

ECO-INNOVERA Strategy and Network Development

Briefing paper for the Strategic Board meeting

Brussels, 12th September 2012

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Summary

The status of work on strategy and network development is reported and options on both presented for the Strategic Board for comment and guidance.

The work on **strategy development** builds on the Position Paper of June 2011. Based on guidance received from the previous Strategic Board meeting and consultations with the consortium the main focus of activity has been on system innovation for sustainability.

A facilitated workshop was held in August 2012. The objective of this workshop was to identify key characteristics of system innovation based on solid academic foundations into a language and an approach which can be used by a broader, non-academic audience to help identify practical measures to support system innovation for sustainability.

Supporting system innovation for sustainability has been identified as an area where ECO-INNOVERA could make a valuable contribution to policy, research and innovation support in Europe, and one that would be distinctive among the landscape of ERANets.

Potentially supporting system innovation – based on a thorough analysis of the boundaries and tipping points of a given system – offers policy makers and research funders the possibility of achieving deeper levels of innovation faster, and reducing the risk of unintended consequences of policy interventions.

Based on our improved understanding of the potential for system innovation to contribute to the Eco-Innovation agenda, we seek endorsement from the Board for a greater focus on this topic in the forward programme.

Specifically we have identified a high level objective and four supporting options for ECO-INNOVERA to consider:

Objective: By 2016, ECO-INNOVERA is seen as a key resource on system innovation for sustainability in practice and for policy support, providing access to the information, tools and techniques necessary to make this happen.

Options

1. To build a community of practitioners which effectively is a strategic network of: thought leaders for system change, facilitators to help others use the tools, cascade mentoring.
2. To create a system innovation toolkit – a set of resources for people to use in creating system innovation
3. To promote ways to make funding more widely available for delivery of system innovation projects – pilot projects, new funds, funding criteria etc.
4. To promote recognition that system innovation is key at policy level, leading to other outputs such as cooperation with other networks and a common message

Options 1-3 are described in greater detail in this report. There was insufficient time to develop option 4 at the workshop but it is included in this list for the sake of completeness.

Our recommendation to the Strategic Board is that ECO-INNOVERA focus on delivery of aspects of options 1 and 3 from this list within its activities supporting system innovation for sustainability. We also request guidance from the Strategic Board on the extent to which these options should be implemented.

Implementation of the recommended options is likely to require significant reallocation of resource from within task 1.2 and potentially other tasks. We seek a mandate from the Strategic Board for the project coordinator to propose a reallocation of resources within the project based on its recommendations for future work on system innovation for sustainability by the network.

To an extent, the proposed work on system innovation for sustainability will reinforce the other topics identified in the Position Paper. We will identify these opportunities, and also the balance of other activities supporting the 6 topics identified in the Position Paper as part of the resource reallocation process.

The work on **network development** has focused on collating information provided through Task 2.1 (Investigation of eco-innovation activities in key countries beyond Europe) and Task 1.3 Collaboration with other ERANets and ETPs.

Candidates for greater collaboration are suggested both within and beyond Europe and good practice examples identified from a review of eco-innovation support in key overseas countries.

We seek guidance and comment from the Strategic Board on:

- Which of the suggested ERANets and ETPs should form the focus for deeper collaboration going forward, bearing in mind the requirements of both the strategy and network development objectives? How can they contribute to the Eco-Innova's objectives and how can Eco-Innova contribute to them?
- Prioritisation of the recommendations and good practice examples identified through Task 1.1. (Eco-Innovation activities beyond Europe)
- Any resource implications of the above

Introduction

This document supports the meeting of the ECO-INNOVERA Strategic Board in Brussels on 12 September 2012. It describes the current status and some implementation options in Task 1.1 (Network Development) and Task 1.2 (Research and Innovation Strategy).

Tasks 1.1 and 1.2 are considered together because they are linked and mutually reinforcing. The recruitment of new members to the network is supported by having a strategy that is recognised as being ambitious and capable of achieving high impact: the effective implementation of that strategy at scale depends on broadening and deepening participation in the network.

A series of options are presented for strategy and network development. The Strategic Board is asked to review and endorse these options and to provide guidance both on how they should be prioritized and how they may be resourced.

After the Strategic Board meeting the recommendations will be incorporated into the Interim Strategy, due as a deliverable to the Commission in November 2012.

Strategy Development

The work on Strategy Development builds on the findings reported in the Position Paper in June 2011. This set out six areas for further development by ECO-INNOVERA:

1. Developing a common understanding of eco-innovation (eco-innovation framework)
2. National programs / developing a research landscape
3. Metrics
4. Value chains and business models
5. System innovation
6. Structuring eco-innovation (sectoral roadmaps)

Work on topics 2 and 3 is the subject of tasks 2.1 and 2.4 and is reported elsewhere. Work on an internet-based eco-innovation framework is underway but is not sufficiently developed to be reported here.

At the previous Strategic Board meeting, advice was provided by the Board to identify activities that were distinctive from other ERANets and that embed thinking about how to “act eco-innovative” Through consultation with the consortium (in the form of a survey over the summer of 2011 and workshop session at the second consortium meeting in February 2012) we identified system innovation as a topic that both complies with the directions provided by the Strategic Board, and one that is of high interest and a learning opportunity for the wider network. This topic therefore has been the focus of activity over the last 12 months and is the main subject of this report.

System innovation

The overall objective of Ecolnnovera is to support innovation to reduce environmental impacts/resource use at a European level. Systems thinking (and by extension support for system innovation) is one method to do this and one which potentially offers the prospect of encouraging high-impact change.

We propose the following working definition of system innovation for sustainability:

A set of interventions (new approaches or new applications that scale) that lead to a shift in a whole system (a sector, a city, an economy) on to a more sustainable or better ecological path.

We do not set out to review the academic literature on system innovation here. Our objective is to translate key characteristics of system innovation based on solid academic foundations into a language and an approach which can be used by a broader, non-academic audience to help identify practical measures to support system innovation for sustainability.

Typically innovation is triggered by an external event: the distinctive feature of system innovation is the response by the broader system to that trigger. Profound change is created by a complex interplay of factors including technology, markets, public policy, cultural beliefs and consumer behaviour. Depending on the dimensions and nature of the system being considered, the range of non-technological innovations will vary, but it is generally true that system innovation requires more than just technological innovation to occur.

Systems thinking is a means of thinking about complex problems to identify how to make substantive progress and ultimately resolve them. For example, tackling problems such as climate change or vulnerable ecosystems through small or isolated initiatives won't deliver change at the speed or scale required. By taking the approach of viewing of "problems" being parts of an overall system, rather than formulating a response to a specific part of that system. By doing this, the risk of unintended consequences of an intervention on that system is reduced.

Systems thinking focus on cyclical rather than linear cause and effect. Classic system theory considers that there are levers or places within a complex system (such as a company, a city, an economy) where a small shift in one component can produce big changes throughout the wider system. By understanding the dynamics of these systems, and then intervening at strategic tipping-points, it should be possible to transform them to a new and more sustainable way of functioning.

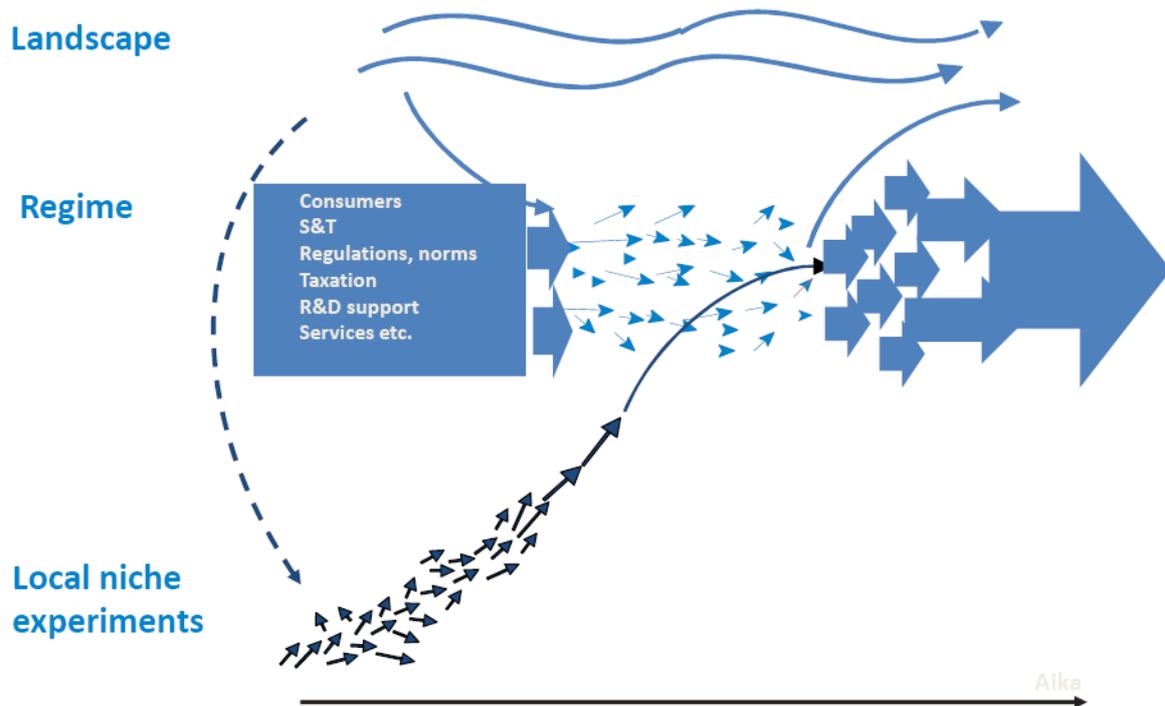


Figure 1: System level changes and innovations. Source: Tekes, after Geels (2011)

System innovations, according to Geels, can be seen as “a change from one socio-technical system to another.” The functions of a society in this model are met by ‘socio-technical systems’ – “a cluster of elements, including technology, regulation, user practices and markets, cultural meaning, infrastructure, maintenance networks, and supply networks.” Encouraging system innovation can be seen as structuring these transitions - in the image overleaf this is the coalescence of smaller arrows into the larger arrows. The result is that the individual elements become aligned and stabilise into a new design, creating the momentum for a system shift.

The implication is that the correct mix of policy interventions and research support - tailored to intervene at the tipping points and levers of a given system – has the potential to achieve a deeper level of innovation faster than through a traditional, non-system approach. Furthermore, if the system is correctly defined and its potential interactions with other systems are well understood, the possibility of unintended consequences is reduced.

Previous work

System innovation was identified in the Position Paper (June 2011) as one of six topics that form the basis for the development of the network's Research and Innovation Strategy. A survey of the consortium members revealed that while system innovation is an area of interest for many of them, few partners claimed significant expertise and/or experience of running programmes that actively seek to support system innovation. The partner with most experience was Tekes, whose Green Growth programme¹ includes promoting radical and system-level transitions in its scope.

Having identified a need to share learning and best practice among the partners, the second consortium meeting in February 2012 included a briefing session on system innovation (delivered by TSB/Tekes), followed by a workshop where consortium members were asked to locate several case studies on the matrix below:

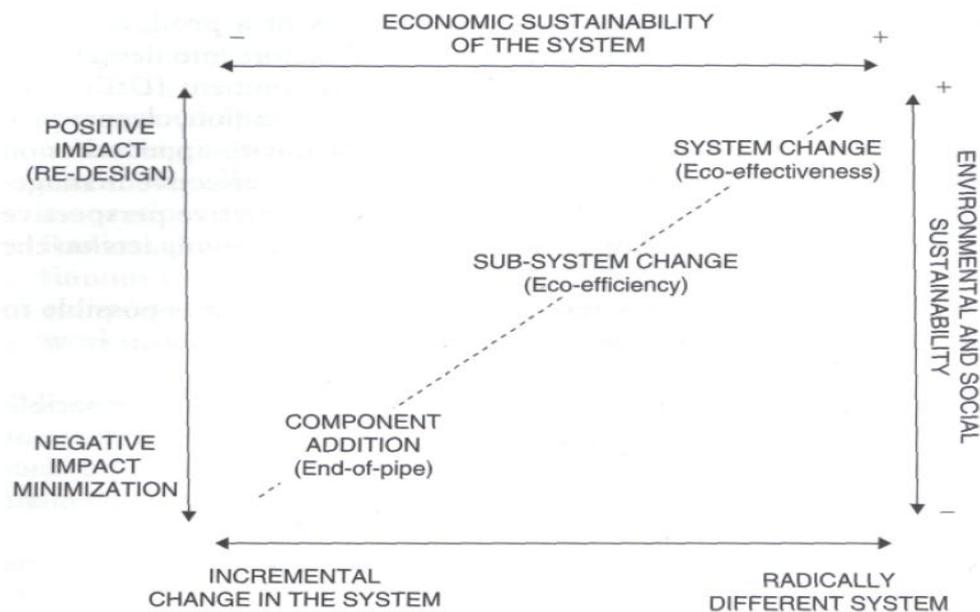


Figure 2: Ecolnnovation matrix (after Carrillo-Hermosilla et al, 2009)

This had limited success: while there was good agreement at the extremes of this diagram (e.g. pollution control as end-of-pipe; smart cities as system change) there was a wide variation in the assessment of intermediate cases such as industrial symbiosis or mobility systems (e.g. Car-2-go, Peugeot Mu). However there was broad agreement that the focus of ECO-INNOVERA's activities should be on promoting sub-system change, perhaps by developing a method to identify sectors/applications that ready for sub-system change and proposing steps to accelerate that process.

This exercise was useful in illustrating some of the pitfalls of discussing system innovation in a large group. Inevitably there is a degree of subjectivity in what constitutes a radical versus incremental change; there is a need for prior and explicit definition of which system or sub-system is being considered. There may be differences in national experiences on the novelty of a given innovation – for example extended urban mobility schemes (pay per use or membership schemes including use of cycles, cars and/or public transport) are well established in some countries but less so in others.

¹ <http://www.tekes.fi/programmes/Kestavatalous>; see also http://www.tekes.fi/u/towards_green_growth.pdf

System Innovation workshop

While the workshop held during the consortium meeting in February 2012 was useful for establishing a degree of common understanding of system innovation among the partners, the guidance it provided for developing the strategy was at a high level only. Further work was necessary to identify practical steps the network might take forward to support system innovation in practice.

Forum for the Future (F4F) is a UK NGO with extensive experience of working with government organisations and business to translate complex issues such as sustainability and system innovation into practical measures appropriate to their needs. F4F were contracted to facilitate a workshop of a small group of ECO-INNOVERA member organisations and partner networks (EcoInnovation Observatory, EcoPol).

The aim of this workshop was to deliver a set of strategic options on system innovation for consideration by the Strategic Board. To do this, the workshop was structured around the following objectives:

- To develop a shared sense of vision and purpose for a system innovation strategy and agree a working definition of system innovation
- To develop a broad set of strategic options for the network on system innovation
- To identify how ECO-INNOVERA can accelerate system level eco-innovation

Thinking about systems innovation means embracing and understanding complexity. This means it is difficult, perhaps even counter-productive, to attempt to provide an inflexible or universal definition of system innovation. Instead, the workshop group sought to identify some of the characteristics by which system innovation for sustainability can be identified, and which might provide some insight on the levers that can help bring about a system shift.

The key characteristics of **system innovation for sustainability** were identified by the group as being:

1. **Interdisciplinary, multi-faceted** - combining behaviour, technology, policy and economy;
2. **Radical, transformative** – creates significant change, using new approaches and applications
3. **Collaborative** - cross sector, involving different players, new entrants and new types of partnerships;
4. **Including whole value chains**
5. **Designed to work towards a shared eco or sustainability goal**

In addition, some secondary characteristics are that a well-defined system should have a clear diagnosis, including mapping/ modelling the system and testing potential leverage points and outcomes and making the whole system transparent to stakeholders. It should also present opportunities for learning and experimentation, including methods for monitoring the change created.

The EcoInnova network has several strengths that place it in a unique position to support system innovation for sustainability. The network members have a diverse set of experiences, both in terms of programming (research funding, innovation support, policymaking) and national /regional context. As a cross-cutting network with a remit to support eco-innovation, it can reasonably expect to have influence in shaping EU-wide policy and has the opportunity to occupy a distinctive space of high policy significance. At a national/regional level, network members provide links to national funding opportunities which can translate into practice.

At the same time it is recognised there are some significant weaknesses/threats to the network, in particular that fact that its reputation for an agent of change for system innovation has not yet been established. Also, there is limited window of opportunity in which to act for example if the objective is to influence the Commission in its formulation of H2020 calls.

A series of case studies were discussed – the Sustainable Shipping Initiative², the UK's Future Cities programme³ and Nike's approach to system innovation (closed loop models of production). Working in groups, the workshop identified over 20 potential practical measures that EcoInnova might take forward to support system innovation. Based on a discussion of what the networks impact could be in 2016, the measures were consolidated and prioritized to give 4 options supporting an overall network objective.

Objective: By 2016, Eco-Innova is seen as a key resource on system innovation for sustainability in practice and for policy support, providing access to the information, tools and techniques necessary to make this happen.

Options

1. To build a community of practitioners which effectively is a strategic network of: thought leaders for system change, facilitators to help others use the tools, cascade mentoring.
2. To create a system innovation toolkit – a set of resources for people to use in creating system innovation
3. To promote ways to make funding more widely available for delivery of System Innovation projects – pilot projects, new funds, funding criteria etc.
4. To promote recognition that system innovation is key at policy level, leading to other outputs such as cooperation with other networks and a common message

Figure 3: Potential ECO-INNOVERA objective and supporting options for system innovation

The first three options were analysed in greater detail and are described in the following pages. There was insufficient time to develop the fourth option in the workshop, although it is included in the above for the sake of completeness.

² <http://www.forumforthefuture.org/project/sustainable-shipping-initiative/overview>

³ <https://connect.innovateuk.org/web/future-cities>

Option 1: Community of practitioners

System innovation is an emerging field which is attracting great interest from a range of different audiences – government, business, researchers and others. With this field being at such an early stage of development it is expected that experienced practitioners – “champions” of system innovation for sustainability– will be motivated to share knowledge and encourage others. Currently there are few, if any, formal networks supporting system innovation and so there is an opportunity for ECO-INNOVERA to support an embryonic community of practitioners, starting at the European level but with the aspiration to be global in scope.

There would be multiple opportunities in this community for learning, cross-fertilisation of ideas or more active forms of collaboration. We see a role for ECO-INNOVERA to support this community by:

1) Sharing understanding

- a. Among the broader consortium, to achieve a common understanding, and broader ownership of this topic as a network strength, and to inform discussions at a partner level of what system innovation might mean in a national/regional context.
- b. With key partner networks and projects. This process has already started through the involvement of EcoPol and the EcoInnovation Observatory but could be extended to include:
 - i. Key partner ERANets and organisations from the list presented in Table 3).
 - ii. Programme owners at the Commission (this would also support delivery of option 3)

The content to support this shared understanding could be a combination of practical examples and inspirational speakers who are either recognised advocates of system innovation and/or have had experience of system innovation in practice.

2) Connecting active practitioners:

- a. This could be a high-level forum or a series of working groups of individuals are comfortable working with uncertainty and are stimulated by generating practical solutions or approaches to complex problems.
- b. This core of expertise could be encouraged to work intensively on specific challenges, perhaps through extended intensive workshops or “sandpits”

Through these activities it might be possible to assemble a self-teaching network through a cascade monitoring process

3) Building and sustaining the community

- a. Opportunities for university-based projects or summer schools providing a mixture of academic content and experiential –based learning
- b. Opportunities for internships, exchanges to work on specific projects which have a system innovation character

The ERANet resource would be used within this option mainly for priming activities, through developing strong content and providing a community manager to provide structure and support in the early stages. Once the community achieves critical mass, it is expected that other organisations might be persuaded to support delivery of specific tasks.

Within this option there would be roles for:

- Research funders to develop customised content and training
- Innovation agencies to help identify the challenges, bring business champions into the community
- Policy makers to develop national programmes, host events, acting as problem-owners for complex, multidimensional challenges
- National / regional partners to help define challenges which have a geographical dimension

Risks for this option include:

- Potentially high upfront workload for EcoInnova as the community builds critical mass. Ideally a dedicated community manager would be responsible for this task.
- Awareness of system innovation lower in targeted partner organisations than expected
- Slow rate of take-up through the existing practitioners being fewer in number harder to engage than anticipated.

Option 2: System Innovation Toolkit

Supporting the community of practitioners there could be a toolkit of practical tools, techniques and guidance on approaches. This toolkit would make best practice and information more accessible and workable; provide a learning place to understand system innovation principles and practice; provide guidance on how to understand the dimensions/boundaries of a given system. Building on existing resources, it could be a mechanism to encourage, speed and scale up expertise in system innovation in ready to support H2020.

Potentially there could be two variants of the toolkit:

- A "systems data" toolkit for system innovation, which could include multi-domain representation of a given system (maps, process flows, supply chain info etc.), forecasts of future system data and tools to experiment and explore different interventions within a given system
- A "systems innovation practice" toolkit for system innovation, including tools for policy makers and organisations, tools to influence change actors and ways to identify path dependence and how to change it

Key activities for ECO-INNOVERA to develop this option would include:

1. Explore what is already available through desk study, survey of member countries and their programmes
2. Scanning and identifying “front runners”
 - a. using recommendations and lessons learned from the desk study and elsewhere
 - b. through interviews, turned into stories
3. Provide a systematic description of this information to develop a toolkit for EU use.
 - a. Identify needs from activities 1 and 2 (e.g. interviews, workshops etc.)

ECO-INNOVERA is well placed to deliver this option through the breadth of its network and the fact that it has a cross-cutting focus compared with other ERANets which are often sector specific. The outcome of this activity would be that there would be a mechanism to help and accelerate translating policy and research insights into practice.

Within this option there would be roles for research funders to provide information and best practice and for innovation agencies to specify the toolkit. The risks associated with this option are in potential duplication of toolkits available nationally and limited value added at an EU level. Both of these risks could be fully characterised and if necessary mitigated after reviewing existing activities in this space.

Option 3: Influence funding of system innovation

ECO-INNOVERA has a limited amount of funding within its direct control in the form of the two joint calls envisaged during the first four years of the network’s life. More substantive and sustained support will be necessary if system innovation is to be implemented at scale and a rate sufficient to meet the substantial environmental challenges with which Europe is faced. A distinctive and valuable function of the network would be for it to act as an advocate for system innovation, providing the necessary arguments, evidence and practical support to make a compelling case to funders at a European and national level.

We see a role for ECO-INNOVERA to influence and leverage funding through embedding system innovation in existing innovation programmes and identifying new finance mechanisms for creating system innovation solutions and removing barriers to system change. This could include activities such as:

1. Map how system innovation is currently supported through national and EU programmes, identify candidate programmes to which these approaches can be extended and/or pilot new approaches, particularly those which focus on the implementation of system innovation

- a. Large scale system innovation demonstrators – for example several member countries currently have or are developing Future Cities programmes which have a high system innovation character
 - b. “Sandpit” funds (a model whereby funding is allocated after an intensive structured workshop, effectively being a form of highly collaborative proposal development in response to challenge identified by the funder)
 - c. Linking to business networks which are trying to support system innovation
2. Promote an EU-wide standardised approach o support for system innovation, including:
- a. Embedding system innovation funding criteria for projects that require systems thinking approach. This would involve identifying and supporting flagship system innovation projects, probably linked to recognised societal grand challenges
 - b. Providing guidance and training for a cohort of evaluators to assess these types of projects –
 - c. Developing a standard definition and toolkit for research funders (links to option 2)
3. Programme for dissemination of system innovation projects and related research areas (“game changers”) including:
- a. Focus on collating/ generating research into financial mechanisms to address barriers (for example green procurement as a driver for innovation)
 - b. Task groups with expertise in on specific system innovation challenges
 - c. Recognising that different countries/ regions have different starting points in terms of their understanding and support for system innovation, and tailoring the ECO-INNOVERA support to them accordingly.
 - d. Linking to a community of practitioners (see option 1)

ECO-INNOVERA is well placed to deliver this option through its links to the Commission and national/regional funding agencies. There is a significant opportunity over the next 6-12 months to influence H2020 priorities and the Eco-Innovation Action Plan.

The main risks for this option are that system innovation may be seen as too complicated and difficult to articulate to incorporate into funding programmes. Supporting system innovation may be viewed by funders as being too risky, as the potential benefits are long-term and difficult to predict or quantify.

Network Development

Network development identifies new contacts/programmes for future cooperation and maintains and strengthens the existing network to support close cooperation. The long term objective of network development activities is to lead to a self-sustaining network beyond the funded term of the ERANet.

Developing the network could take the form of bringing in new partner countries or by be strengthening the participation within existing network members (for example bringing in additional programme owners/managers). We have mapped out an overview of eco-innovation activities in key countries beyond Europe. (Task 1.1) resulting in a report and 5 Good Practices.

Within Europe, the main activity has been to review the landscape of ERANets and European technology Platforms (ETPs) to identify candidates for collaboration and to monitor their activity (Task 1.3). Mechanisms to exchange information and engage with potential partner networks partners have been established in workpackage 4 (Dissemination).

Currently the ECO-INNOVERA network includes 24 partners from 19 countries and regions. All partners are national or regional programme owners or programme managers.

EcoInnovation networks in key countries beyond Europe

Task 1.1 included a review of EcoInnovation activities in key non-European countries (US, Japan, Republic of Korea, China, and India) through a programme of desk study and workshops with experts, resulting in a report and the identification of 5 examples of good practice.

In this report public R&D programmes of relevance for eco-innovation and other activities to foster eco-innovation in the five key countries outside Europe: were investigated and analysed. The report contains information on market-based policy instruments to support eco-innovation, programmes and activities to mobilise the financing of eco-innovation, environmental regulation and standards, demand-side oriented initiatives to raise awareness with regard to eco-innovation and international initiatives to promote eco-innovation.

Table 1 presents the perceived strengths of the respective countries in different sectors and the recommendations from task 1.1 are presented in Table 2. A summary of the report is included in Appendix 3, the full report on this activity being available on the EcoInnova website.

	US	Japan	Korea	India	China
Climate change mitigation technologies	X	X	X		
Energy and resource efficiency	X	X	X		X
Biotechnology				X	
Water				X	X
Renewable energy				X	
Agriculture				X	X
Buildings					X

Table 1: EcoInnovation support in key countries beyond Europe

RECOMMENDATIONS

- In terms of research collaboration, US, Japan and Korea are particular interesting partners in the areas of climate change mitigation technologies, energy and resource efficiency.
- There are good opportunities for research collaboration with India in the areas of biotechnology, water, renewable energy and agriculture
- China is an interesting research partner particularly in buildings and energy efficiency, agriculture, and water resources
- The US Environmental Protection Agency portfolio addresses different stages of the R&D process, including support for verification, utilisation, commercialisation and dissemination. This could be a useful source of learning when designing cross-cutting programmes in Europe.
- The US venture capital market for eco-innovation can serve as a model for an active venture capital community.

GOOD PRACTICES

- The US SBIR programme is a successful good practice example for fostering R&D and innovation in small companies. There are similar examples in several ECO-INNOVERA partners – these with the US experience form a solid basis of good practices to be taken into account.
- The US ARPA-E programme stands out as a good practice of a programme that promotes high-risk transformative innovations.
- The Japanese Top-Runner programme is recognised as a successful strategy to promote eco-innovation.
- The Californian Zero Emission Vehicle Program (ZEV) presents a promising and ambitious new approach to reduce vehicle emissions.

Table 2: Key recommendations and best practice opportunities for networks beyond Europe

Other ERANets and ETPs

The core of task 1.3 is to exchange information with partner networks. Over 20 partner networks (Table 3) have been identified, based on the degree of overlap of research interests. ECO-INNOVERA is in regular communication with these networks, collating information on the following points (maintained as a resource on the ECO-INNOVERA intranet..

- Project funding,
- Meetings & conferences,
- Deliverable, studies, results,
- Activities of the network,
- Reciprocal information of Eco Innovera's activities.

Table 3 summarises the principal activities of ECO-INNOVERA partner networks.

Eco Innovera Partner Network Landscape									
	KEY activities				Sectors				
	Project Funding	Supporting Businesses	Innovation Policy	Information & Networking	Cross Cutting	Waste & Recycling	Manufacturing	Construction	Minerals. Chemicals
EUREKA	X	X		X	X				
PROINNO EUROPE			X	X	X				
EUROPE INNOVA			X	X	X				
Eco Innovation									
ECO INNOVATION OBSERVATORY					X				
EcoAP					X				
MANUNET II	X	X		X			X		
Manufacture				X			X		
SusChem				X					X
EuMat				X			X		
ECTP				X				X	
ETP SMR		X		X					X

Table 3A: ECO-INNOVERA partner network landscape

Eco Innovera Partner Network Landscape									
	KEY activities				Sectors				
	Project Funding	Supporting Businesses	Innovation Policy	Information & Networking	Cross Cutting	Waste & Recycling	Manufacturing	Construction	Minerals. Chemicals
KIC				X	X				
LMI					X				
CAPITA									
CIR2CLE	X		X	X	X				
ERA-CHEMISTRY	X			X					X
BiodivErsA 2	X			X					
ECOPOL			X	X	X	X			
ZeroWIN		X		X		X			
Eco WEB				X	X				
Still to investigate:									
Eco Innovation									
CAPITA									
ERA Min									
Lead ERA									

Table 3B Eco Innovera Partner Network Landscape

Discussion

The Position Paper delivered in June 2011 set out six areas for further development by ECO-INNOVERA, as summarised in Figure 1:

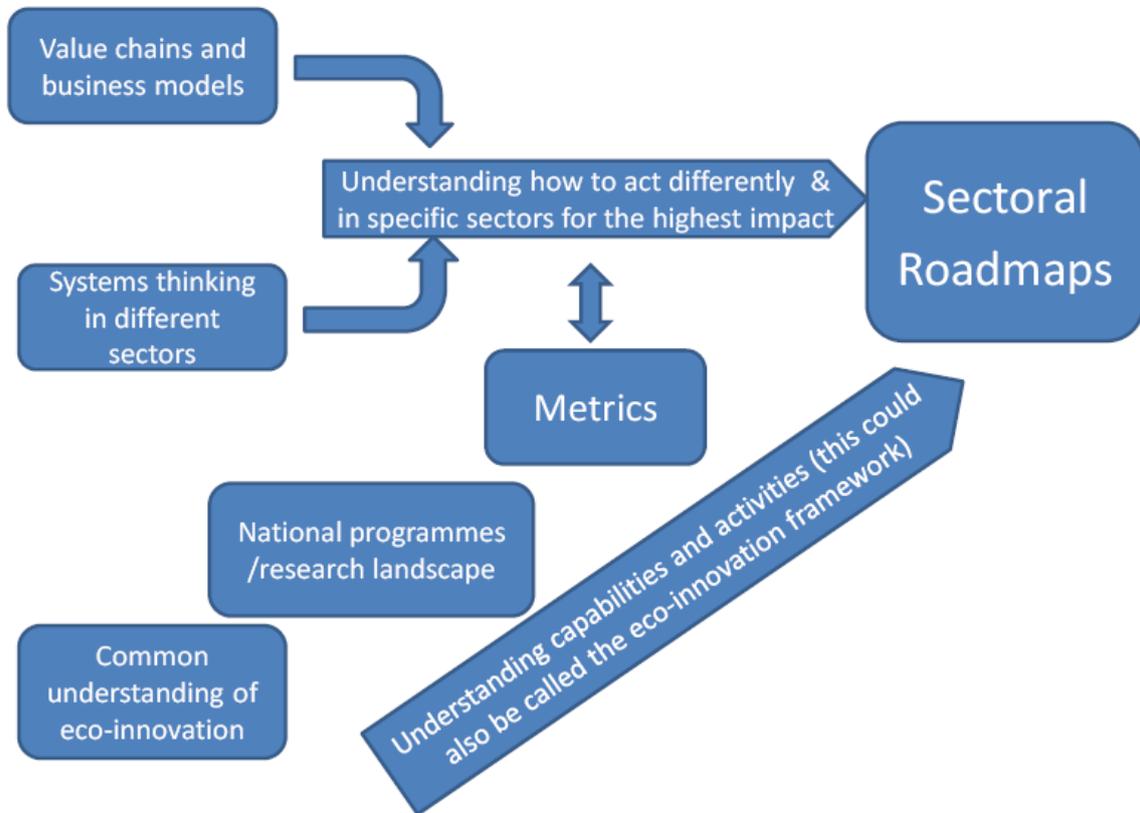


Figure 1: Interrelation of Strategy Topics in the Position Paper

The picture emerging from our work on system innovation is that it is strongly related to most, if not all of the other topics, and that support in this area, if correctly designed, could offer a way to encourage innovation that is both faster and deeper than normally is the case – i.e. a system shift rather than incremental change.

The options described in this paper potentially provide a pathway for ECO-INNOVERA to occupy a distinctive and valuable position in the ERANet landscape as a source of expertise and support for system innovation for sustainability.

There are links between system innovation and the other topics described in the Position Paper. For example, the content provided through developing a community of practitioners and a system innovation toolkit can be expected to contribute a rich library of case studies and examples to populate the eco-innovation framework. Our current understanding of metrics is mostly project or programme-based, but we might hope to develop an understanding of which metrics best describe different systems, potentially helping to identify the levers that can be applied to provoke a system shift.

Depending on the criteria used to identify the challenges of interest (i.e. the triggers for system innovation), different sectoral roadmaps might be identified. The role of ECO-INNOVERA then is in understanding the potential for system innovation implicated by current sectoral roadmaps, which is more valuable and reduces the risk of duplicating existing roadmaps. Measures to support system innovation are likely to involve new value chains and business models.

We believe significant progress in several or all of the options presented in this document would provide a powerful case to help recruit new organisations both from Europe and overseas. However, the ambition and resource implications of these options should not be understated. The barriers to system innovation are complex and deep-seated; overcoming them will require substantive and prolonged effort by ECO-INNOVERA and many other partners.

The implementation of these options is not provided for within the existing budget for ECO-INNOVERA and would have to be either self-funded by network partners and/or may require significant reallocation of the existing budget.

Our preliminary assessment of option 2 (systems innovation toolkit) is that it would require the greatest resource and is probably beyond the ECO-INNOVERA's capabilities to deliver at present. Option 4 (promoting system innovation for sustainability at policy level) is not currently developed at this stage to assess the feasibility or resource implications at this stage.

Option 1 (Community of practitioners) and Option 3 (Influence funding of system innovation) represent the best balance between distinctiveness of offering / potential to add value at a European scale and the capability/resource availability of the ERANet to deliver. Our recommendation to the Strategic Board therefore is to focus on these two in the first instance.

Appendix 1

The case for system innovation for sustainability is illustrated by two references from the literature:

Pier Vellinga, Chair of the Scientific Steering Committee of the Industrial Transformation Project of the International Human Dimensions Programme on Global Environmental Change (IHDP IT)

“Global environmental change poses an unprecedented international challenge for 21st century societies since it requires a radical change in the way human needs in the way energy, food, water and mobility are met. It calls for a transformation in our current consumption and production patterns as well as a transformation of incentive structures and the institutions which shape the relationship between the two. Such a proactive approach is based on the understandings of system analysis, system being defined as a set of inter-related economic activities and actors and flows of goods and services. For system change to be effective, it needs attention in all aspects of life: technology, institutions, economy, and the socio-cultural sphere. Because of this complexity, it is not surprising that a change to a more sustainable system will require a long time – at least one generation.”

Source: Foreword: System innovation and the Transition to Sustainability, Theory, Evidence and Policy. Geels F.W., Elzen, B. and Green, K. Edward Elgar Publishing, Cheltenham UK and Northampton Mass, USA, 2004 p. xxiv]

Frank W. Geels, Department of Technology Management, Eindhoven University of Technology, The Netherlands

“Modern societies face structural problems in several sectors... Since the 1980’s much effort has been made to solve problems with product and process innovations. Cleaner products and processes have been developed along with ‘end of pipe’ solutions. Sometimes these innovations have led to substantial improvements in environmental efficiency, such as in the case of automobile catalysts which greatly reduced tailpipe emissions of pollutants. The focus in these cases has been on changing some technological artefact.

Substantial improvements in environmental efficiency (a Factor 2 is a general average) may still be possible with innovations of an incremental kind. But larger jumps in environmental efficiency (possibly by a Factor 10) may only be possible with system innovations... Such system innovations not only involve new technological artefacts, but also new markets, user practices, regulations, infrastructures and cultural meanings.

Because of its sustainability potential there is increasing interest from policy makers, NGOs and large firms in transitions and system innovations.”

Source: General Introduction: System innovation and the Transition to Sustainability, Theory, Evidence and Policy. Geels F.W., Elzen, B. and Green, K. Edward Elgar Publishing, Cheltenham UK and Northampton Mass, USA, 2004

Appendix 2

The following participated in the workshop in System Innovation held In Utrecht on 15 August 2012.

Name	Organisation
Scott Cain (TSB)	TSB - Future Cities
Tessa de Haas	Agentschap NL
Robbert Droop	MinEnM
Kerry Mashford (TSB)	TSB - Buildings
Michal Miedzienski	EcolInnovation Observatory
Christopher Palmberg	Tekes
Mike Pitts (CI KTN)	Chemistry Innovation KTN
Tura Tomi	EcoPol
Just van Lidth de Jeude	MinEnM
Esther Veenendal	Agentschap NL
John Whittall	TSB - Resource Efficiency
Stephanie Draper	Forum for the Future (facilitator)
Charlene Collison	Forum for the Future (facilitator)

Appendix 3

Summary and conclusions report Eco Innovation activities in countries beyond Europe

The investigated countries (USA, India, South Korea, Japan and China) differ in the degree of innovation capacity and R&D investment. In particular Japan and USA are major players in the field of eco-innovation. Due to Korea's high investments in this area, it is catching up fast. With regard to innovation potential in the area of cleantech start-ups, USA and South Korea rank rather high compared with other countries. China and India have a strong potential for growth in this area, as policy to promote eco-innovation and green growth becomes more and more important. The percentage of Government budget for R&D in environmental issues is particularly high in Korea (around 4 %), while in US and Japan it is around 1%.

Almost all investigated countries include green growth as major pillars in recent strategy documents and stimulus packages with regard to the economic crisis. These strategies stress the importance of R&D for innovation in the environmental area to address both ecologic and economic challenges, particularly in Korea, the US, and Japan, but also in China. The strategies foresee an increase of the share of Gross Expenditure on Research & Development (GERD) for environmental issues to foster green innovation and increased investment to green the economy.

The investigated countries apply a broad range of programmes and activities that on the one hand fund and foster R&D in eco-innovation related areas and on the other promote the commercialisation and dissemination of eco-innovations. In general, most R&D funding programmes of relevance for eco-innovation in the investigated countries do not explicitly focus on eco-innovation per se. Instead, some R&D programmes listed in this report fund environmental research and environmental technology development without a specific focus on transfer of results and implementation, while other programmes and activities put their focus on promoting implementation and commercialisation of results without a specific environmental focus. However, there are also programmes that combine both.

In the US, a strong focus of public R&D programmes for eco-innovation is on dissemination and commercialisation. The strategy of the US Environmental Protection Agency (EPA) is to anchor innovation in the environmental programmes and to use the limited resources of the EPA as leverage by supporting collaboration with other actors. A number of EPA programmes focus not only on the funding of research and development, but also on demonstration, verification, diffusion and utilisation / commercialisation activities. EPA has been designed as a one-stop-shop to coordinate all programmes in the context of eco-innovation.

The US Small Business and Innovation Research Programme (SBIR) that funds demonstration and commercialisation activities of SMEs can be named as a good practice example. The programme includes a specific EPA-funded programme line for environmental protection. The successful approach of the SBIR programme, which was established in the 1980s, has served as a model for similar programmes in other countries, e.g. the KOSBIR programme of Korea, but also in Japan and a number of European countries.

The US “Advanced Research Projects Agency – Energy (ARPA-E) is viewed as a good practice example for a programme that promotes high-risk transformative innovations. ARPA-E funds projects at the intersection of fundamental and applied clean energy research and aims to overcome long-term and high-risk technological barriers. The programme’s design foresees to sustain for long periods of time those projects whose promise remains real, while phasing out programs that do not prove to be as promising as anticipated.

Public support to R&D is a major instrument to promote eco-innovation in Japan. This is illustrated by the exceptionally high Gross Expenditure on R&D (GERD) and the fact that environmental issues form a priority area within the R&D strategy. Japanese public R&D programmes put a major focus on fostering cooperation between academia and industry to contribute to economic development and competitiveness. A main Japanese R&D programme with regard to eco-innovation is the “Environment Research and Technology Development Fund (ERDF)” that contains a strong orientation towards research that contributes to formulation of policies.

In Korea, recent strategic documents on green growth and on R&D strategy have given priority to the area of environmental research and eco-innovation. However, the linkages between business, university and government research institutes are still weak in Korea and should be improved to support innovation. A specific approach to generate eco-innovations by R&D projects that bring together a critical mass of academia and industry and cover technology development as well as commercialisation was the programme “Eco-Technopia 21 Project”. While it did not reach all its goals, it was successful in increasing the level of technologies in all environmental sectors and in providing business opportunities.

China has seen a big increase in R&D expenditure in recent years. The highly centralised Chinese research system funds R&D projects through a number of different programmes, which usually address several science and technology areas. When it comes to the development of eco-innovation, particularly the “863 R&D programme”, which targets cutting edge technologies, and the “National Key Technologies R&D Programme”, which has a specific focus on industry needs, should be mentioned. Both programmes cover different areas, among them environmental protection, rational utilisation of resources and sustainable agriculture. With regard to innovation, China’s strategy is to evolve into a more innovation-driven society in the coming years.

India has a low but quickly increasing level of general R&D funding. There is a general trend toward fostering innovation in India. The term and concept “eco-innovation” is not that common in India yet; instead the term “environmental and bio-technology” is used in science and economy. Therefore the funding programmes mainly reflect topics of natural and environmental sciences related innovations. In the area of biotechnology, there is the specific programme “SBIRI” to support pre-proof-of-concept research as well as late stage development for SMEs. A particular programme that is described in the annex as a “Good Practice Example” is the Research, Development and Demonstration Programme of the Ministry of New and Renewable Energy. This programme provides good and successful examples for the specific context of Indian rural areas - new technologies that are easy to handle and accepted by rural people.

The US and Japan are very strong supporters for public funding of R&D in energy. Both hold very high patent applications in climate change mitigation technologies. The role of ICT for efficiency

improvements in resource use is another priority in Japan. In India, high thematic priorities with relevance for eco-innovation are in the areas of biotechnology, water, food, agriculture, and renewable energy – environmental research is also a priority. Korea's priority fields as defined in the strategy documents are energy sources and efficiency, climate change, and water and waste management. In China the fields of photovoltaic and hydropower, buildings and energy efficiency, agriculture, and water resources should be mentioned. China and India are also heavily involved in waste management.

It can be emphasised that the main instruments of environmental policy and particularly policy to stimulate eco-innovations are almost universally used. All investigated countries apply Emission Trading Schemes (ETS) or are in the process of introducing them. Environmental technology verification programmes are in place in the US (since the mid 1990s), Japan (J-ETV, since 2003) and Korea. India and China both expressed interest in developing ETV programmes in the near future. While most countries established laws on Green Public Procurement (Japan, Korea, some US states, China), there are also non-mandatory initiatives (e.g. the activities of the Green Purchasing Network in India). The Indian government just introduced a green public procurement initiative in Nov. 2011. In many of the investigated countries eco-innovations are promoted through tax incentives for investments in energy efficiency technology (e.g. US, Korea), fuel efficient, hybrid or electrical vehicles (Japan, US) or renewable energy (e.g. US but also China

Among the applied instruments to mobilise financing for eco-innovation are tax incentives for R&D in general (US, China, Japan, India) and the provision of funds for specific loans. These instruments are often targeted to increase private R&D investment in general and are not specifically focused on eco-innovation. In the US there is a specific focus on supporting R&D in SMEs with loans. There are also activities that aim at the further promotion of US venture capital investment in eco-innovations. Korea is an example where a specific environmental venture fund exists, established by the Ministry of Environment to support venture companies.

All countries apply environmental regulations and performance targets – but specific implementation issues differ. In Japan the Top Runner programme is a specific highlight that defines dynamic targets by setting the most energy-efficient products as a benchmark. The Top Runner Programme is described as a "Good Practice Example" in more detail in the Annex. The Californian Zero Emission Vehicle Program (ZEV) presents a promising and ambitious new approach to reduce vehicle emissions by combining the control of vehicle emissions in a single coordinated package of standards with other measures to increase the number of hybrid and zero-emission vehicles. India and China face the problem that implementation of environmental regulation lacks effectiveness and efficiency.

In addition, all countries are also involved in international initiatives to foster eco-innovation. These range from industry round-tables, R&D cooperation, strategic cooperation, and Clean Development Mechanism projects under the Kyoto frame to specific initiatives to actively promote a country's eco-innovations abroad. It can be observed that the Asian-Pacific space as a frame for cooperation is very important to all the investigated countries.

The investigated countries feature a number of initiatives to raise demand for environmentally friendly products such as awards (e.g. for outstanding companies in the area of eco-efficiency in Japan), eco-labels, and education or awareness raising campaigns.