HOW

can policies supporting innovation deliver on SDGs?

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Outlook 2

How can policies supporting innovation deliver on the SDGs?

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Key messages

The United Nations Sustainable Development Goals provide a framework for monitoring progress towards sustainability, within which several indicators highlight connections across the three dimensions of development

Several development policies have failed in the past, delivering good out-comes within a sector, but creating side effects for many others due to the lack of understanding of systemic complexity.

Policy design for the SDGs requires a systemic approach that allows for capturing policy outcomes across sectors and actors, and over time. This would improve policy design, strengthen policy assessment and ultimately lead to a more effective implementation and a stronger monitoring and evaluation of performance.

Eco-innovation allows to decouple economic growth and social development from material and natural resource use. In doing so, it lowers costs and reduces the impact of human action on the environment, while lowering health impacts as well as providing opportunities for inclusive growth in both efficiency-based resource-based sectors.

The opportunity lies in both using eco-innovation to balance social, economic and environmental performance, and to harmonize and leverage existing sectoral policies to create synergies and avoid the emergence of side effects.

Specific tasks are identified and proposed for decision makers to better understand and use a systemic approach to the formulation, assessment and implementation of eco-innovation policies.

1 INTRODUCTION

Several challenges for sustainability have emerged over the last decades, across sectors and for various economic actors. Most of these challenges are the result of side effects, rather than deliberate actions to maximize performance on one set of indicators (e.g. economic growth) over others (e.g. forest cover). The Sustainable Development Goals (SDGs) provide a framework for monitoring progress towards sustainability, across a variety of dimensions (social, economic and environmental), sectors and economic actors.

Collaboration between actors across various steps of the policymaking process needs to be ensured to maximize impact towards the SDGs and minimize policy resistance. The opportunity lies in the formulation of policies that contribute to sustainability, by effectively delivering on intended consequences and avoiding the emergence of side effects.

A systemic approach should be used, assessing policy outcomes across sectors and actors, as well as over time. This would improve policy design, strengthen policy assessment and ultimately lead to a more effective implementation and a stronger monitoring and evaluation of performance. Eco-innovation stands out among many other intervention options for its potential to realize synergies across sectors. This is because eco-innovation allows to decouple economic growth and social development from material and natural resource use. This new trajectory lowers costs and reduces the impact of human action on the environment, while lowering health impacts as well as providing opportunities for inclusive growth in both efficiency-based resource-based sectors.

National leaders have called for better designing and integrating eco-innovation policy in national and sectoral planning exercises in several occasions. The Paris Agreement is one of many examples. On the other hand, current sustainability challenges have shown how difficult it is to realize triple bottom line outcomes. Eco-innovation policies, like many others, have side effects, which emerge and are noticed depending on the actors involved and the breadth of the goals to be achieved (e.g. sectoral performance vs. SDGs).

This policy outlook explores how eco-innovation policies can be designed to directly support several steps of the policy cycle, from problem identification to monitoring and evaluation. It shows how crucial it is to identify the strength and weaknesses of eco-innovation policies in the context of national and cross-sectoral (or multi-dimensional) development. For this, a broad range of stakeholders and a comprehensive set of indicators are needed that go well beyond sectoral domains of expertise and performance.

2 SUSTAINABILITY CHALLENGE

Sustainability issues have emerged during the last decades across geographical scales, such as the case of climate change, which has both localized and global impacts. There is increasing evidence that the economic growth of the last few decades has been achieved at the expense of natural capital. Further, there is growing recognition that the over-exploitation of the same resources that fuelled economic growth in the past is now causing the crises we are currently facing (UNEP, Towards a green economy: Pathways to sustainable development and poverty eradication, 2011). There is a clear opportunity for eco-innovation policy to curb these trends, and improve the sustainability of current socio-economic development strategies.

Innovation is traditionally associated to novel things and to creativity. Scholars very often describe it as a process and an outcome to produce economic value. Such traditional view is valid for innovation an outcome, when it constitutes a novel function or a novel way of performing an existing solution. As a process, however, it leads to the creation of value by means of the design, development and diffusion of novel solutions to wicked problems, including those related to society, climate change, ageing population, etc. (Nooteboom and Stam, 2008).

There are many definitions of eco-innovations; it can be understood as "Any form of innovation aiming at significant and demonstrable progress towards the goal of sustainable development. This can be achieved either by reducing the environmental impact or achieving a more efficient and responsible use of resources" (EC, 2014). In fact, while value has been created by the use and transformation of natural resources, stocks have been greatly depleted. For example, 25 per cent of commercial fish stocks – mostly low-priced species – are now underexploited (FAO, The State of World Fisheries and Aquaculture, 2008) and 27 per cent of the world's marine fisheries had already collapsed by 2003 (Worm, et al., 2006). Oil production has reached its peak and is declining in most countries (EIA, 2009). With the current water supply predicted to satisfy only 60 per cent of world demand in 20 years, water stress will increase (McKinsey & Company and 2030 Water Resources Group, 2009). Chemical fertilizers boosted agriculture yields (FAO, 2009) to the detriment of the soil quality (Muller & Davis, 2009). Between 1990 and 2005, 13 million hectares of forests disappeared per year (FAO, 2009), the size of Bangladesh and Greece. As a result, the general public and policy makers still believe that the goals of economic growth, environmental protection, as well as national and energy security, involve a complex set of trade-offs (Brown & Huntington, 2008; CNA Corporation, 2007; Howarth & Monahan, 1996).

The rapidly evolving environment in which we live requires faster and more decisive responses (responses to what appears to be multiple and simultaneous challenges), leaving little room for a careful analysis of alternative intervention options. Such pressure on decision makers can lead to rushed decisions. If these decisions are taken on the basis of recent events, they do not consider the complex dynamics underlying the root causes of the problem. Further, short-term reporting or rewarding practices often motivate the search for immediate solutions and lead to unintended consequences or side effects. These may exacerbate the problem in the medium and longer term, and create cross-sectoral cascading effects.

We are experiencing these crises and observing fragmentation in assigning responsibilities and in carrying out monitoring and evaluation because the socio-economic and environmental systems in which we operate are complex. Global crises make this complexity even more evident nowadays. In fact, we are used to dealing with complicated systems, which are composed of many different interacting parts whose behaviour follows a precise logic and repeats itself in a patterned way. They are therefore predictable. Complex systems instead are dominated by dynamics that are often beyond our control. These dynamics are the result of multiple interactions between variables that do not follow a regular pattern. As a result, their dynamic interplay can lead to unexpected consequences.

Identifying and assessing complexity is crucial for policymakers. Having a good and shared understanding of how policies affect behaviour is a precondition to the design of effective interventions. In fact, policymaking is generally done against several goals, by involving various stakeholders and hence it has to take into account a variety of perspectives and priorities.

For instance, one of the main national development goals, as outlined in the National Strategic Development Plan 2014-2018, is for the Kingdom of Cambodia to become an Upper-Middle-Income Country in 2030. A Rectangular Strategy was developed, which centers around good governance and targets (a) agriculture, (b) private sector development and employment, (c) development of physical infrastructure and (d) capacity building and human resource development. Similarly, the Sustainable Development Goals (SDGs), a set of seventeen aspirational "Global Goals" with 169 underlying targets, highlight the need to improve simultaneously on various indicators of progress across sectors and domains. The SDGs also touch upon governance and policy coordination.

In order to reach these goals, each sectoral policy in Cambodia, and in any other country, should be based on the potential to contribute to the overarching national goals, and to the SDGs. As an example, several national development goals as well as the SDGs are influenced, directly and indirectly, by the energy sector, and especially by energy efficiency. Direct impacts include the reduction of the use of fossil fuels relative to the business as usual scenario, making energy services more affordable and reducing GHG emissions. These aspects are reflected in three SDGs in particular:

- **Goal 7 (affordable and clean energy),**
- **Goal 12 (responsible consumption and production), as well as**
- **Goal 13 (climate action).**

Indirect impacts include reduced costs for households and businesses, through reduced energy use in the decades to come (Goal 1, no poverty); lower air and water emissions, due the reduction in the use of fossil fuels (Goal 3, good health and well-being); increased investments in efficient technologies, and resulting job creation (Goal 8, decent work and economic growth); improved productivity, due to the reduction in energy use and resulting savings on energy expenditure (Goal 9, industry, innovation and infrastructure); reduced congestion and air pollution, through the use of more efficient transport modes (Goal 11, sustainable cities and communities); lowered environmental impacts, through the reduction of fossil fuels and fuel wood consumption, and hence curbing mining and deforestation (Goal 15, life on land).

On the other hand, it is the disconnect between sectoral policies, each of which responds to different goals, that creates uneven progress across social, economic and environmental indicators. This is often causes for the emergence of side effects, and the reason why policies are frequently less effective than envisaged originally.

3 ECO-INNOVATION POLICY OPPORTUNITIES AND CHALLENGES

3.1. Policy opportunity

In 2015, UN member countries have adopted a set of goals that aim at ending poverty, protecting the planet and ensuring prosperity for all: the Sustainable Development Goals (SDGs). The achievement of these 17 goals will demand continuous efforts, as well as a new approach to development planning. Specifically, policymaking so far has focused on sectoral policies, which may work well in isolation, but neglect potential negative impacts on other sectors. As a result, the implementation of these policies may strengthen the performance for some SDGs and hamper others. Planning for the SDGs requires a systemic approach to ensure that policy measures are well aligned and complement each other. This implies that policy outcomes are measured and assessed across sectors and actors, as well as across all the SDGs.

There are two main opportunities for the design of effective eco-innovation policies in the context of the SDGs: the first one regards the performance of such policies across social, economic and environmental indicators; the second one pertains the coherence, and creation of synergies, of eco-innovation policies with other existing sectoral development policies.

Both opportunities can be realized through the use of the Integrated Policymaking (IP) cycle (UNEP, 2009). With the IP cycle, issues are identified across social, economic and environmental dimensions, their potential impacts are identified and assessed, and monitoring and evaluation is performed against all indicators of national development (and/or the SDGs). The policymaking cycle is generally represented through five steps:

(1) the definition of issues (or agenda setting) in a systemic context

(2) policy formulation and assessment

(3) decision-making

(4) policy implementation

(5) monitoring and evaluation.

In this process:

(a) policy or strategic issues are appropriately identified and defined

(b) potential solutions are formulated and

(c) assessed,

(d) the solution that increases synergies and reduces trade-offs is chosen and implemented,

(e) and the adopted solution is monitored, and evaluated.

Key steps of the Integrated Policymaking (IP) cycle

- **Problem identification and agenda setting:** in the context of public policy, an agenda is a list of issues or problems (including potential opportunities, which may be missed without policy interventions) to which government officials, and people outside of the government closely associated with those officials, are paying some serious attention at any given time.

- **Policy formulation:** it is intended as a process of generating policy options in response to a problem established on the agenda. In this phase, indicators and models can be used to support the identification of key entry points for intervention. In particular, priority should be given to the identification of synergies and complementarities between policies, as well as the capacity of interventions to address the economic, social and environmental aspects of development.

- **Decision making:** Decision-making is not synonymous with policy-making. In public policy sciences, decision-making is described as a stage where a government decision-maker or a decision-making body selects a course of action or non-action among a small set of policy options identified at the policy formulation stage with a view towards policy implementation (UNEP, 2009).

- **Policy implementation: I**mplementation is the stage where a selected policy option is translated into action. Institutional and technical capacity are crucial at this stage of the policymaking cycle.

- **Policy monitoring and evaluation:** this phase refers to the effort of monitoring and determining how a policy has performed during implementation. With the help of indicators, relevant tools and methodologies, decision-makers would be able to identify gaps and potential side effects of policy interventions, and plan alternative/compensatory policies to ensure the achievement of initial desired goals.

If relevant information is provided for all steps of the policy-making process the probability that a policy contributes to reaching sectoral targets and sustainable development improves greatly. This is both because of the opportunity to design a policy that delivers across various dimensions of development, and because it would do so by working coherently in conjunction with other policies.

3.2. Eco-innovation policy in practice

There are several cases of eco-innovation policy that have been successful, as well as many others that either have failed or have led to the creation of side effects. Side effects have generally emerged when sectoral or silo approaches were taken. In this case an intervention was designed to solve a specific problem, without taking into account the underlying relationships existing among the key drivers of change in the system. As a result, in response to the implementation of the intervention, new dynamics (e.g. behavioural responses) emerge that partly or fully offset the initial gains.

Example 1:

Many different causes can be identified and addressed to solve a complex problem such as the availability of potable water. However, a siloed approach might miss the potential synergies between public policies and private sector strategies. This greatly increases the risk of implementing conflicting measures. For example, in 2012, China announced a USD 372 billion plan for energy efficiency and pollution control, with a specific focus on water pollution from industrial waste. The implementation of this policy led to the introduction and adoption of various technologies to reduce the dis-charge of pollutants in river courses and to purify surface water. However, the Chinese government simultaneously subsidizes national industries that produce chemical fertilizers for agriculture. The use of these fertilizers contributes to water pollution, both groundwater (through perculation) and surface water (through soil erosion and runoff). Thus, the government is artificially lowering the price of substances that greatly pollute water while at the same time providing incentives to reduce water pollution (Huang, Cheng, & Dagsvik, 2012). Owing to these two conflicting policies, public expenses and private investment have both increased, as well as employment, but improvements of water quality have been uneven.

Example 2:

The tourism business in Small Island Developing States (SIDS) often considers only the current state of its natural resource stocks (e.g., coral reef, fish variety, beaches) when assessing competitiveness and local offer. This approach to tourism development is only profit-oriented. Further, it is based on the assumption that nature will always provide the ecosystems that make islands attractive travel destinations. It ignores tourist development's unsustainable impacts on the health (and value) of the ecosystems on which the industry relies. With the introduction of social media many tourism establishments have started to individually promote their offerings, as well as the beauty of the natural surroundings. This has often led to a sharp increase in the number of tourist, also at a lower cost when compared to more conventional marketing methods. This innovation on outreach and marketing has led to a short-term increase in revenues and a decline in costs. On the other hand, the long-term profitability and viability of these tourism establishments is being threatened by the impact that the larger number of visitors has had on natural capital. With more waste to be managed on beaches, degradation of coral reefs and decline in fish stocks, many coastal resorts have become less attractive, leading to a decline in visitors and reduced profitability. The traditional business model thus leads to increasing environmental problems such as coral reef degradation and coastal erosion, and this trend is only exacerbated with the introduction of innovations on social outreach. An integrated approach to innovation for sustainable development in SIDs is now being developed in Aruba: Jamaica, Seychelles, among others. In Aruba a 10-year roadmap that tackles energy, waste, and sustainable tourism as a central themes – and where innovation is implemented in projects for Solar PV technology, a smart community and a bio-refinery, aiming at diversifying the economic base of the old oil refinery.

Example 3:

Narragansett Bay (USA) has experienced fish kill or die-off a few times in the last decade. An analysis of the present state (or of a snapshot) of the system biology cannot identify the actual causes of this large-scale mortality. Although hypoxia – the lack of oxygen in the water – is the immediate cause of the fish dying, this is the result of the interaction of several conditions, including water pollution, algae growth, and water temperature. Unfortunately, these conditions are often not analyzed simultaneously, nor is their evolution over time. An understanding of how the system functions is crucial to identify and implement effective interventions. In this respect, several options have been tested over the years, from the use of tunnels to collect and discharge wastewater further out in the bay, to specific independent sewage units for houses located in the proximity of water courses and coastal areas. More holistic options are also now being considered, to avoid the peaks in nitrogen loading caused by water runoff, including green infrastructure (to reduce impervious surface). With such a complex problem, on the utilization of several eco-innovations simultaneously can effectively reduce the amount of nutrient concentration in coastal waters and avoid resulting impact on human and ecosystem health.

Successful cases have often taken a systemic approach instead. In this case both causes and effects of the problem are analyzed, the dynamics governing these are identified and assessed (e.g. through the identification of causality and feedback loops) and potential emerging behaviour (e.g. side effect and synergies) are anticipated. It is critical to take a systemic approach when the goal is to contribute to national development.

For instance, to eradicate poverty (SDG1), hunger (SDG2), and ensure health and well-being (SDG3) in areas vulnerable to climate impacts it is necessary to ensure that policy makers design interventions that support climate-resilient infrastructure (SDG9). This will increase the resilience of socio-economic development. Further, sustainable production and consumption patterns (SDG12) should be promoted, so as to have them aligned with the carrying capacity of the local landscape. In other words, planning should take into account current and future vulnerabilities, within the system and imposed from the outside (e.g. climate change) to ensure an effective implementation of investments and inclusive development.

Example 4:

EDF – an integrated energy company in the United Kingdom, with operations spanning electricity generation and the sale of gas and electricity to homes and businesses throughout the UK – has decided to invest in weather forecasting in order to reduce the possible negative impacts of climate change on its activities, and to maximize related opportunities. For instance, EDF uses weather forecasting to make projec-tions regarding energy demand for cooling, based on expected average temperatures. On the other hand, the negative impacts of high temperatures are also considered, such as the possible closure of hydroelectric plants due to water scarcity (Agrawala et al., 2011). As a result, EDF has analysed the vulnerability of the business to climate impacts, while at the same time has assessed opportunities to use the same (weather) information to improve its preparedness and responsiveness to changes in demand. Similar approaches are been adopted by companies such as Monsanto, BASF, Syngenta and Bayer for the development and commercialization of drought-resistant seed varieties, with the goal to improve the adaptive capacity of the agriculture sector to changing climatic conditions.

Example 5:

Concerning the assessments of policy outcomes across sectors and actors, an ecosystem valuation study was conducted by Aggregate Industries UK in order to estimate the benefits of wetland restoration in North Yorkshire. More specifically, the project implied the creation of a lake and a mix of wetlands to restore the wildlife habitat. A conventional assessment would indicate that, from an economic perspective, land conservation is not a viable option. On the other hand, the study carried out by Aggregate Industries UK, using a 50-year time horizon, concluded that the benefits would far exceed the costs, as well as potential revenues from other land uses. Specifically, the total net benefits were estimated at USD 2 million, which comprise the value of the biodiversity, recreational activities associated with the lake, and the increased flood storage capacity (and hence the potential reduction of damage to physical infrastructure). Wetland restoration would thus produce far higher benefits than the then current use of land for agriculture (TEEB, 2010).

Example 6:

The German climate change program for the building sector is an example of a successful policy measure that has produced positive impacts across a variety of actors. The initiative aimed at providing incentives for energy-efficiency refurbishments of existing housing. Funded by the German promotional bank KfW Bankengruppe, it in-cluded different promotional initiatives such as loans and grants targeting homeowners, private builders, landlords, and housing companies. The level of financial support provided was proportional to the inverstor's energy-efficiency target (e.g., the best standard, KfW Efficiency House 55, receives the highest loan). This incentive package enabled CO2 emission reductions of 5 million tons every year, with a positive impact on climate change mitigation, pollution reduction, and health. Moreover, energy efficiency in buildings has a direct impact on households through the reduction of energy use and costs. Finally, the program has contributed to the expansion of local small and medium construction enterprises, thereby positively impacting national economic growth and employment (UNEP, 2011b).

4 ECO-INNOVATION CHALLENGES

There are several challenges to the effective design of eco-innovation policies that deliver on sustainability targets. Some of these challenges are determined by institutional setting (including the allocation of roles and responsibilities across ministries and departments) while others regard limitations brought about by the policy-making process (which often is carried out in silos).

An example the budgeting process is a relevant example of challenges caused by the institutional setting. Ministries are assigned a specific budget, based on which project proposals are formulated. If the implementation of a project in a given sector leads to savings on others, no reward mechanisms are envisaged for these cost savings. Similarly, if negative impacts may emerge in other sectors, no system is in place for the identification of these impacts and for the design and implementation of preventive actions. This is because planning takes place primarily at the sectoral level and in a reactive fashion. As a result, not using the available budget translates into losing it, especially in a system that rewards sectoral performance (or performance against one indicator) as opposed to systemic performance (i.e. measured across several indicators simultaneously).

One challenge related to the policy process is in the area of stakeholders involvement in sectoral decision-making processes. Engineering-related problems are normally addressed by engineers only, while economic-related issues are only discussed by economists. While this seems fair, it prevents the identification of policy outcomes outside the area of expertise of the expert group involved in the policy development process. As a result, some synergies, as well as side effects, are often overlooked. There are many real-life examples for national planning taking place in silos. An example is the development of the 10th national development plan of Malaysia, where sectoral plans were developed in isolation and several inconsistencies were found when the Economic Planning Unit (EPU) of the Prime Minister's Office had to integrate them in a harmonized action plan. A second example is the preparation of strategies and action plans for the implementation of Nationally Determined Contributions (NDC), where several countries, including Nigeria, have prepares strategies for mitigation and adaptation in isolation, to then discover that some of the interventions planned for mitigation are vulnerable (and little resilient) to the increase probability of extreme weather events.

When considering the policymaking process, not only for eco-innovation, six main conceptual mistakes have been identified by Probst and Bassi (2014). These include the belief that:

#1: Abundance of data allows us to find ultimate solutions and predict system behaviour;

#2: Every problem is a direct consequence of a single cause;

#3: We only need an accurate "snapshot" of the actual state of the system to find solutions;

#4: The problem will be solved with the implementation of the intervention selected;

#5: With a problem-oriented optimization, the solution will maximize benefits for all;

#6: Monitoring and evaluation do not affect the decision making cycle, they only evaluate the system performance.

These conceptual mistakes highlight well why interconnected crises have emerged, and why it is so difficult to carry out planning exercises that are at the same time delivering on sectoral and national goals. More careful monitoring and evaluation are required for not only sectoral performance, but for an overall assessment of the contribution of each intervention to sustainable development. Only with this approach more coordinated action across sectors and economic actors can be achieved. On the other hand, the implementation of such a process is very complicated. This is because it requires having a shared understanding of development (how is it defined, how it can be reached), clear measures for

goals and objectives (what indicators can be used to measure sustainable development within and across sectors), and platforms that support an active exchange across all stakeholders.

5 WHAT CAN POLICY MAKERS DO?

5.1. Methods and tools

A few key actions should be implemented to address the challenges described above. Supporting methodologies are available to decision makers. Further, each step of the policy cycle could benefits from the utilization of tools in the domain of systems analysis, as described next.

For the first step of the policymaking cycle, agenda setting, the creation of system maps can support the analysis of the problem (considering cause and effect relationships as well as feedback loops) and the identification entry points for intervention.

- A causal loop diagram (CLD) is a map of the system analyzed, or, better, a way to explore and represent the interconnections between the key indicators in the analyzed sector or system. A more accurate definition is that a CLD is an integrated map (because it represents different system dimensions) of the dynamic interplay (because it explores the circular relations or feedbacks) between the key elements – the main indicators – that constitute a given system. By highlighting the drivers and impacts of the issue to be addressed and by mapping the causal relationships between the key indicators, CLDs support a systemic decision-making process aimed at designing solutions that last.

- The creation of a CLD has several purposes: First, it combines the team's ideas, knowledge, and opinions. Second, it highlights the boundaries of the analysis. Third, it allows all the stakeholders to achieve basic-to-advanced knowledge of the analyzed issues' systemic properties. In this context, the role of feedbacks is crucial. It is often the very system we have created that generates the problem, due to external interference, or to a faulty design, which is showing its limitations as the system grows in size and complexity. In other words, the causes of a problem are often found within the feedback structures of the system. Indicators are necessary but not sufficient to identify these causes and explain the events that led to the creation of the problem.

Policy formulation and assessment, the second step of the policymaking cycle, is generally supported by quantitative assessments, such as Cost Benefit Analysis (CBA). This is generally carried out by ministries of finance and economic development, and should not only be done on a policy/project/sectoral basis. Instead, it should include economy-wide impacts, across all actors and sectors, to better appreciate the outcomes of innovation and possibly develop complementary measures (if side effects or rebound effects emerge).

Such a systemic CBA would be based on three main analytical components: investment, avoided costs and added benefits, all estimated economy-wide for each of the policies considered:

- Investment: from a private sector perspective, investments refer to the monetary costs of implementing a decision, such as complying with sustainability standards, including, for example, annual certification fees, auditing and other management costs related to certification. From a public sector point of view, investments refer to the allocation and/or reallocation of financial resources with the aim to reach a stated policy target (e.g. create enabling conditions for the development of sustainable businesses in a given country).

- Avoided costs: the estimation of potential costs that could be avoided as result of the successful implementation of an investment/policy. In the case of sustainability principles and processes, these refer to the use of green production practices (as a result of sustainability certification) and may include direct savings deriving from a more efficient use of natural resources, as well as indirect avoided costs, e.g. health expenditure, avoided losses from environmental degradation, and avoided payments for the replacement of key ecosystem services (UNEP, 2012).

- Added benefits: the monetary evaluation of economic, social and environmental benefits deriving from investment/policy implementation, focusing on short-, medium- and long-term impacts across sectors and actors. In the case of sustainability cer-

tification, as an example, these include enhanced access to markets, or the availability of premium prices for certified products, health benefits. These are all additional benefits that would not be accrued in a business as usual scenario.

In the case of monitoring and evaluation, it is crucial to identify the indicators against which performance has to be measured. In this case, performance refers to national development, and the indicators include measures of the problem, of the solutions identified, as well as of policy outcomes.

Several indicators could be selected and analyzed in the issue identification phase of the planning process. In particular, emphasis should be put on those indicators that provide information on the stocks (e.g., forests, mineral reserves, public debt) and flows (e.g., annual deforestation, mineral extraction trends, annual deficit) that govern the behaviour of the system. The combined analysis of trends is expected to highlight the multiple causes and effects of consumption and production, as well as the role played by past policies and investments in improving or worsening the situation.

The policy formulation and assessment phase involves the selection of relevant policy and investment interventions that are expected to address worrying trends and create the enabling conditions for a transition to sustainable development. Policy formulation indicators include targets, investment and existing support provided to specific sectors/product (e.g. subsidies and incentives). Policy assessment indicators include the expected outcome of these policies, such as employment creation and economic growth.

The last stage of the policy cycle consists in the monitoring and evaluation of policy/strategy impacts. In this phase, policy outcomes are measured and evaluated in order to address potential gaps and unintended consequences, as well as to inform future development planning processes based on lessons learned, including considerations about likely rebound effects at the sector and system levels. The performance of the strategy/policy implemented has to be evaluated with respect to the problems identified at the beginning of the policy cycle, as well as the costs and cross-sec toral benefits identified in the formulation and assessment phase. As a result, three main steps should be followed in this phase (UNEP, 2014):

(1) measure policy impacts in relation to the issue;
(2) measure policy performance and
(3) analyze impacts across sectors and on the overall well-being of the population.

5.2. Success factors and steps towards transformative change

Several actions could be taken to inform the formulation and implementation of eco-innovation policies that effectively support sustainable development. The opportunity lies in both using eco-innovation to balance social, economic and environmental performance, and to harmonize and leverage existing sectoral policies to create synergies and avoid the emergence of side effects.

Policy makers planning to address the SDGs should make sure to:

- Identify the causes and effects of the problem across social, economic and environmental dimensions. The system is characterized by feedbacks, which may create synergies or cause the emergence of side effects.

- Use a multi-stakeholder approach to take a variety of points of view into consideration and to incorporate as much varied knowledge as possible in the analysis.

- Evaluate the impacts across sectors and find a balanced strategy aimed at improving the entire system's performance rather than a strategy aimed at maximizing some areas at the expense of others.

- Evaluate the impacts across actors and find an inclusive strategy that will allocate the costs consistently and distribute the benefits fairly across the key actors in the system.

- Think long term and prioritize sustainability, because success often depends on resilience in the light of unforeseen events, which means focusing on increasing a system's capacity to absorb change and adapt to it with clear, long-term goals.

- Monitor the performance of the system to learn how systems respond to strategy and policy implementation, which provides an opportunity to -step by step- improve decision making by learning about the causes of success and failure to implement these.

Adopting this simple, structured approach can provided the needed improvements to the formulation and implementation of eco-innovation policies. It would allow policymakers to utilize eco-innovation at its full potential, providing the best possible outcomes (across social, economic and environmental dimensions) for all stakeholders.

Further reading

- UNEP Green Economy Initiative: http://www.unenvironment.org/explore-topics/green-economy;
- PAGE Green Economy Toolkit: http://www.un-page.org/green-economy-toolkit-policy makers;
- Green Growth Knowledge Platform: http://www.greengrowthknowledge.org;
- System Dynamics Society: www.systemdynamics.org;
- Sustainable Asset Valuation: https://www.iisd.org/project/SAVi-sustainable-asset-valuation-tool;
- Wharton Nano Tools: https://executiveeducation.wharton.upenn.edu/thought-leadership/wharton-at-work/2015/06/identify-the-real-problem/;
- Sustainable Development Knowledge Platform: https://sustainabledevelopment.un.org/sdgs

References

- Agrawala et al. (2011). Private Sector Engagement in Adaptation to Climate Change. OECD Publishing.
- Brown, S., & Huntington, H. (2008). Energy Security and Climate Change Protection: Complementarity or Tradeoff? Energy Policy.
- CNA Corporation. (2007). National Security and the Threat of Climate Change. Alexandria: CNA Corporation.
- EIA. (2009). International Energy Statistics. Washington, D.C.: Energy Information Administration.
- FAO. (2008). The State of World Fisheries and Aquaculture. Rome: Food and Agriculture Organisation of the United Nations.
- FAO. (2009). Report of the FAO Expert Meeting on How to Feed the World in 2050. Rome: Food and Agriculture Organisation of the United Nations.
- FAO. (2009). The State of World's Forests. Rome: Food and Agriculture Organisation of the United Nations.
- Howarth, R., & Monahan, P. (1996). Economics, Ethics and Climate Policy: Framing the Debate. Global and Planetary Change.
- Huang, W., Cheng, D., & Dagsvik, J. (2012). The impact of price on chemical fertilizer demand in China.
- McKinsey & Company and 2030 Water Resources Group. (2009). Charting Our Water Future. Washington, DC: 2030 Water Resources Group.
- Muller, A., & Davis, J. (2009). Reducing Global Warming: The Potential of Organic Agriculture.Policy Brief, no.31.5.2009; Kutztown, PA: Rodale Institute.
- Nooteboom, B. & Stam, E. 2008. Innovation, the economy and policy. In: Nooteboom, B. & Stam, E. (eds.) Micro-foundations for Innovation Policy. Amsterdam: Amsterdam University Press.
- Probst, G., & Bassi, A. (2014). Tackling Complexity - A systemic approach for decision makers. Sheffield: Greenleaf Publishing.
- TEEB. (2010). TEEB for Business: Executive Summary.
- UNEP. (2009). Integrated policymaking for sustainable development - A reference manual. United Nations Environmental Programme.
- UNEP. (2011). Towards a green economy: Pathways to sustainable development and poverty eradication. United nations Environmental Programme.
- UNEP. (2011b). Green Economy Success Stories from the UNECE Region.
- UNEP. (2012). Measuring Progress Towards an Inclusive Green Economy. Geneva: United Nations Environment Programme.
- UNEP. (2014). Measuring, Reporting and Verification. Additional guidance supporting UNEP's MC4Aclimate initiative: a practical framework for planning pro-development climate policies. United Nations Environment Programme.
- Worm, B., Barbier, E., Beaumont, N., Duffy, J., Folke, C., Halpern, B., Lotze, H. (2006). Impacts of Biodiversity Loss on Ocean Ecosystem Services. Science.

ABOUT

About the Policy Outlook series

The Inno4SD Policy Outlooks series focuses on the horizontal policy issues or transversal topics relevant for public policy supporting innovation for sustainable development. The selected topics are based on questions and issues raised by policy makers and stakeholders active in the Innovation for Sustainable Development (Inno4SD) network.

1. Why should public policy support transformative eco-innovation?
2. How can policies supporting innovation deliver on the sustainable development goals (SDGs)?
3. How to support eco-innovation in trade policy and international trade regimes?
4. Can environmental process standards enable eco-innovation?
5. Can eco-innovation respond to NEXUS challenges?
6. Can public procurement in cities support circular economy?
7. How to measure eco-innovation and assess its impacts?
8. How to build effective policy mixes for eco-innovation?
9. How to ensure the level playing field for eco-innovation, taking into account adverse effects of existing policy measures?
10. How to design and implement science, technology and innovation (STI) roadmaps to foster eco-innovation for sustainable development?
11. How to account for macro-economic framework conditions in designing eco-innovation policy?
12. Can environmental product standards enable eco-innovation?

The content of each document has been peer- reviewed by experts and by the editorial team of the inno4sd network. The views expressed in each Outlook are those of the authors and not necessarily reflect the views of inno4sd or its strategic partners.

Expressions of interest to contribute to the series are welcomed; please send us your proposals at the email/ contact details indicated at in the back cover of this document.

Advancing the state-of-the-art in innovation for global sustainability

The Innovation for Sustainable Development Network (inno4sd.net®) brings together networks dedicated to innovation for sustainable development with the aim of reducing fragmentation and supporting collaboration, whilst engaging policy-makers, research & development, and businesses to achieve the sustainable development goals.

The H2020 Green.eu project and inno4sd® network was coordinated by the Netherlands Organisation for applied Scientific research TNO in the period March 2015-January 2019. As of February 2019 the inno4sd Steering Board oversees the activities and management of the network.

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