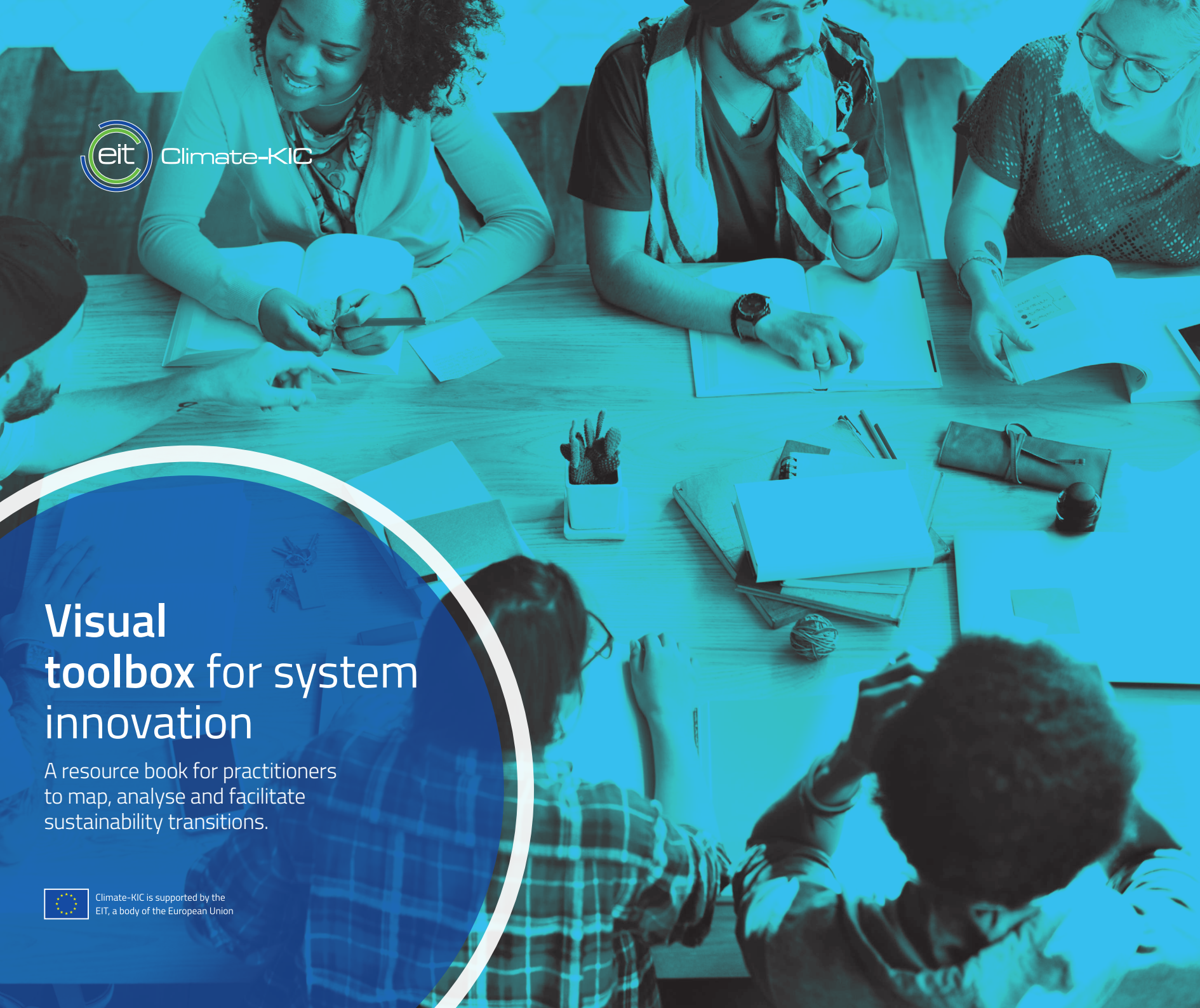
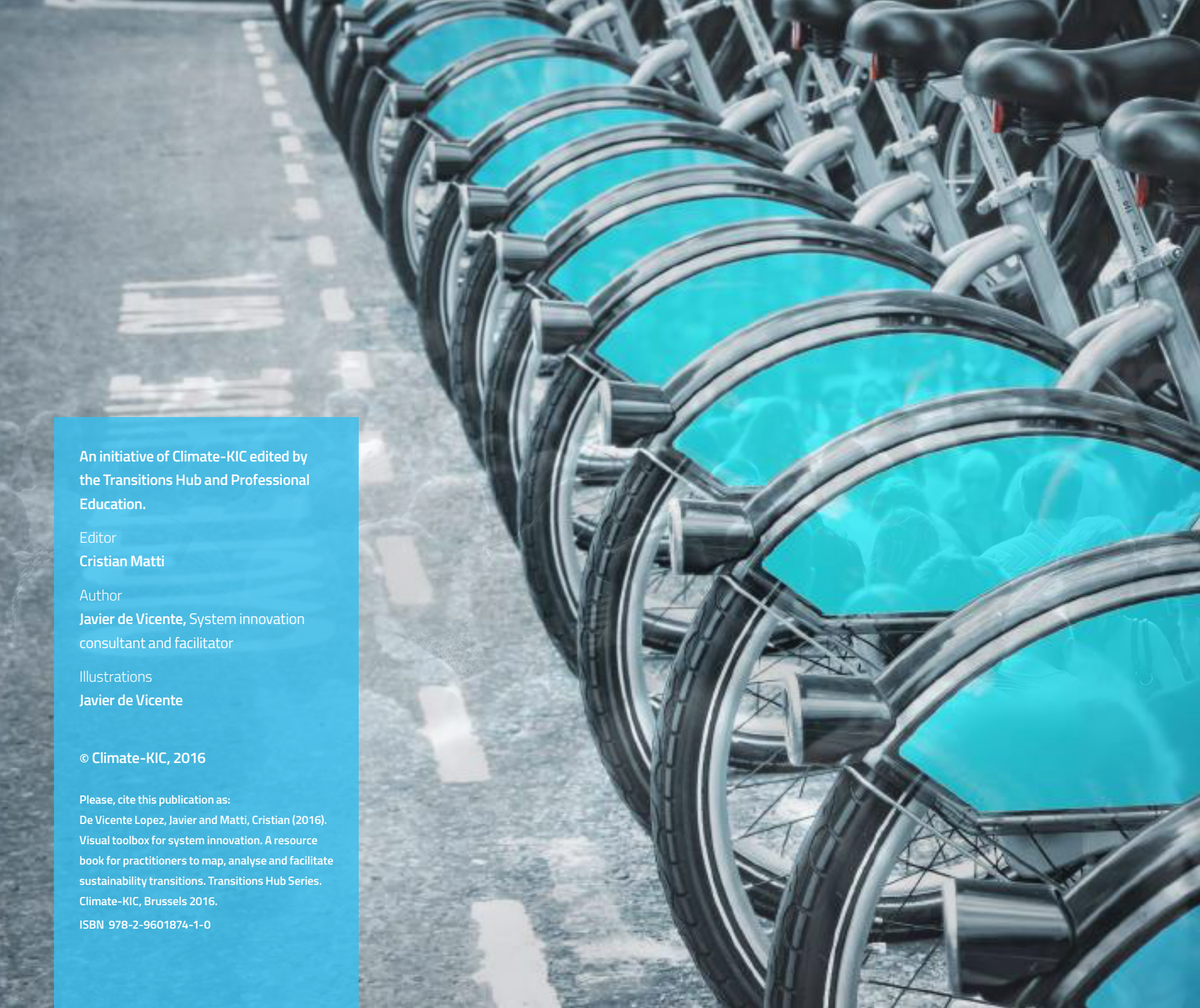


Climate-KIC

Visual toolbox for system innovation

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

Climate-KIC is supported by the EIT, a body of the European Union



An initiative of Climate-KIC edited by the Transitions Hub and Professional Education.

Editor
Cristian Matti

Author
Javier de Vicente, System innovation consultant and facilitator

Illustrations
Javier de Vicente

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Why this book?

The idea of system innovation has been widely diffused in academia and business to refer to major transformation in national and regional economies through technological breakthroughs, reorganizations of industries and the implications of a globalised economy. In the field of climate change, this concept has been deeply applied through the study of socio-technical transition by a number of expert organisations such as the Knowledge Network for System Innovations and Transitions (KSI), the Dutch Research Institute for Transitions (Drift) and the STEPS Centre of the University of Sussex - (Social, Technological and Environmental Pathways to Sustainability). The more practical application of sociotechnical transition, known as transition management, has also been developed by practitioner-based organisations such as Smart CSOs and Forum for the Future.

The Climate-KIC has widely applied elements of system innovation and transition management by combining other general project and innovation management elements. Pioneers into Practice, the Innovator Catalyst and summer schools are some of the key education programmes that have adopted this approach for years. That experience has revealed the difficulties of applying the theories and perspectives to day-to-day practice in certain projects. Practitioners demand adaptable and flexible tools and methods that are easy to transfer to their challenges and problems.

At the same time, throughout these years of intense training, the use of co-operative learning methods, peer-to-peer activities and modular formats have arisen to be as highly valued by skilled participants who are demanding new learning methods in which experts and mentors are liberated to work more horizontally with practitioners and problem owners. All these experiences have been the inspiration for this book which aims to play a key part in improving the development, the skills and the application of support system innovation in the field of climate change at both, individual professional level and organizational level.

Cristian Matti
Transitions Hub - Climate-KIC &
Utrecht University *

* Learning and Knowledge Manager at Transition Hub and researcher at the Copernicus Institute of Sustainable Development - Utrecht University.

Content

1- What is this book about?

The book is a collection of ready-to-implement tools to structure and manage the challenges and exploit opportunities of sustainability innovations and transitions. The goal is twofold: improving the understanding of a challenge by going deeper, broader and by improving the quality of the discussions and conversations around the problem among participants. It means to put the focus not only on the problem solving process but also on the learning process while designing and implementing solutions. The tools are presented in a simple and visual approach with the purpose of supporting practitioners' every-day work on climate change, transition and system innovation.

The toolbox is rooted in a modular structure, built upon four modules that account for the main steps in the system innovation process before getting into the prototyping phase. That is: stakeholder management, multi-level perspective, visioning and backcasting and niche management. This structure is meant to facilitate the problem-solving process by setting out a pathway in the always blurred, uncertain and fuzzy process for system innovation. In addition to these modules, a standalone tool has been added to help users define the real problem they are facing.

The four modules holding the tools feed into a multidisciplinary setting, including transitions management but also practical elements from innovation management, systemic thinking, design thinking and project management. Based on this structure, the learning approach is based on the assertion "learning by doing through the application of tools on the users' cases".

In this regard, the toolbox is designed to help pick out those tools that best adapt to the practitioners' needs and background. The design of the tools has been sculpted around four features to maximise the learning experience under this approach:

Flexible. The book is designed for you to pick out the tools that best fit your challenge and then you can adapt those you chose to your own context. To make it easy to find the most proper tool, a variety of alternatives with different levels of complexity have been designed.

Standalone. The tools have been conceived to work individually and as a full suite. That means, you can single out one tool and apply it to your project, whether you are going to use more tools or not. Regardless of this capacity to be applied in a standalone way, it is highly advisable to conceive a pathway to follow within your innovation project including a coherent set of tools.

Visual. Most of the tools have been designed as visual devices to spark creativity, systemic and lateral thinking. The book is not illustrated to make it pretty. The pictures have a clear purpose and shouldn´t be skipped. It may take you time to feel comfortable with the visual metaphors proposed, but these techniques will help your non-linear and creative thinking (you just might need to practise a bit).

Systemic. The toolbox aims for a systemic understanding of problems and challenges. Therefore, you can expect this type of conceptualisation underlying every tool instead of a linear process of reasoning. This is why all the tools have been designed to be used in multidisciplinary and even multicultural frameworks, and to factor-in data and inputs from the context surrounding the project.

This book was developed simultaneously with eLearning material based on the main elements of flipped and seamless learning. In that sense, the tools are presented to facilitate a learning process where different types of activities, at different times and with multiple resources can be applied. The tools are also designed to support project management, organisational change and capacity building process for organisations or multi-stakeholder project set ups. Thus, group work, project development and peer-to-peer interactions are included as key elements for this flexible and tailored approach for practitioners.

2- How to use this book?

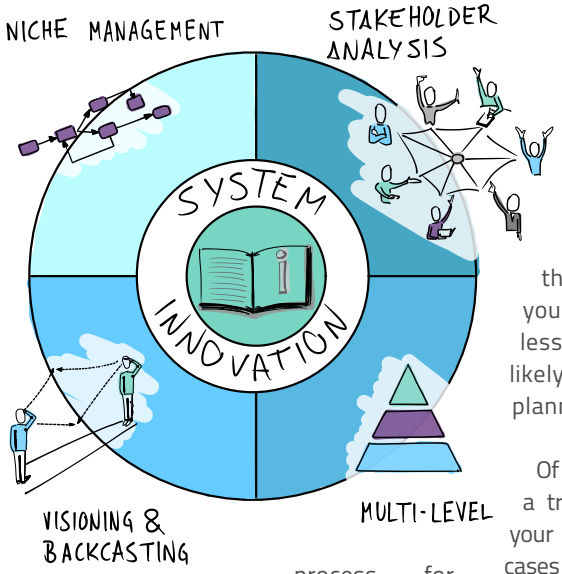
There are two important perspectives about how to use this book. First, is the use of the set of tools as a coherent sequence to support a system project management process or a training event. The second refers to the use of each single tool in whatever context you may need them.

As explained in the previous section, the book is built upon four modules accounting for a suggested pathway for system innovation (not including the prototyping phase): stakeholder management, visioning and backcasting, multi-level perspective and niche management. A kick-off tool has also been added to better define the system challenge (find out more in the box).

With this structure in mind there are two main ways of using this book. The first and simplest way is just to go for one specific tool you need in a certain moment of your project. Since the tools are designed as standalone devices, you may want to use one of them to work out a specific problem you are dealing with. For instance, you might only need to map out your stakeholders or to run a backcasting workshop. If that were the case, you would-n´t need to go through any sequence of tools but simply use the most relevant one.

The second way of using the toolbox is to be applied when you have a system project or a training workshop ahead of you. In those cases, you may opt for designing a comprehensive innovation route, starting with the problem definition and then going through the four modules. According to the challenge you face, the background and experience of the team and the context you are in; just pick out some of the tools from each module and build your own pathway for innovation.

You might think the toolbox suggests a kind of lineal



process for system innovation, but it doesn't. First of all, you don't need to cover all of the four modules if you think you don't need to at this stage of you project. Secondly, and more importantly, this is a systemic process to deal with systemic problems, even though you may design an initial process made up of five tools going through the suggested pathway. In this regard, most of the tools are to be applied once in a while during the project lifetime and many times there will be more than one tool in use at the same time. These feedback loops and parallel pathways characterise the real application of the toolbox to your project. Throughout these non-linear steps you will obtain invaluable lessons that will more than likely modify the previously planned pathway.

Of course, if you embark on a training workshop where your time, resources and real cases are very fixed, you might want go for a more linear process, just to get participants acquainted with the use of the tools.

1. Stating the Problem.

It is often noticeable that the main issue for a project team is to nail down and define the real problem and challenge. This is especially relevant in system contexts in which wicked problems are difficult to pin down and when we run the risk of finding the right solution for the wrong problem. Therefore, this tool is aimed to reframe the problem by helping practitioners to better spot what the right problem is and to nail it down at the same time as keeping a systemic perspective.

2. Stakeholder analysis.

Working with stakeholders is probably one of the commonalities in systemic projects and one of the first conditions. In this regard the toolbox covers three steps of this work with stakeholders: identifying, characterising and depicting relationships. Depending on time availability it can be useful to work with one tool from each category. Bear in mind that the stakeholder engagement phase is left out. For that reason, you may consider including a role game or similar activity to somehow engage your stakeholders with the conversation. The World Café, open spaces, roundtables or Fishbowl techniques can be applied for such a task.

3. Multilevel Perspective.

With the support of the stakeholders it comes to deeply understanding the system in which your project is embedded, how it works and how it has evolved. In this regard, two types of tools have been included so far: one devoted to describe the dynamics (from past time to present time) of the system and another to describe a static picture of the current system or status quo. Whereas the static vision provides a comprehensive picture of the way the mainstream system works, the dynamic approach can help to understand how the system got to the current stage. You may start with the static perspective and then move onto the dynamic tool or the other way around. This is the type of flexibility to keep in mind when applying tools.

4. Visioning and Backcasting.

Foresight is at the very core of any disruptive and system innovation. By envisioning the future, your team will be able to step backwards, identify what changes would be necessary and then go forward again; setting an agenda of actions. This backcasting process is easily understandable but hard to put into practice, due to the counter-intuitiveness of starting in the future and

moving backwards. You can find tools with different levels of complexity so that you can select the tool you feel most comfortable working with.

5. Niche Management.

Under the label of niche management, the last module included in the toolbox addresses the issue of how to get lessons out of the project management process and how to apply those lessons to enhance the process. The goal is to include a new dimension in the project management process, emphasizing how an on-going learning and reflection process can move the innovation idea forward.

As to the use of each tool, as mentioned before, the focus of these tools is on the problem solving and on the learning process. The tools are not designed to be perfectly filled out and to represent a nice drawing but to think differently of new ways in tackling the problem, based on a systemic perspective and to learn from that process. Bearing that in mind, don't forget that:

You may feel like adapting the tool to your specific needs and context (background, culture...). If so, please, feel free to remove, modify or add new elements to the canvas. The only element to keep at the forefront of your mind is; keep the systemic perspective.

It is essential that you spend time in the debrief step after applying each tool. This debrief is to help you better understand the outcomes you got and how to apply them on your challenge, but also to give you some specific time and space to reflect on the lessons about the process, and your performance as a team. Therefore, don't skip or underestimate the value of a good debrief. Instead always try to break it up into two blocks: one devoted to the outcomes and the other to the process, its lessons and the consequences for the team.

Now you are ready for making the most of the toolbox. Decide what to start with and give it a try. Enjoy the experience and let your creativity out.

3

Visioning and backcasting the future

Envisioning the desired future and learning from that future becomes necessary when it comes to system innovation.

eit Climate-KIC

Visioning

What is visioning?

VISIONING is about picturing the desirable future and describing what it might look like.

To plan the future, you need to imagine how it might look. There are lots of ways you could do this. Forecasting is one of the most well-known techniques, massively used in strategic planning. It involves looking at the data you have and current trends you can see today. Using that information, you can predict what the future might look like. But, since we cannot foresee the future, we must plan for multiple contingencies. The Future Scenarios technique involves creating alternative futures based on the trends you see, or decisions being made today. Both Forecasting and Future Scenarios can provide useful insights into possible futures.

Because predictable doesn't mean desirable, sometimes you need a more radical approach. Visioning helps you see possibilities you didn't know were there before. Consequently you will be able to move forward to a system innovation perspective.

However, because predictable doesn't mean desirable, sometimes you need a more radical approach. An approach which isn't based on what you can see today. By looking beyond what you see today, Visioning helps you see possibilities you didn't know were there before. Consequently, you will be able to move forward to a system innovation perspective.

Visioning is a foresight method that attempts to create a feasible and desirable future scenario in which current problems are solved. Visioning answers the question WHAT... What is my desired future? What does it look like?

Why visioning?

System innovations are designed to bring about a fundamental and radical change in the way societal functions are performed.

By building a clear long-term vision of the future you aim for, you will avoid falling into obvious thought patterns and becoming ensnared by existing structures.

What does a vision look like?

A vision is not a daydreaming outcome* in which an ideal but utterly unrealistic and impossible future is described. Instead, a vision has to be credible, practical and feasible enough so as to be useful.

Radical innovation idea.
A radical idea/innovation should underpin your vision. Without a radical innovation, visioning is not necessary and you could opt for doing foresight scenarios or developing exploratory scenarios.

Socio-technical.
Since you aspire to elicit a transformative change in the system, your vision has to comprise both technical and social elements.

Medium-term to long-term horizon.
The time scope has to be long enough for innovation to grow and take over but short enough to be feasible and credible. 10

* although "dream-sessions" are used as one of the techniques to help you come up with a new vision.

to 20 years is a commonly used time-frame.

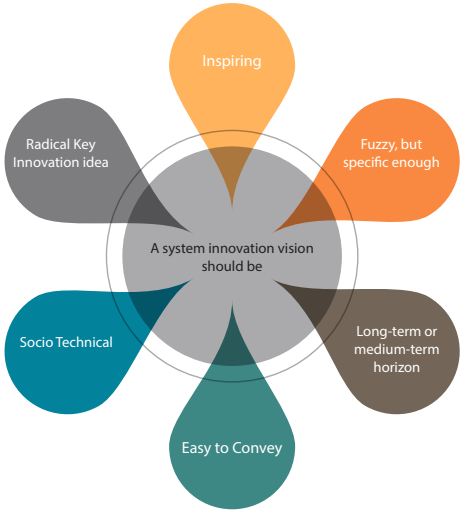
Inspiring
A vision should inspire others to follow and to adopt it as their own vision.

Easy to convey
If you want to inspire others, your message has to be simple and clear.

Fuzzy but specific enough.
A vision of a future in which unknown technologies are probably involved has to be fuzzy. Yet it should be specific enough to allow for actionable plans and events.

How to build a vision?

Trends, statistics or expert knowledge can be used to build out a vision. Yet since it has to be comprehensive and disruptive, more open and participatory approaches are used. Storytelling-based techniques, such as dream-sessions are becoming more and more common.



On May 25, 1961, the U.S. president John F. Kennedy stood before Congress and proposed that "this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the Moon and returning him safely to the Earth".

It is probably an archetype of a vision. It may not be socio-technical, but it is absolutely radical, with a 10-year time horizon, utterly inspiring and completely easy to convey. He didn't explain how to achieve the goal but the vision set a pathway for that vision.

3 Visioning and backcasting the future

Tool 11
Ocean of opportunities

Tool 12
Visual story

Tool 13
Future radars

Tool 14
Socio-technical roadmap

Backcasting

What is backcasting?

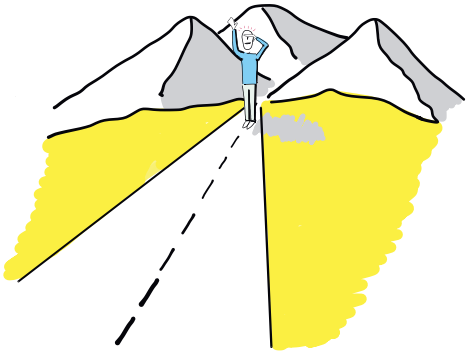
Backcasting is a technique that makes you look back from a future scenario, identifying and assessing changes and actions for that future to come true. It allows managers to make a plan and set an agenda for change by exploring the feasibility and implications of achieving certain changes. Backcasting is mainly used in policy making, strategic planning, resource management and corporate culture, especially when dealing with complex systems such as social or environmental.

Backcasting answers the question HOW... How can I achieve my envisioned FUTURE?

Why do backcasting?

As you have seen in the visioning section, when we are dealing with complex systems, forecasting methods are not enough. We first need to envision the future we aspire to achieve, regardless of the current trends and system stages. Then, the question is: What is needed to achieve such a future? The context for that question is a complex system and so is the answer. It can entail new technologies, new political or economic frameworks, significant changes in actor configuration, cultural and formal rules, etc. But most importantly, it can comprise more than one alternative, sometimes interwoven. Thus, we need a tool to pin down those changes and to asses them in terms of feasibility, control, impact, effort, etc.
Therefore, backcasting allows organisations to consider what actions, policies and programs are needed today that will connect the future to the present. In other words, what actions have to be taken to achieve the future. Some of the advantages of using backcasting instead of other foresight techniques are:

- Backcasting reminds participants that the future is not linear, and can have many alternative outcomes depending on decisions made and the impact of external events on an organisation.



- It prevents managers from developing strategies that just solve the problems that we perceive today with the solutions we have at hand.

- Backcasting keeps plans off extrapolating present conditions.

- It is a quick and visual tool

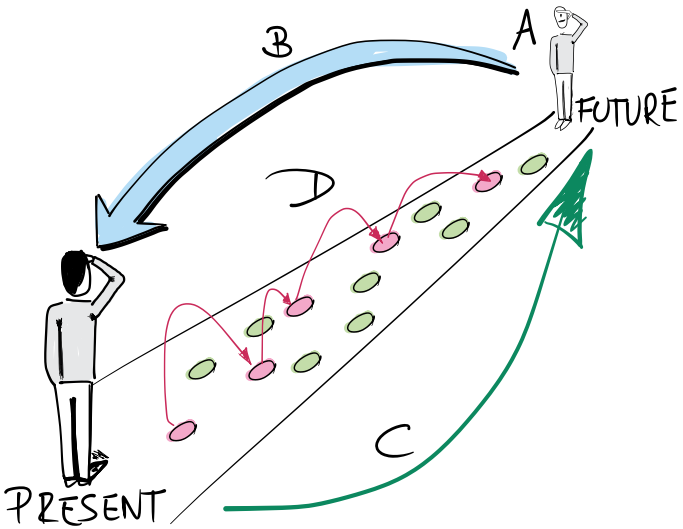
How to do backcasting

Awareness

Backcasting starts with a twofold understanding of your problem. On the one hand you need to start with a specific vision of the future scenario you want to achieve. For such a scenario you may use the visioning technique, fulfilling the six features a system innovation vision should have. The second element of this starting point is your current state, the present time. You have to be aware of the system in which you are, as well as of the problem or challenge you are facing. You can resort to the Pentagonal problem tool, the Context map or the Flourishing multi-level tool to get more awareness.

Backwards

Now you have to put yourself in the envisioned future. Imagine that vision has been achieved and then think back from the future to the present conditions. In the process, identify



necessary changes for filling the gap between the vision and the present time. There will be many changes and some of those you spot will elicit more and more changes. In the picture you can see these changes as the green and red dots.

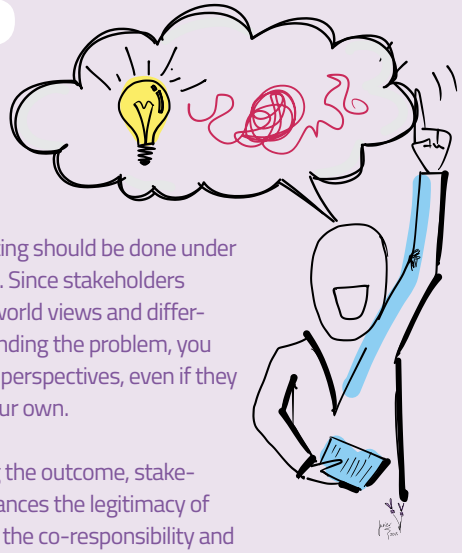
Create solutions

Once in the present time, backcasting takes you to the future moving forward and deciding the actions to be carried out for the changes happen. As you move forward to the future you need to analyse the feasibility for the changes to come true and the actions needed for that to happen. Given that you begin with the end in mind, foster more creative solutions and see the connections and consequences of those solutions.

Decide on priorities

The final outcome is to set your own strategy for change, based on those actions you consider as a priority. In this regard your criteria as a specific stakeholder will guide your decisions about priorities.

Tips



- Visioning and backcasting should be done under a participatory approach. Since stakeholders have radically different world views and different frames for understanding the problem, you should incorporate their perspectives, even if they are wildly different to your own.

- In addition to enriching the outcome, stakeholder participation enhances the legitimacy of that outcome, increases the co-responsibility and broadens the reflexivity scope.

- In this regard, visioning and backcasting should be updated regularly, given that constraints and resources (including knowledge and perspectives) change all the time. Consequently, a learning and reflecting process should accompany these tools.

- As a consequence of the different stakeholders' perspectives, they all have their own priorities and agendas. Involving them in the backcasting process will allow you to draw more than one plan from the same process.

- In complex and wicked problems, as sustainability is, the problem definition might come to focus after adopting a future vision. In such cases, the vision is the seed for the challenge and not a consequence of it.

Tool 11
Ocean of opportunities

Ideation
Looking at the future

Climate-KIC

Ocean of **opportunities**

What it is

Ocean of opportunities is an ideation tool aimed at identifying gaps in the market that might become windows of opportunity. It frames the current solutions by two main features or dimensions and helps you to map out the range of current solutions within such variables. E.g.: the mobility system is bound by use (individual/collective) and access (private/public).

The tool is inspired in the Growth-Share Matrix (Henderson, 1973), the Blue Ocean Strategy (Kim and Mauborgn, 2005) ,and the White Spots (Carleton et al, 2013).

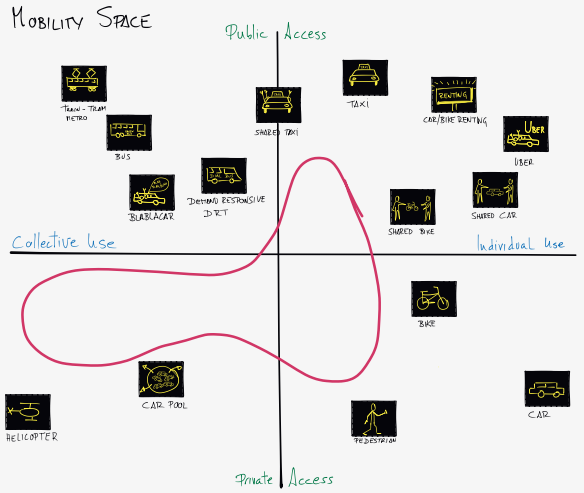
When to use

When you have to imagine radical innovations or alternative solutions for a current problem and need a hand with the ideation process.

Why it is useful

Visioning requires a lot of creative thought and energy so sometimes it's helpful to warm up first. Ocean of Opportunities is one of the many tools and activities you could use to do this. Compared with other ideation tools it first guides you to discover gaps in the market, and then gives you the opportunity of centring in on those gaps to imagine new ideas and solutions.

At the same time, since the dominant system (market) is depicted by means of two of its dimensions, you can find out which system's dimensions are relevant when it comes to designing solutions.



HOW MANY	From 1 person to groups of 10 people.
HOW LONG	30-40 min.
DIFFICULTY	Low.
WHAT YOU GET	A visual map of the current technologies and solutions for your challenge, mapped out according to a couple of variables. As a consequence, you can spot the spaces for those variables with no solution in the market. Those spaces might provide a window of opportunity to your project.
WHAT IS NEXT	
WHAT YOU NEED	A basic idea of your challenge and the current solutions.
	Now you can move on to envisioning a future in which the solution comes from some of those empty solution spaces you spotted.

Steps

STEP 1. Draw the canvas and pick out variables

The tool is designed as a 2x2 matrix in which two system dimensions are depicted by the axes and the solutions are scattered in the defined space. Therefore, draw the canvas with the matrix and select two features from your dominant system (meso-level, regime) that are characterising the solutions in the market. For instance, if your project is about mobility solutions, you might want to try with the access to the mobility solution (public-private) and the way of using those solutions (individual-collective).

STEP 2. Define extreme values

Define the extreme values of each axis. If possible, avoid quantitative scales and go for qualitative endpoints. You may think of conceptual or provocative values such as "factual/perceived", "fossil fuel/renewable energy", "Affordable/expensive", etc. In any case, avoid using judgements as categories, such as "better" or "negative". Once endpoints are defined, place examples of businesses in each matrix's corner of the matrix. In case you cannot identify those "extreme businesses" try a different set of endpoints or a different combination of features.

STEP 3. Define extreme values

Look for the current solutions accounting for combinations of two values of the variables. Plot as many examples as you can picture. When you finish, what you get is a map of the full ocean of solutions in the dominant system.

STEP 4. Define extreme values

Identify blank gaps where no solutions have been developed, they represent windows for innovation. Run a brainstorming session about the kind of service/business that could be created within that combina-

Green skills for boosting transition in water management Innovator Catalyst series. The Climate-KIC. Valencia, 2014 (Spain). https://goo.gl/llq0oS

tion of variables and offered to the market. Use post-its to put on the empty space as many solutions as possible. Then you can start an open discussion to distil them down: Is it a disruptive innovation? Does it look feasible, affordable, etc.? Would it make a long-term impact on the regime? After that you will get a short list of potential innovations for your project.

STEP 5. Try it out with different variables

Try a different pair of features and look for new windows of opportunity. This process can be iterated as many times as dimensions/features you consider relevant for your system. By doing that, not only new windows of opportunity will arise but also you will be able to assess the importance of such features in terms of relevance for the system performance.

STEP 6. Debrief

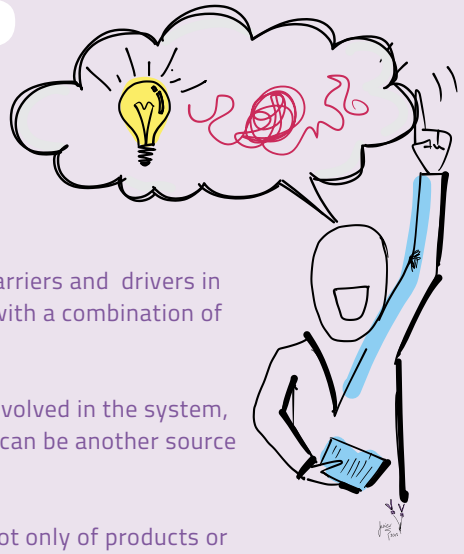
After a couple of iterations with different variables for the axes, take a step back and reflect on the outcomes and the process.

Did you find it difficult to come up with different variables for the axes? Did you feel comfortable using qualitative scales instead of quantitative ones? Is there any variable which stands out from the average? Were they all relevant for the system?

Did you find many opportunities or was it a difficult process? Would those opportunities for innovation be able to transform the system? Do they entail concepts such as actors' involvement, social value, co-creation, etc.? Did you find any significant differences in the maps between iterations? Did you find out new ideas when the axes were changed?

> Try a different pair of features and look for new windows of opportunity.

Tips

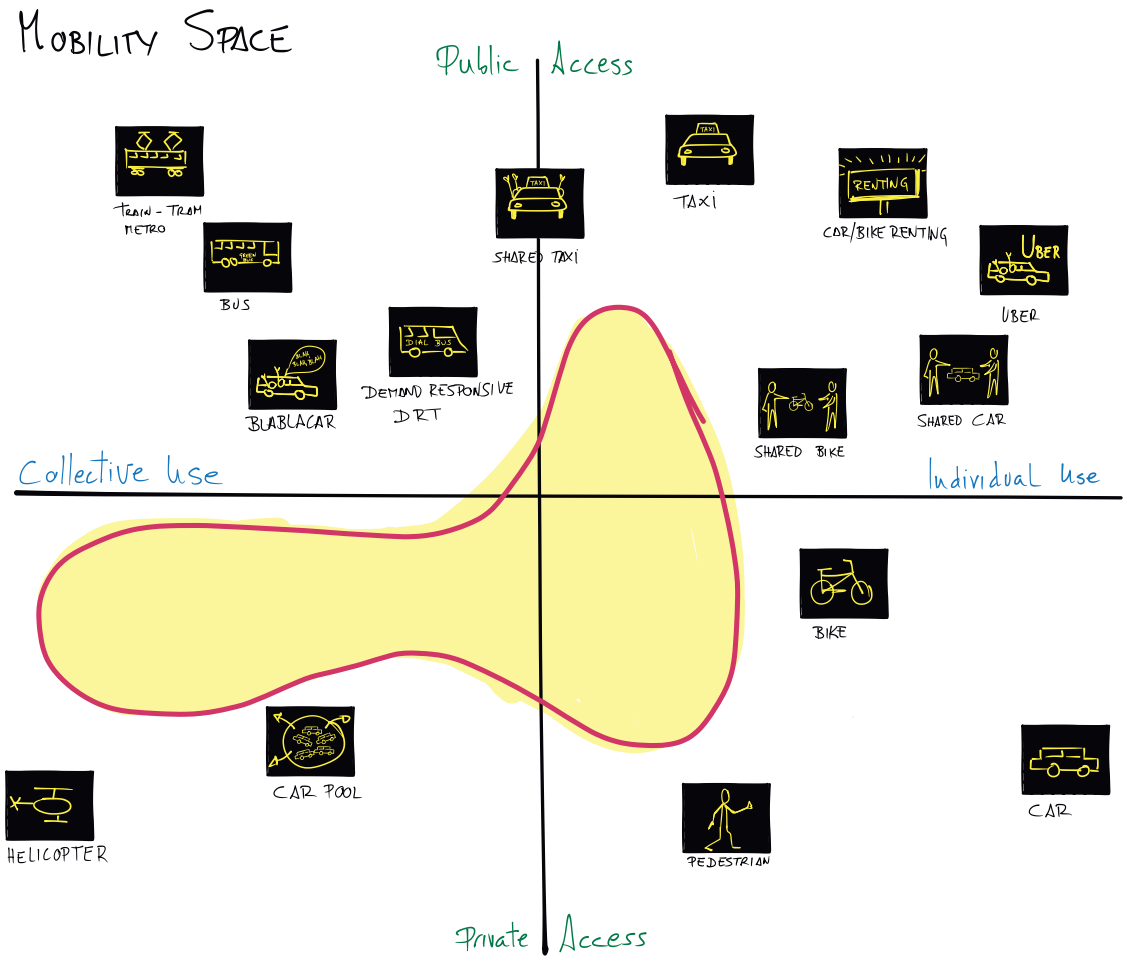


- Identify the main barriers and drivers in your regime and try with a combination of them for the axes.
- The stakeholders involved in the system, or the role they play, can be another source for axes definition
- Think of services, not only of products or business-as-usual as fillers of your matrix.
- Use arrows to depict evolutions or services taking up more than one quadrant.

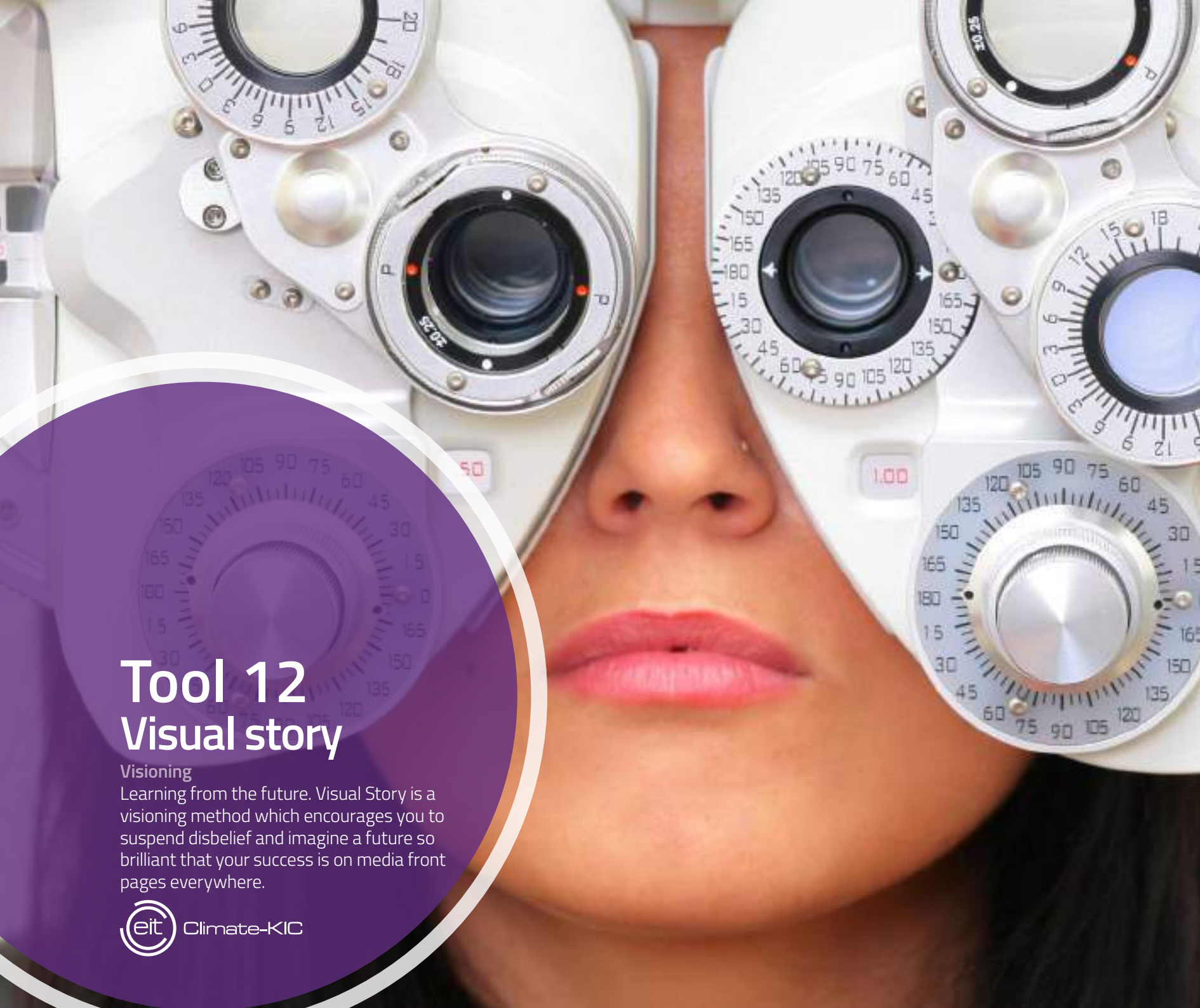
Find out more

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

The Canvas



De Vicente López, Javier and Matti, Cristian (2016) . Visual toolbox for system innovation. A resource book for practitioners to map, analyse and facilitate sustainability transitions. Transitions Hub series. Climate-KIC, Brussels 2016.



Tool 12
Visual story

Visioning

Learning from the future. Visual Story is a visioning method which encourages you to suspend disbelief and imagine a future so brilliant that your success is on media front pages everywhere.

eit Climate-KIC

Visual **story**

What it is

The Visual story is a visual tool that helps you to imagine and describe the ideal future that would happen as a consequence of succeeding in your project. This tool is built on the Cover Story, developed by the visual meetings company The Grove (Macanufo et al. 2010). The objective of the tool is to suspend all disbelief and envision a future state that is so stellar that it landed the project/group challenge on the cover of the media. To do that, this activity challenges you to describe, with words and pictures, the successful future outcome and the process to reach it.

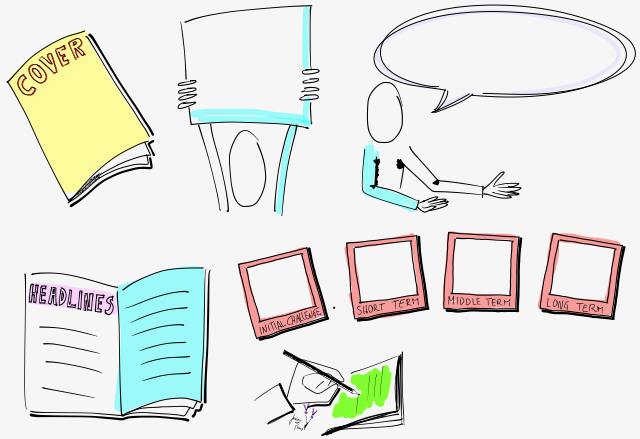
When to use

We will usually use visioning right after defining the problem or the challenge you are facing and before starting any specific project. This is the moment to build a common vision about the desired future for the challenge you have just defined (buildings, energy, food, mobility…) in an appealing and visual way.
After envisioning the future you can start conceiving projects, but it shouldn't be done before.

Why it is useful

Storytelling driven techniques are taking over more and more visioning workshops, due to their simplicity and their capacity to introduce disruptive ideas absolutely disconnected from the present time. In this regard, the Visual story follows these features, making the process of disruptive thinking more accessible and easy.

Since it suspends all connections with the present time, it facilitates the process for disruptive thinking which can lead to radical innovation. The price for that creativity is that neither feasibility nor probability are included as criteria to build the vision. As a consequence before building plans and projects on your vision you should go for a backcasting process which will root your process in the real world.



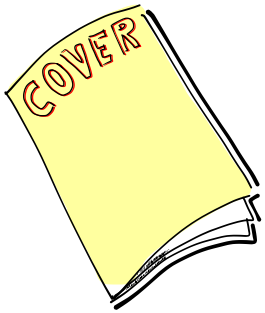
HOW MANY	From 2 to 5 people.
HOW LONG	60-90 min.
DIFFICULTY	Low.
WHAT YOU GET	A visual story of the future you can imagine.
WHAT IS NEXT	An idea about the new future you would like to achieve as a consequence of your project succeed.
WHAT YOU NEED	After envisioning your future you will need to build the pathway from the present time to that future. Hence you can go for any of the backcasting tools.

The Canvas

The canvas is made up of six parts, each one describes a different aspect of the future or the process to achieve it.

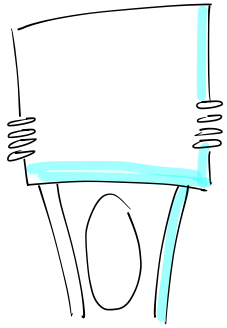
COVER

"Cover" tells the great story of your success. It should represent what the cover of main papers are saying about your story. How they describe it, what the headlines would be. This cover should convey a message both APPEALING and EASY TO CONVEY.



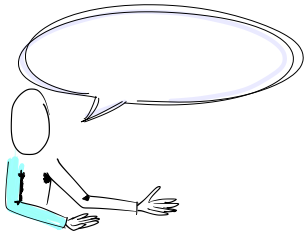
RADICAL IDEAS

"Radical Ideas" documents initial ideas for the project that drove you to this shiny future. That is, the ideas underlying the RADICAL INNOVATION. What ideas fuelled the process? Where did they come from?



QUOTES

Write down any quotation that someone in the future might be saying about your project, your innovations and your success. "Quotes" can be from anyone as long as they're related to the story. Quotes should be INSPIRING

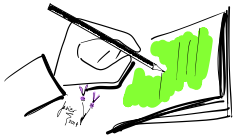


HEADLINES

"Headlines" convey the substance of the cover story. It is something other than the mere cover. It must be FUZZY but SPECIFIC enough to be turn into an agenda. Some description of the process and/or the outcome.

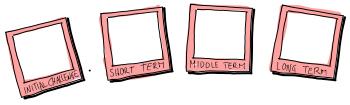
STACK OF PAPERS

"Stack of papers" reveals the background stories behind the history of your success. Pitfalls, drawbacks, milestones, new alliances...



IMAGES

"Images" stand for the initial challenge and the changes achieved in the SHORT, MIDDLE and LONG TERM. Draw some pictures depicting your achievements or milestones.



Steps

STEP 1. Define yourself and draw the canvas

This is the future, you managed to pull off for your challenge. Before starting to imagine that future, define who you are and the role you played during the process to reach the future and your 'new/adapted' role in this new future. If you are in a real project, then adopt your own roles as different stakeholders. If you are working in a training session or with no stakeholders involved, then pretend each of you are different stakeholders and play their role. This pretending game will enrich the perspectives when it comes to envisioning the future.

After adopting your respective roles, take a large piece of paper and draw the canvas with its six different sections

STEP 2. Imagine the future

Envision the future. Imagine that you are 20 years from now (or the interval you decide). What does your sustainable future look like? Depending on the challenge: Where do people live, what does it look like? How do they move, make transactions, spend their days, what does the environment look like? What social/technical options are available? Which technology is needed? How does it affect culture and the structure of society? What are important trends, and events? Could we make the future vision even more sustainable? That's visioning. Spend a few minutes to imagine individually and then start a brainstorm.

In this step, suspend all judgement and simply let your ideas flow freely. You can use post-its to write down as many ideas as you all can, describing what the future looks like. As you explain and discuss ideas, put them on a wall; make clusters and include new ideas arising throughout the discussion. Some ideas will be about technology, others regarding regulations, new ways of consumption, infrastructures, etc. After 30 or 40 minutes of discussion, a more concrete vision of the future should be emerging. It is time for you to pick out those most representative ideas for the future you, collectively, have built.

STEP 3. Fill out the canvas

Use the canvas to turn your ideas about the future into pictures, words and stories. Try to imagine what will be said about your challenge when it is achieved. The canvas will help you to narrow down the fuzzy vision you probably built in the previous step. Remember that your vision should be credible but also radical, easy to convey and inspiring, fuzzy but specific enough to be agenda permitting. Finally, it should be based on radical innovation in the medium-term to long-term horizon, encompassing both technology and society.

STEP 4. Debrief

Now, with your new future in your pocket, spend some time reflecting on the outcome and the process.

Was it easy to detach from current trends and for putting your brain in a disruptive mode? Was it specific enough? Do you think it will be achievable? Was the discussion biased towards some approach or stakeholder's perspective? Do you think some perspectives were missed in the process? Did you spot the exact system "failure" that needs to be solved? Did you find many different alternatives for the future in which the problem is resolved? While you were working on the vision, did you find it easier to think about new technologies or any other dimension of the system such as new use habits, new infrastructures, new ways or social organisations, etc.? Why do you think there was a bias?

> This is the future you managed to pull off for your challenge.

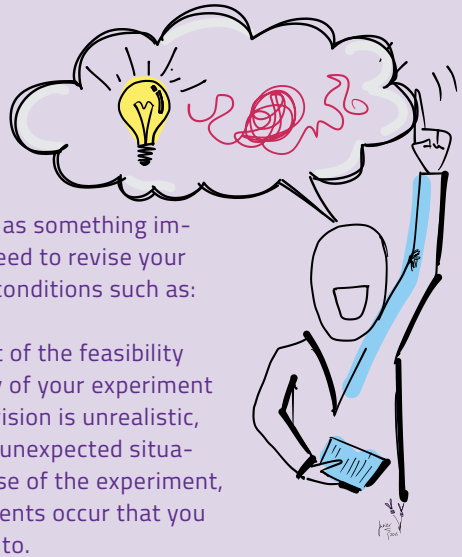
Pioneers into Practice Programme. The Climate-KIC. Valencia, 2014 (Spain).

Tips

- Visioning should be a participatory tool in which a large diversity of stakeholders ensures a richer and broader vision. Therefore, consider inviting other stakeholders outside of the project or just playing different roles yourselves if you are in a training session.

In formulating the vision, you could consider:

- Other relevant experiments
- How you will link your experiment to general trends and pressures coming from the macro-level (windows of opportunity?)
- Structural bottlenecks that explain why the goal has not yet been accomplished.
- Don't give up too soon.



Don't use the vision as something immutable. You may need to revise your vision, under some conditions such as:

- An assessment of the feasibility and acceptability of your experiment shows that the vision is unrealistic,
- You encounter unexpected situations in the course of the experiment,
- New developments occur that you need to respond to.

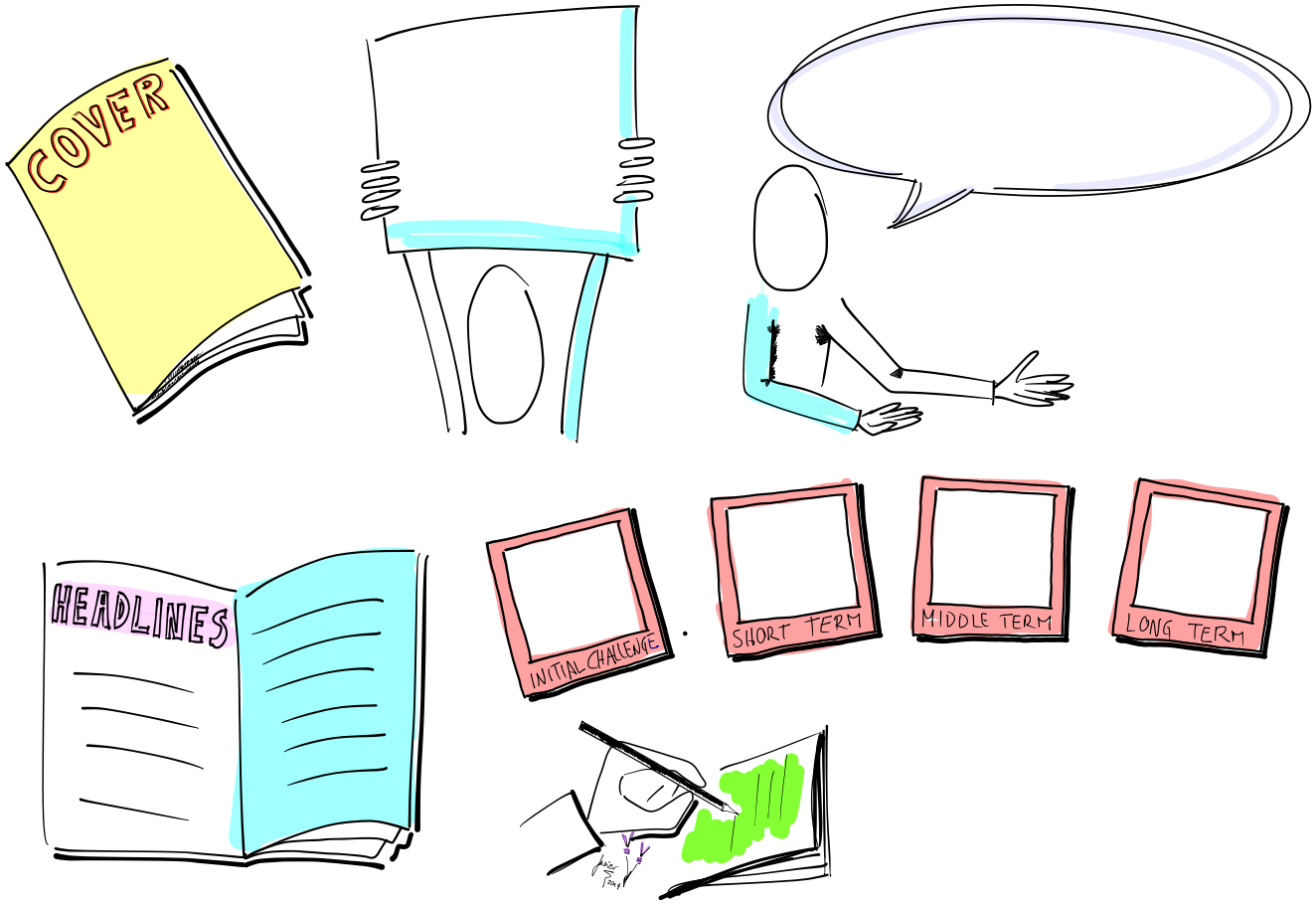
You have to put yourselves into that future and to describe it using present and past tenses.
Be creative from the very beginning and dare to draw your own version of the canvas. Remember the sections you should cover, but make up your own design, add new sections, etc.

Find more here

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

Pioneers
into Practice
Programme.
The Climate-KIC.
Valencia, 2014
(Spain).

The Canvas



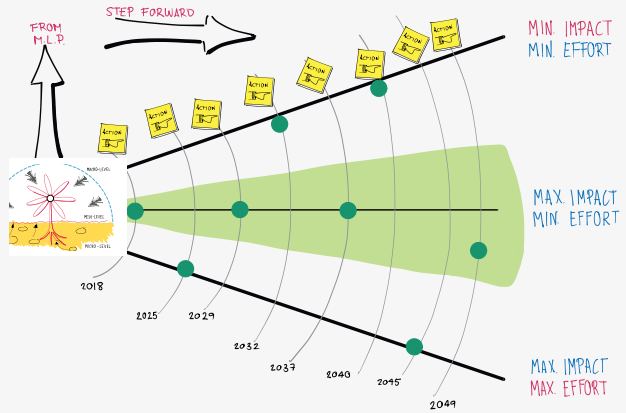
De Vicente López, Javier and Matti, Cristian (2016) . Visual toolbox for system innovation. A resource book for practitioners to map, analyse and facilitate sustainability transitions. Transitions Hub series. Climate-KIC, Brussels 2016.

Tool 13
Future radars

Backcasting
Guiding from the future

Climate-KIC

Future **radars**



What it is

Future radars is a backcasting method which uses time travel and a little imagination. First, travel forward in time to your ideal future. Then look back on your path to success. How did you get here? Next, return to the present day. Use your new understanding of the future to plan your path to success. These different perspectives can help you to evaluate the feasibility of your ideal future and the actions needed to get there.

When to use

When you have a long-term and complex challenge, the pathway of which is full of uncertainties and possibilities as a consequence of the systemic context (multiple stakeholders interwoven with each other, and a context also interplaying with them). Under these conditions, traditional planning can lead to your project derailing very quickly due to competitors, unexpected risks or changes not happening.

Why it is useful

By applying this tool you can plan actions equipped with a global overview of the milestones to achieve, coupled with their feasibility and the influence you can put on them to happen. This pathway of milestones allows you to elaborate a more reliable plan including alternatives in the case of unforeseen events.

HOW MANY	From 1 person to groups of 8 people.
HOW LONG	60-90 min.
DIFFICULTY	Medium- Low.
WHAT YOU GET	A characterised collection of changes and actions that will lead you to achieve the envisioned future from the present time.
WHAT YOU NEED	A clear description of your challenge, your current state, and the vision of the future.
WHAT IS NEXT	After applying the tools, you can opt for action planning which also includes an ongoing process for learning throughout the project lifetime. If that is the case, then you may want to run the niche management tools in addition to other more traditional planning tools.

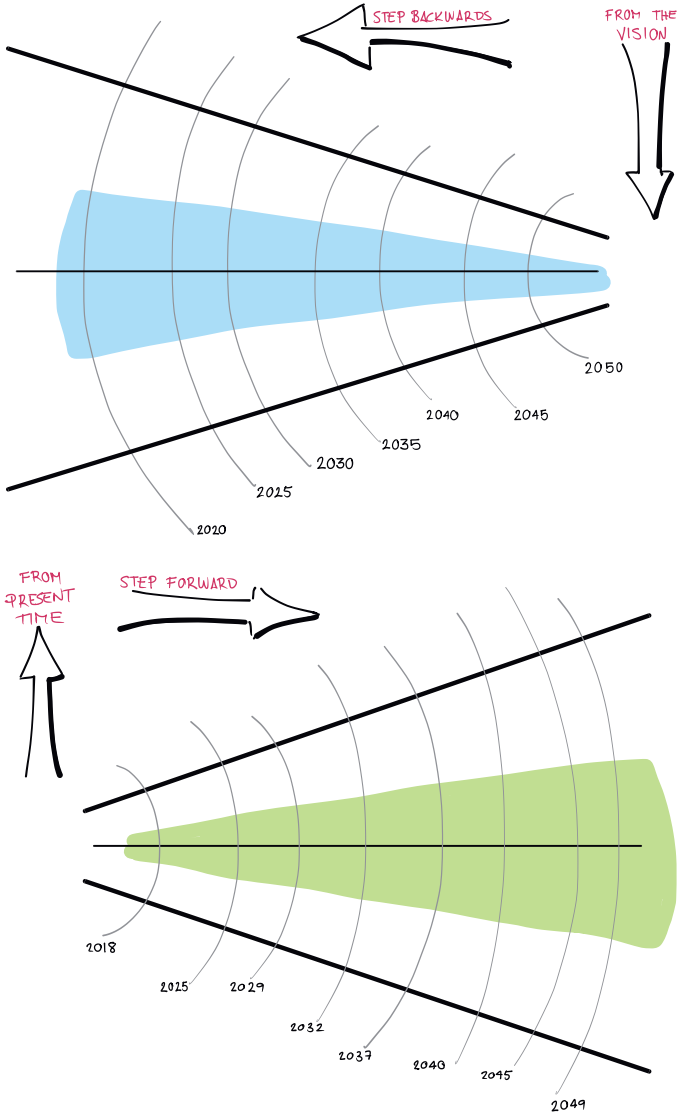
Steps

STEP 1. The canvas and your challenge

The Future Radars canvas is made up of two parts: the radar for changes and the radar for actions.

The radar for changes looks at the present time from the envisioned future. The radar is depicted by a cone whose narrow extreme is at the future time and from that point it broadens as we move to the present time. The goal of this cone is for you to identify changes necessary to achieve the envisioned future and place them on the cone. The width of the radar accounts for the potential number of changes that can drive the system to the vision. The farther the vision is from the time you are looking from, the broader the collection of potential innovations and changes that can lead to the same vision.

The radar for actions is the second part of the tool which mirrors the first radar by looking at the future from the present time. In this case the cone is reversed; the tip of cone is the current moment. This radar is intended for you to place the actions you will carry out to achieve the changes you spotted within the same radar. Therefore you will have a clearer idea about short-term actions, whereas the actions in the long-term will remain fuzzy. That is why the cone opens towards the future, widening the set of possible actions for the same change to happen.
The first step before you start filling out the canvas is to define your starting and ending points. That means: define the vision of the future you aspire to and the the system in which your challenge is embedded. You might want to use the outcomes from the MLP tools and the Cover story tool. With those starting and ending points you can draw your own time scale using vertical lines going across the two cones.



Defining a reginal policy for biomass management. Public participation workshop. Castellón, 2015 (Spain). http://goo.gl/Q8vzeH


WATER HUBS
2015
2020
2025
2030
2035
Authoritation of local Government for Expansion
Better WW Management in pilot slums
Local Good slum networks
Slums develop like part of the city
Government acceptance
Other services are developed in the slums
People demand less corruption
International awareness campaign
Export the concept to other SE-Asian countries
More and more hubs are built
Changes
2014

STEP 2.
Move backwards

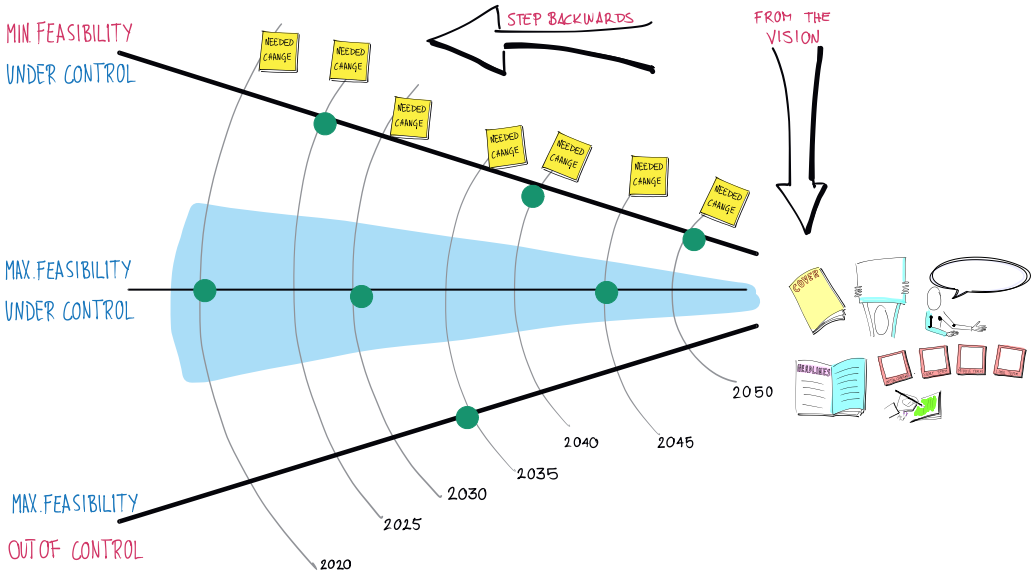
Put yourself in your vision. Imagine your 'preferred future' actually happened and now your vision accounts for the real world. With that image in your mind, start moving backwards towards the present time and identify what changes should have happened to reach the desired future. Spend 10 minutes individually to brainstorm as many changes as you can imagine. They could be: new knowledge, financial arrangements, new technologies, new political or economic frameworks, significant changes in actor configuration, cultural and formal conventions, changes in routines, rules, culture, infrastructure, etc.

Write down those changes on sticky notes (one idea per post-it) and then collectively discuss the suitability of each idea, pick out as many as you want and place them along the time scale. This is another important point. Spend some time to discuss the chronology of the changes. This chronology, along with the discussion about the suitability of your ideas, can spark off your creativity, giving you new ideas and how changes can come to light.

STEP 3.
Assess the changes

After brainstorming and collecting all the ideas, it is time for judgement to come into play. Evaluate each change according to the feasibility and the control you might have over the process for that change to happen. Do you think the change is feasible? (notice: we are not talking about probability, but feasibility)? Do you think and feel you can influence the process to trigger that change? If the change is barely feasible and out of your control, just rule it out and go to the next item. It is not worth spending valuable time discussing intractable/unsolvable topics. The ideal situation is when the change is feasible and you have some kind of control over the process. If that is the case put a sticky dot in the central part of the cone (bluish in the picture). Changes in this central part of the cone will be the most important for your action plan.

Then put a sticky dot in the lower side of the cone for those changes that are feasible but out of your control. You may be interested in them, but since they are out of your control, your strategy might be only to monitor those changes. Conversely, put a sticky dot on the upper side of the cone if the change is barely feasible, yet you might have an influence on the process. Think deeply about the items and spend time on them but only if you find pertinent synergies with your main interests.



STEP 4. Starting and ending points

Now you move to the radar for actions. Put yourself in the present, looking at the future you can see the chain of changes you have identified. The underlying idea for this step is to identify those actions that can lead to changes coming about. Therefore, spend around 10 minutes to brainstorm individually as many actions as you can think of. It is up to you, as a team, if you only centre in on the feasible changes that are somehow under your control, or embrace all the identified changes regardless of the assessment you did.

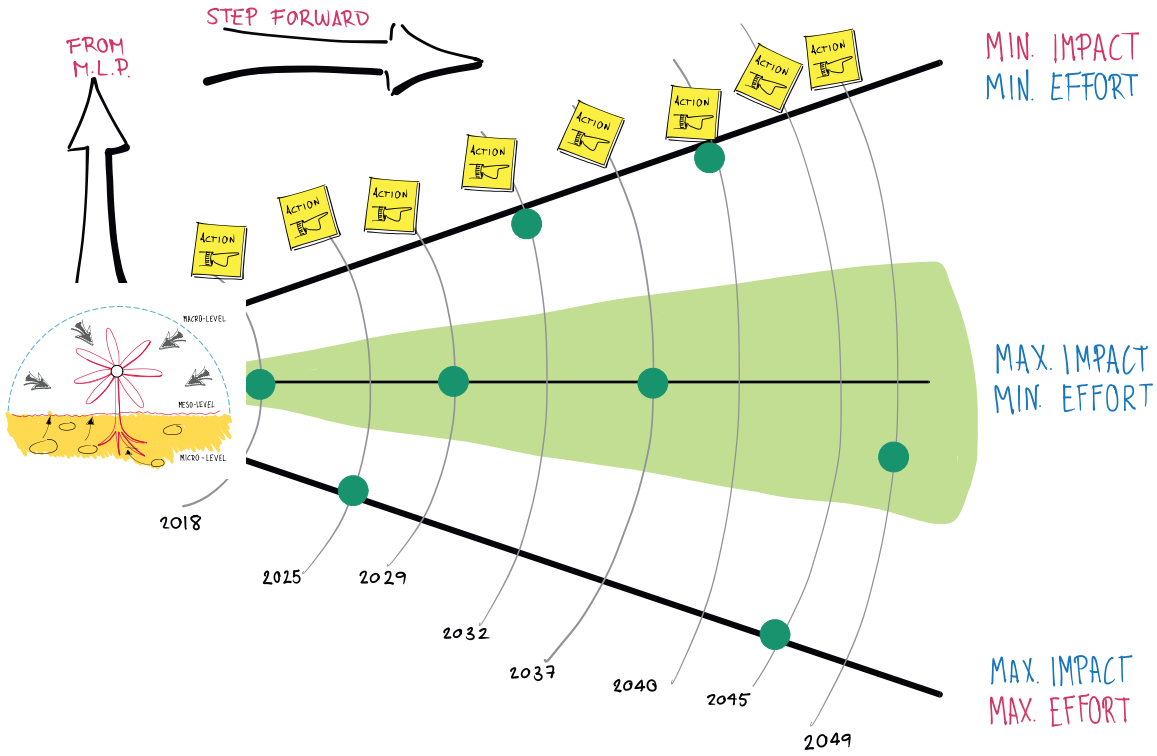
After brainstorming, discuss the suitable actions and then put them on the radar making a timeline.

STEP 5. Assess the actions

After the brainstorm step, move on to assessing the actions you identified. Use forecasting or your own experience to evaluate each action according to the impact they will cause on the system to trigger the change and the effort it will take you to carry it out.

Similarly to the changes, actions with maximum effort and minimum impact will be discarded. Conversely, actions with the maximum impact and the minimum effort will take up the centre of the cone (greenish in the picture) becoming crucial for your future strategy. Use the upper and lower part of the cone to assess the rest of the actions according to the scale in the canvas.

After assessing all the actions try to come up with a line of actions following the assessment and your role as a stakeholder. This line of actions should be one of the main inputs for your future action plan.



STEP 6.
Debrief

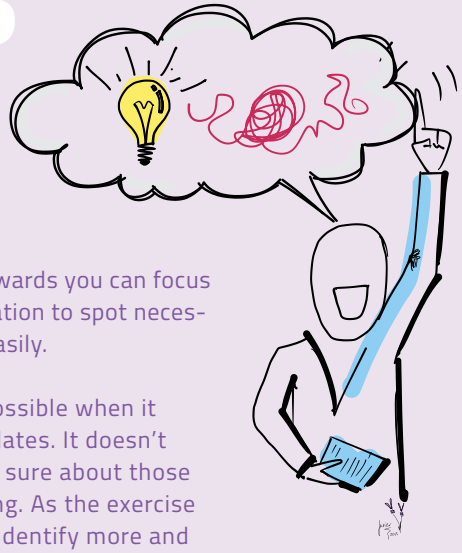
After having worked on the two radars of the canvas, reflect in groups about the process and the future steps. The following questions can guide you to a fruitful discussion and reflection.

What was the process like? Was it counterintuitive to start thinking from the future backwards to the present time? Do you think it hindered you to be more creative or, to the contrary, did it help you to spark your lateral and more creative thinking? Did you find out something new and unexpected in the pathway of changes from the present time to the future? Do you think you are now better equipped to plan? Would you have used other criteria to assess changes and actions? If so, which criteria?
Do you think you can draw up a strategy for action based on the second radar? Is the prioritisation you did a good starting point for action planning? Why? If the answer is yes, you may want to spend more time drawing up a draft version of that strategy.

Having been equipped with this new outcome, what do you think the next step should be? Do you think this process should be repeated once in a while throughout the project life time? Why?

By applying this tool, you can plan actions equipped with a global overview of the milestones to achieve, coupled with their feasibility and the influence you can put on them to happen.

Tips



- When moving backwards you can focus on barriers for innovation to spot necessary changes more easily.

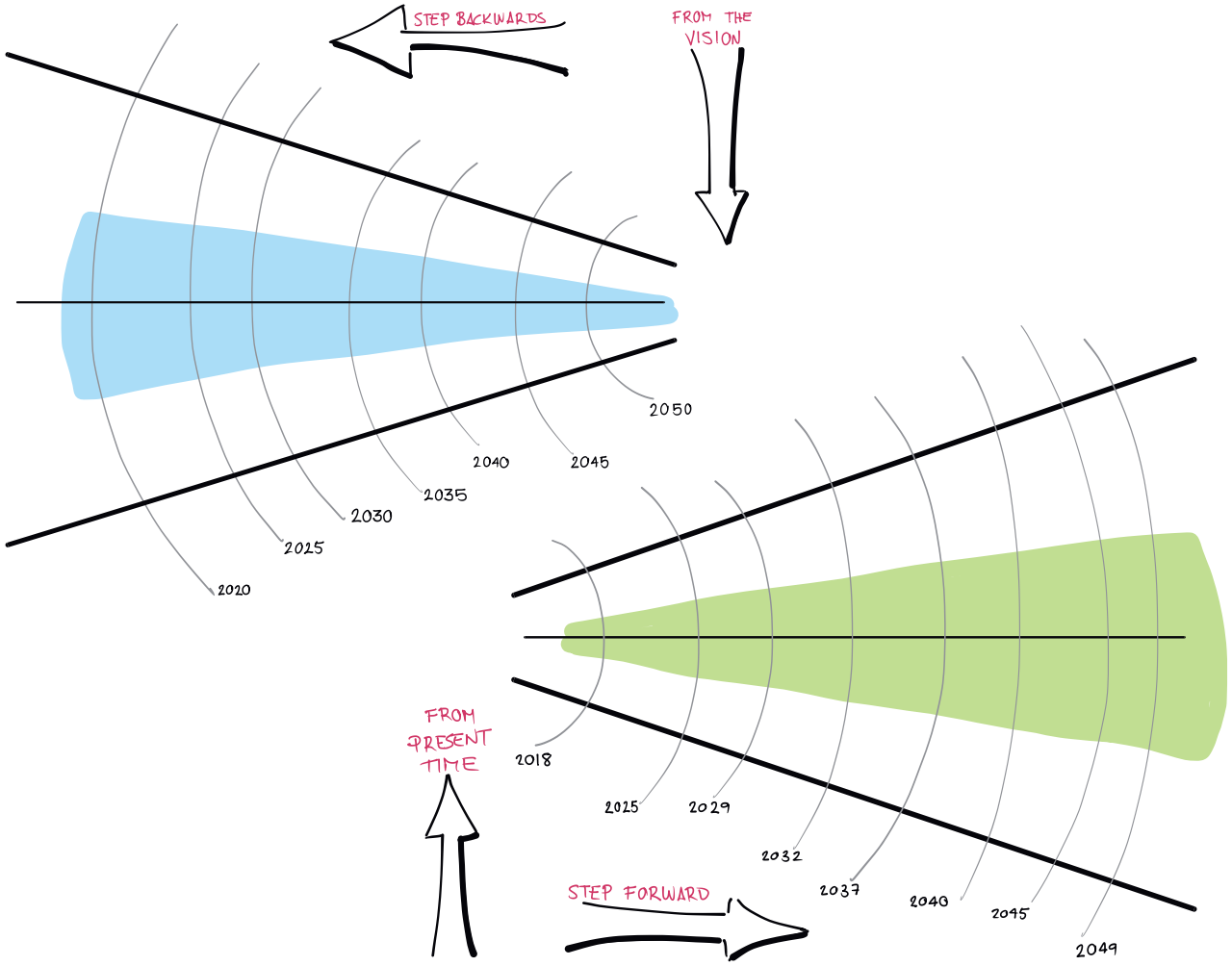
- Be as specific as possible when it comes to assigning dates. It doesn't matter if you are not sure about those dates at the beginning. As the exercise goes ahead and you identify more and more changes or activities, you will be able to give more consistency and coherence to the overall picture.

Find out more

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

Defining a reginal policy for biomass management. Public participation workshop. Castellón, 2015 (Spain). http://goo.gl/Q8vzeH

The Canvas



De Vicente López, Javier and Matti, Cristian (2016) . Visual toolbox for system innovation. A resource book for practitioners to map, analyse and facilitate sustainability transitions. Transitions Hub series. Climate-KIC, Brussels 2016.

eit Climate-KIC

Tool 14
Socio-technical roadmap

Backcasting
Mapping pathways from the future

Climate-KIC

Socio-technical **roadmap**

What it is

Socio-technological roadmap (STRM) is a collaborative backcasting tool for multiple stakeholders to plan together. After envisioning the desired future, stakeholders can jointly set out different pathways to bridge the gap between such a future and the present time.

Socio-technical roadmap is based on the technical roadmapping technique, largely used in industry to support technology strategy and planning.

When to use

As we saw in the radars tool, there are a variety of reasons why to use backcasting, depending on your specific role. Yet, generally speaking, STRM is to be applied whenever you are working with complex problems which also entail long-term goals and a high degree of uncertainty throughout the process.

This coupling of complexity and uncertainty will probably comprise breakdowns, breakthroughs, "wild card events" (events with low probability of occurrence but high impact) and sudden shocks in the economic, social and environmental spheres. Predicting the future under these conditions can be a daunting task full of alternatives and ambiguity. If you think about an environmental challenge or a project somehow related to the dynamics of global change, you will have one of these wicked problems.

In these cases, you should identify and analyse alternative pathways form the present time to the future, before getting into your action plan.

Why it is useful

Socio-technical roadmap helps you generate innovation pathways for the future based on chains of change. At the same time, it leads you to identify opportunities and risks in market, technologies and social environments. By doing that you can start identifying, prioritising and planning your future action as well as the resources and partners you will need. STRM provides you with a visual picture of the changes in the future, making it easier to come up with your action plan.

HOW MANY	From 1 person to groups of 6 people.
HOW LONG	90-150 min.
DIFFICULTY	Medium-High.
WHAT YOU GET	A set of pathways from the future to the present time and vice-versa, made up of changes and actions. As a result of them you can end up with a strategy for different stakeholders.
WHAT YOU NEED	A collaboratively built vision, a clear description of your current system and situation as well as sources of information about trends or even potential breakthroughs.
WHAT IS NEXT	After carrying out a backcasting exercise you are ready to move into action. You can opt for fine-tuning your action plan or getting right to the action. In both cases you should take a look at the system management or niche management project to develop a learning and reflection strategy for the project lifetime.

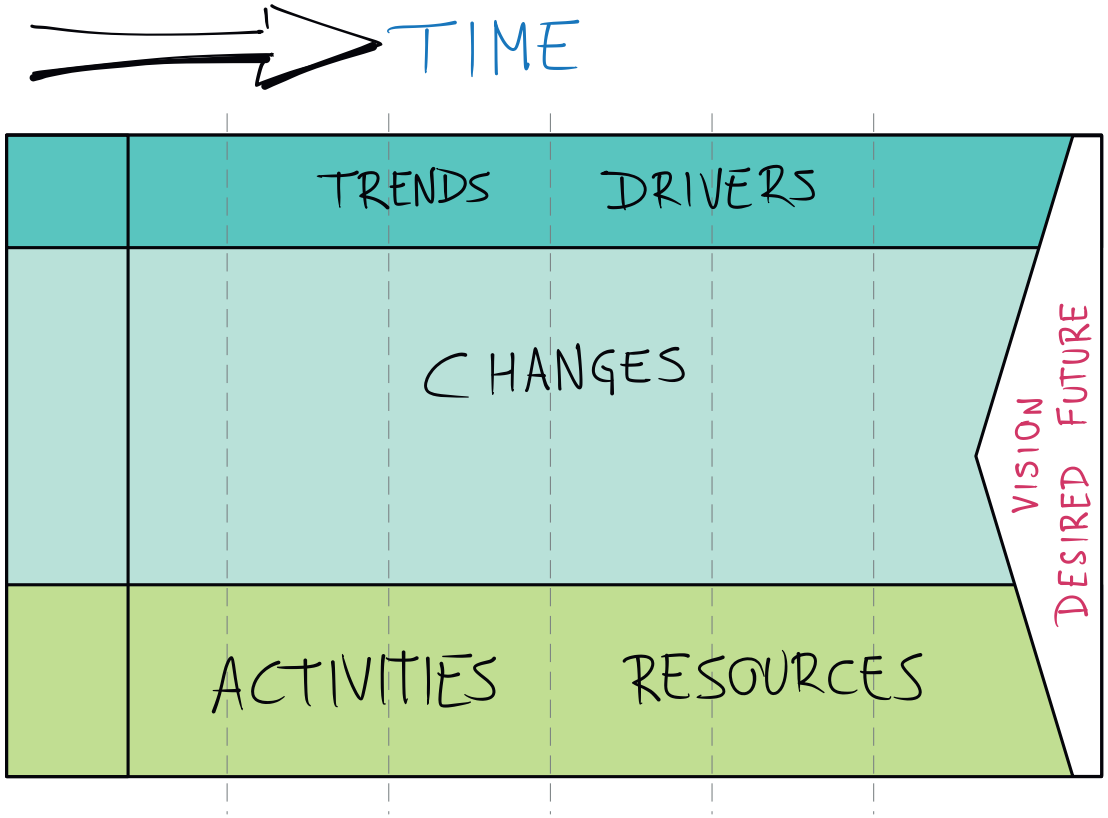
Steps

STEP 1.
The canvas

STRM canvas is made up of a main rectangle, in which the horizontal axis accounts for time, starting from the present at the left hand side, and ending with the future vision. The vertical axis accounts for the changes that should come about over time. This axis is broken down into three parts or rows. The upper row represents social and technical trends and drivers in the market, now and in the future. They depict the broad context exerting pressure on the market and might be identified as the macro-level of the complex system.

The middle part depicts main changes needing to happen for the vision to be reached. Those changes can be technological, in the physical infrastructure, in social habits, regulations, etc. This row mainly refers to the meso-level, but also includes changes in the micro-level. The lower segment ultimately accounts for the activities that different stakeholders have to carry out to bring changes about. These activities or resources that are needed, can be plotted in

Socio-technical roadmap helps you generate innovation pathways for the future based on chains of change. At the same time, it leads you to identify opportunities and risks in the market.



Stakeholder management workshop. Innovation Building Block series. The Climate- KIC. Frankfurt, 2015 (Germany). http://goo.gl/MTSuTW

both, the meso-level and the micro-level.

STEP 2. Vision and Calendar

First of all, put your vision on the right hand side of the canvas and write down the date for such a vision. You might use the cover story if you have done it, or any other description of the vision. It is important to have it in mind while applying the tool. Once you place the vision with its date, draw a timescale in the horizontal axis drawing vertical lines every five or ten years. This scale will help you to place changes and activities.

STEP 3. Stepping Backwards

Starting from your future vision, you are going to step backward. Therefore, place yourself in such a vision. Imagine you are in that future and then look at the most recent past and focus your attention in the middle part of the canvas, that is the "changes" part. The goal is for you to identify which changes must become real for the vision to happen. Try to imagine the last change just before achieving the complete vision in which you are right now. From that change on, imagine other changes that were necessary to happen before it. Each plotted change will trigger other earlier changes that were necessary to move the vision forward. Write down one change on one post-it and stick them on the canvas at the proper temporal distance. As you identify causal relations between changes, draw a line linking them to map out those relations. For instance in order for a new product to be adopted a new regulation may be necessary or a new infrastructure. In the same way for a new product to be developed, a new technology might be a necessary condition.

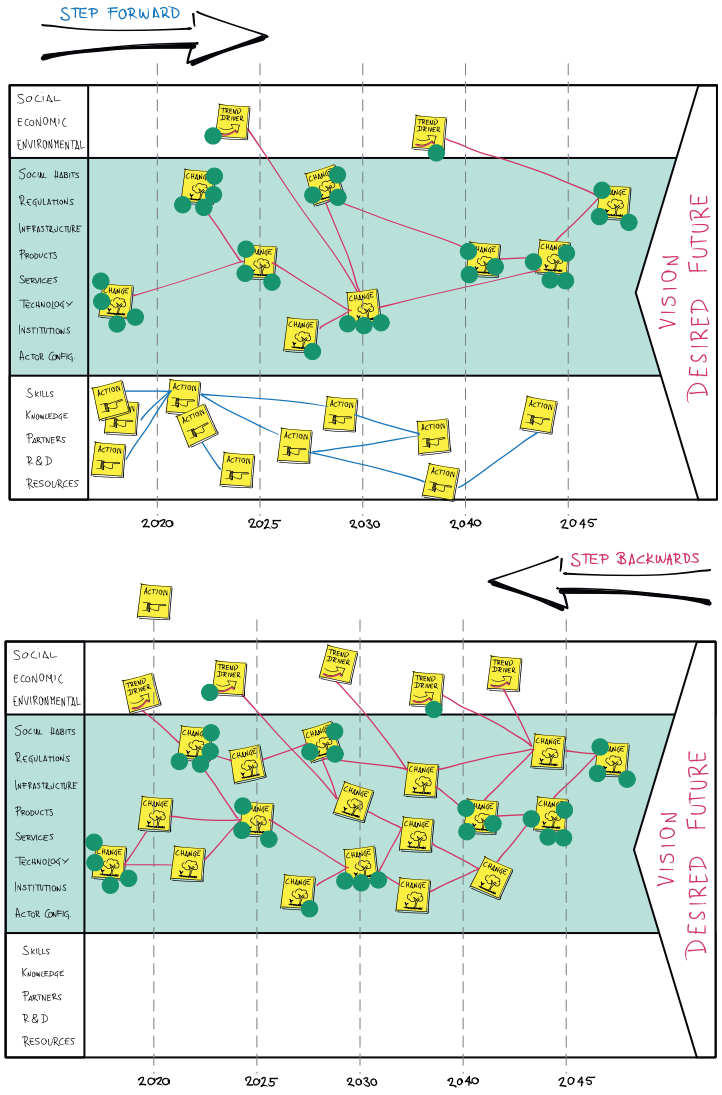
Step by step you will build a chain of changes with different pathways, alternatives and possibilities. These changes comprise any of the different components or dimensions of the market place from technical to social, as well as changes in trends or drivers: social habits, technologies, physical infrastructure, industrial capacity, products, services, regulations, institutions, etc. Throughout this process, different trajectories of change towards the vision will arise providing a scenario with a set of alternatives to reach the vision.

As you are working on this middle part, on identifying changes, you might also identify some social, economic or environmental trends or drivers that could be affecting the whole system included in your changes. For instance, you might identify that for some changes to happen, the economy needs a steady upward trend. If that is the case, write it down on a post-it, place it on the upper row at a proper time scale and then draw the relation between the trend and the change.

STEP 4. Prioritising

If the backward process has been fruitful enough there will be quite a number of changes. Then, prioritize some of them as essential for the pathway(s) to be taken forward. You can prioritise changes within the same trajectory or not, but always keep in mind the

> Socio-technical roadmap is based on the technical road mapping technique, largely used in industry to support technology strategy and planning.



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

causality relation between changes. Use sticky dots or any other system to vote and rank options. Whether it comes to the changes or their prioritisation, these steps are independent from your role as stakeholder. It doesn't matter if some of you are policy makers, technological suppliers or consumers; for the vision to be reached those changes have to happen.

STEP 5. Going Forward

With the chain of changes on the canvas it is time to identify activities and resources to bring about those changes. You can assume that it is not possible for one single stakeholder to handle all the changes; start by defining who you are and what your role and objectives are. Depending on that, you will focus on those changes that you might help to provoke. If there is more than one stakeholder in your team, then you can run this step several times identifying the forward pathway for each of them.

With your identity, role and objectives in mind, place yourself in the present time and step forward until the first change you have linked to your role. Then identify the activities to be carried out to bring about that change as well as the resources you will need.

These activities can entail running different experiments, conducting new R&D processes, adopting a new partnership policy between partners, gaining new skills, etc. As for the resources, these might be physical resources or others such as acquiring physical resources. You can run a fast-paced and short brainstorming session to identify these activities and resources. Then, pick out those you decide as the best, write down one per post-it and place them on the lower row of the canvas and in chronological order. Move forward to the next change you prioritised for your stakeholder role and proceed the same way. Again, it is important to map out relations between actions, given that they will comprise the foundations for strategy settings.

Bear in mind that the same activity can encompass more stakeholders than yourself. If that is the case, identify those stakeholders on a different post-it and put them next to the activities or resources.

Stay with the process until you reach the last change (under your influence) before reaching the vision. By this moment you should have a chain of resources and activities that leads you from the present moment to the vision. Remember that this chain is strictly related to one stakeholder. Therefore, if you might want to identify activities for other stakeholders you should repeat the process.

STEP 6. Allotting time frames

The last step is for you to start your action plan. Once you have your chain of actions you need to work allocating time frames for each of those actions. As if it were a gantt chart, draw a timeline for each activity paying attention to which activities should finish before starting others, which activities

> As you are working on the middle part, identifying changes, you might also identify some social, economic or environmental trends or drivers that could be affecting the whole system.

Stakeholder management workshop. Innovation Building Block series. The Climate-KIC. Frankfurt, 2015 (Germany). http://goo.gl/MTSuTW

might be carried out at the same time, etc. Don't spend too much time with the details, this is only the basis for action planning, not the plan as such.

STEP 7. Debrief

Once you have completed the canvas, spend time reflecting on the process and the outcome you got. Use the following questions as sparks for further discussion.

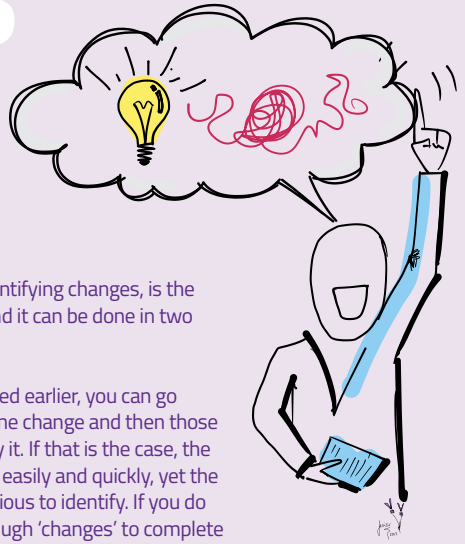
How did the process go? Did you find it clear, straightforward, difficult? Which parts were more difficult to carry out? What does the canvas look like? Does it look coherent, understandable, confusing...? Do you think there was something missing in the canvas? Would you add or leave anything out?

Did you find it difficult to spot the changes? Were there any discussions about the prioritisation? Do you think that prioritization of changes should be done differently according to each stakeholder? Or do you think it is independent from the stakeholders? Did you easily find the chain of cause-effect in changes? Were there any changes with no relation to others? If so, what do you think is the role of that change?

What are the biggest risks, and the biggest uncertainties you found? If you repeated the session on these issues in a half year, do you think there would be many differences? Why? Did you run the step forward for different stakeholders? If so, did you find out many differences? Did you find a lot of interdependencies between the activities and different stakeholders? If so, what do you think it means in terms of system analysis?

Do you think it would be necessary to do the process over once in a while throughout the project lifetime?

Tips



- Stepping backwards, identifying changes, is the key part of this process and it can be done in two different ways.

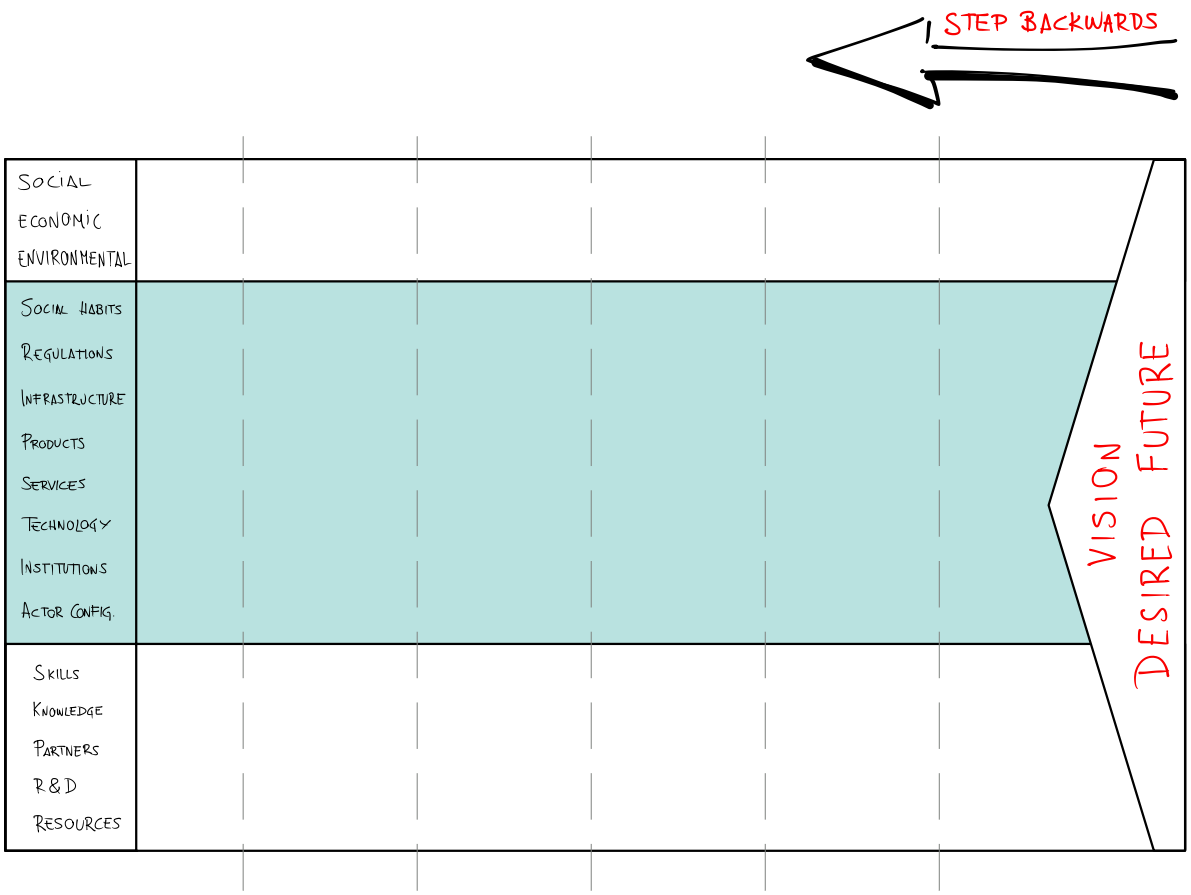
- First method: As described earlier, you can go step by step, identifying one change and then those previous ones triggered by it. If that is the case, the causality chain comes out easily and quickly, yet the changes cannot be so obvious to identify. If you do not feel that you have enough 'changes' to complete a timeline, then maybe you should try the second way of doing this exercise (below).

- Second method: Brainstorm individually or collectively: identify changes that need to happen for your preferred future to become reality. Don't fixate on the chronology or causal relationships; just get the changes on the canvas. Don't try to sequence the events first. It is essential that you "free flow" the changes needed as people place them on the canvas. Finally, put them in a logical order. In this non-linear generation of ideas, you will generate a lot more changes and find it more difficult to put them in order. However, this second way will give you a lot of ideas/changes to play with and you may unravel something hidden until now.

Find out more

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

The Canvas



De Vicente López, Javier and Matti, Cristian (2016) . Visual toolbox for system innovation. A resource book for practitioners to map, analyse and facilitate sustainability transitions. Transitions Hub series. Climate-KIC, Brussels 2016.

References

Andringa José, 2015. Notes on transition management. Not edited.

Boulle M, Carp E, De Cuyper M, Tanghe J, Van de Craen B and Van Holte O. 2013. Visual Innovation Accelerator Tool book. How to ignite powerful innovation?. Amsterdam, January 2013.

Caniëls, M. C., & Romijn, H. A. 2008. Actor networks in strategic niche management: insights from social network theory. Futures, 40(7), 613-629.

Carleton T. et al. Playbook for Strategic Foresight and Innovation. Tekes Ed., 2013. paperback, 264 pp., ISBN 978-9522655714

Carleton, Tammy Lee., Larry J. Leifer, Charles H. House, and Riitta Katila. 2011. The Value of Vision In Radical Technological Innovation. Thesis (Ph.D.)-Stanford University, 2011.

de Bono, Edward. 1985. Six Thinking Hats: An Essential Approach to Business Management. Little, Brown, & Company. ISBN 0-316-17791-1 (hardback) and 0316178314 (paperback).

de Vicente Javier and Sterrenberg Lydia 2015. Toolkit for socio-technical transition workshops. Utrecht 2015.

Dilts, Robert. 1994. Strategies of Genius Volume I, Volume II & Volume III, Meta Publications, Capitola, CA, 1994-1995.

Fantin I. Applied Problem Solving. Method, Applications, Root Causes, Countermeasures, Poka-Yoke and A3. How to make things happen to solve problems. CreateSpace Independent Publishing Platform Ed. Milan 2014. Paperback 212 pp. ISBN 9781499122282.

Geels FW. 2002. Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. Res Policy 2002;31(8/9):1257-74.)

Hanington B. and Martin B. 2012. Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions.2012.

Henderson B. 1973. The Growth Share Matrix or The Product Portfolio. The Boston Consulting Group, 1973.

Kim, W.C., Mauborgne, R. 2005. Blue Ocean Strategy: How to Create Uncontested Market Space and Make the Competition Irrelevant. Boston: Harvard Business School Press.

Krogerus M And Tschäppeler R. 2011. The decision Boom. Fifty models for strategic thinking. Profile Books LTD. London 2011.

Loorbach, 2007. Transition Management. New mode of governance for sustainable development, Doctoral thesis, available online: http://goo.gl/ZouNBR.

Macanufo J. et al. 2010. Gamestorming: A Playbook for Innovators, Rulebreakers, and Changemakers.O'Reilly Media Ed. 2010 paperback, 290 pp., ISBN 9780596804176.

Narberus Mitcha, 2013. How to break out of the system trap?. A model to support conversations for a more strategic activism. Discussion paper. SMARTCSOs, 2013.

Phaal R. Farrukh, C. and Probert D. 2001. Technology Roadmapping: linking technology resources to business objectives. Centre for Technology Management, University of Cambridge.

PMI. Project Mangament Institute. Guide to the Project Management Body of Knowledge (PMBOK® Guide) - Project Management Institute; 5 edition (January 1, 2013).

Popper R. Foresight Methodology. Handbook of Technology Foresight: Concepts and Practice. L. Georghiou, H.J. Cassingena, M. Keenan, I. Miles, R. Popper Eds., Cheltenham: Edward Elgar.

Pugh S. 1981. Concept selection: a method that works. In: Hubka, V. (ed.), Review of design methodology. Proceedings international conference on engineering design, March 1981, Rome. Zürich: Heurista, 1981, blz. 497-506.

Rip A. and Kemp R. 1998. 'Technological change', in S. Rayner and E.L. Malone, Human Choice and Climate Change – An International Assessment, Vol 2, Batelle Press, Washington DC, 1998, pp 327-399.

Saaty, T.L ,2005. Theory and Applications of the Analytic Network Process, Pittsburgh, PA: RWS Publications

Schot J W. 1998. The usefulness of evolutionary models for explaining Innovation. The case of the Netherlands in the nineteenth century. Hist Technol 1998;14:173-200.

Sibbet D. Visual Meetings: How Graphics, Sticky Notes and Idea Mapping Can Transform Group Productivity. John Wiley and Sons Inc., 2010, paperback, 288 pp., ISBN 9780470601785.

Sibbet D. Visual Leaders: New Tools for Visioning, Management, and Organization Change. John Wiley and Sons Inc., 2012, paperback, 256 pp., ISBN 9781118471654.

Sterrenberg, L., J. Andringa, D. Loorbach, R. Raven, and A. Wieczorek, 2013. Low-carbon transition through system innovation: Theoretical notions and applications, Pioneers into Practice mentoring program 2013.

Taiichi Ohno; foreword by Norman Bodek. 1988. Toyota production system: beyond large-scale production. Portland, Or: Productivity Press. ISBN 0-915299-14-3.

Twomey P. And Idil A. 2014. Review of System Innovation and Transitions Theories. Concepts and frameworks for understanding and enabling transitions to a low carbon built environment Gaziulusoy Working paper for the Visions & Pathways project, March 2014. CRC for Low Carbon Living.

United Nations Industrial Development Organization. UNIDO Technology Foresight Manual. Vol. 1: Organization and Methods. Vienna, 2005. Retrieved September 2015 in http://goo.gl/7iZLx4

Van den Bosch, S. & Taanman, M. 2006. How innovation impacts society. Patterns and mechanisms through which innovation projects contribute to transitions. Innovation Pressure Conference 2006, 15-17 March, Tampere, Finland.

Van den Bosch, Suzanne and Rotmans, Jan. 2008. Deepening, Broadening and Scaling up: A Framework for Steering Transition Experiments. KCT essay #2: Delft/Rotterdam.

Van den Bosch, S. 2010. Transition Experiments, Exploring societal changes towards sustainability. PhD Thesis: Erasmus University Rotterdam.

Visual **toolbox** for system innovation

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

Edited by Climate-KIC Transitions Hub and Climate-KIC Professional Education

Transitions Hub
Alice Bauer. Transitions Hub Manager
Cristian Matti. Learning and Knowledge Manager
Jon Bloomfield. Advisory Board
Aled Thomas. Advisory Board
Christoph Auch. Advisory Board
Fred Steward. Advisory Board
Hannes Utikal. Advisory Board

Climate-KIC Education
Ebrahim Mohamed. Director of Education
Christoph Auch. Professional Education Lead
Anne Bartens. Education Manager

Coordination
Cristian Matti and Alice Bauer

Author
Javier de Vicente. System innovation consultant and facilitator https://es.linkedin.com/in/jdevicente/en

Technical review
Bence Fülöp, Boelie Elzen, Dave Green, Jose Andringa, Kati Berniger, Lydia Sterrenberg, Markus Allbauer, Richard Bubb, Roberto Colucci, Sergio Belda, Suzanne van den Bosch and Tijmen Altena.

Graphic Design
Paula Rincón de Arellano

Copy Editor
Lee Monk


eit Climate-KIC
Professional Education
eit Climate-KIC
Transitions Hub
9 782960 187410