extent, but don't forget that changes

can also be on infrastructures, knowledge, industrial capacity, regulations and policy, etc. For instance, the Kyoto Protocol is a regulatory change affecting many different regimes (energy, mobility...). You can use the list of regime domains as guidance to identify the relevant changes that occurred in your system.

3. Events related to long-term developments or a crisis at the macro-level. They could be an event related to the social awareness and mental framework, an unexpected event such as an economic crisis, etc. Just bear in mind that the event must be relevant to your challenge and system. Beyond the overused example of climate change, the first Iraq War accelerated the development of GPS technology. Initially designed for military use, it ended up pervading the civil society and significantly changed the navigation solutions in the mobility system. As you identify any event, write it down on a post-it note and try to put it on the canvas according to the timeline. You may want to

spend time discussing the relevance of some events to decide whether include it or not. However you can leave this discussion for the next step in which the connections will come to light and you will be able to decide which events to rule out.

STEP 4. Identifying relations and trajectories

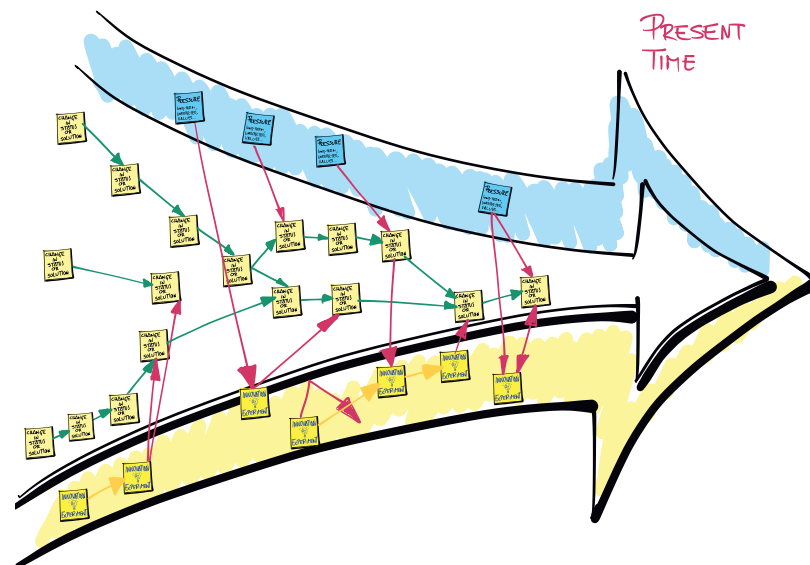
After identifying the events, you need to relate them to each other, as if it were the game "joining the dots", draw an arrow linking those events that are related to each other. Bear in mind that these relations can be within the same level and between levels:

- Changes in the meso-level can happen as a consequence of incremental innovation within the system (green arrows in the figure), these can be a result of an innovation or breakthrough coming from the micro-level (in red arrows going up from the niches to the system) or as a consequence of pressures coming from the macro-level.

- By the same token, innovations in the micro-level can evolve or feed into each other (yellow arrows in the figure) and occasionally scale-up to the meso-level triggering a change (red arrows from micro to meso-level). Some of the questions you may ask are: Are some experiments related? Did one of them build on another? Did they learn from each other? Did some niches develop into a network? Are some niche inno-

vations breaking into the meso-level and influencing new changes?

- In return, long-term developments in the macro-level can pressure the meso-level or even the micro-level bringing about significant changes (red arrows from macro to meso and micro-level). It is noticeable that sometimes a ripple effect can be identified. That is, pressures coming from the macro-level

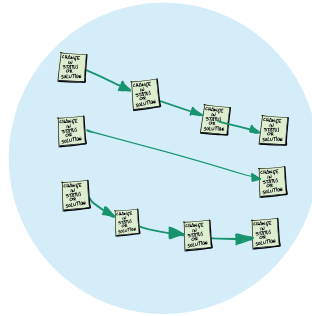


el can cause some changes in the meso-level that open a window of opportunity for innovations to jump from micro-level to meso-level.

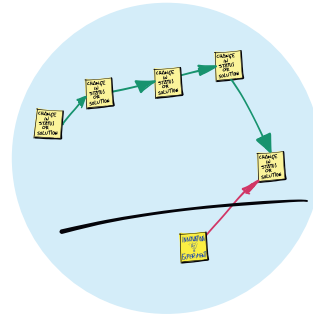
- Although influences between developments within the macro-level or from the micro or meso-level to that macro-level also exist, it is more difficult to pin them down at any specific moment. Rather, they are usually a consequence of accumulative effects. However, if you feel that some of these relations can be clearly spotted, just do it.

- Underscore milestones, junction/splitting (bifurcation) points, moments in which niche-innovations radically changed the system. Your whole system will be defined by the collection of changes and relationships. Both are responsible for analysing the current status quo and identifying the possibilities of transformative change for your challenge.

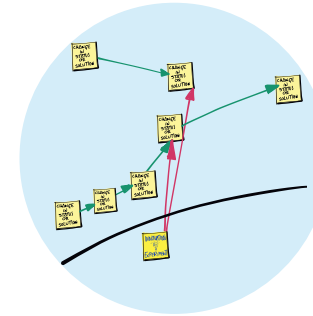
- Notice that you can come across some of the following trajectories:



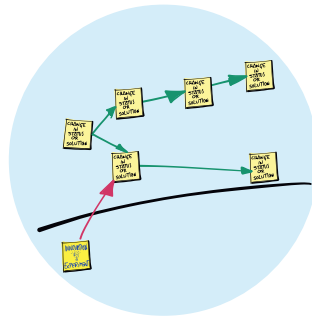
- Different solutions (trajectory) co-existing in the system (meso-level) at the same time. For instance, steam cars, electric cars and gas cars were developed at the same time and those three were in the market simultaneously for a time.



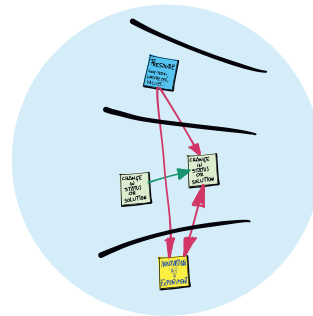
- Bifurcation: For the same reasons, putting on the table different and alternative solutions that emerged at some shared starting point.



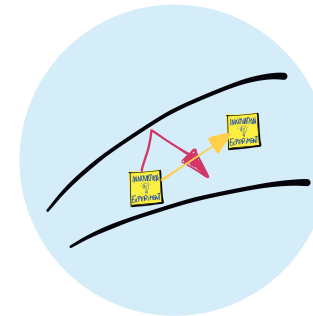
- Similarly, sometimes in the regime a trajectory dies at a certain point. Imagine two alternative solutions coexisting in the market. At a certain moment, a new novelty can provoke the one of these solutions to take advantage of it, adapt and evolve; while the other is not able to adapt. The first solution will probably take over the market and the second will end up disappearing.



- Changes of direction: As a consequence of an innovation (usually coming from niche) the meso-level changes direction; addressing new solutions, structures, etc.



- An experiment or innovation cannot always break into the meso-level and cause a change. Sometimes the innovation is abandoned or ends up evolving or feeding another innovation.



- Sometimes loops and bidirectional relations can appear. For instance, the climate change caused governments to sign the Kyoto protocol which, in return, caused changes in regulations opening a window of opportunity for new technologies, which forced more changes in the system, etc.



Elements of Complete Plan

- Business Plan
- Mission Statement
- Objectives
- Strategies
- Means to Success



Boosting sustainable economy in rural areas. Innovator Catalyst series. The Climate-KIC. Budapest, 2015 (Hungary). <http://goo.gl/iufdY4>

STEP 5. Debrief

Based on the outcomes, reflect on the changes so far in your system and how experiments or niche innovations have been able (or not) to affect the current status quo.

What changes have driven the evolution of your system so far? Technological, financial, social...?

Discuss the effect of long-term pressure on the mainstream system and the other way around. What do you think the effect of the meso-level on the macro-level has been? Do you think the system presents resistance to change? Does it look like it has a strong path dependence?

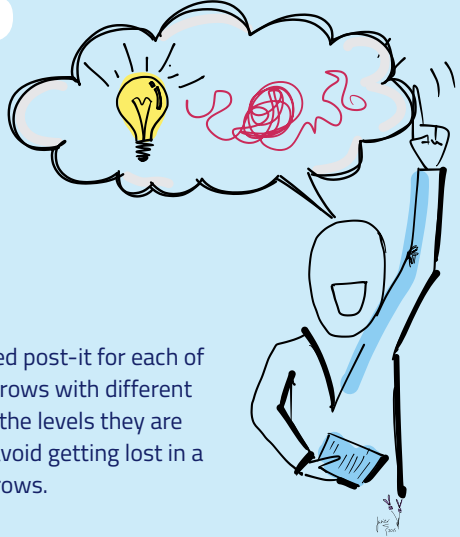
Have there been active and effective grassroots innovations in the past? What are pressures or tensions within the regime, making the current system unstable and creating 'windows of oppor-

tunity' for experiments and niche innovations?

What type of pressure or radical innovation would need to occur for a transformative change to happen? If you have an innovation (whether it is technological, economic or social), what strategies could you use to take advantage of potential windows of opportunity?

What changes have driven the evolution of your system so far? Technological, financial, social...? What do you think the effect of the meso-level on the macro-level has been?

Tips



- Use different coloured post-it for each of the levels and draw arrows with different colours depending on the levels they are linking. It will help to avoid getting lost in a sea of post-its and arrows.

Find out more

<http://www.climate-kic.org/transitions-hub>

