

How to define a regional environmental problem

A theoretical input to prioritising future regional development cooperation in Sub-Saharan Africa

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1. Introduction

What is an environmental problem? How do we recognise an emerging environmental problem? In what way is an environmental problem regional?

The Embassy of Sweden in Nairobi has requested the Helpdesk for Environment and Climate Change¹ to summarise information related to the concept of *environmental problems*².

1.1 Background

The current strategy for Sweden's Regional Development Cooperation with Sub-Saharan Africa is valid until 2015. The Swedish government is expected to convey the instructions and entry points to Sida during 2015 to develop a new results strategy proposal.

Until the instructions are provided it is assumed that environment and climate change will continue to be a priority for Sweden's regional development cooperation with Sub-Saharan Africa. This assumption is supported by guiding documents from the Swedish Government, including most recently the "*Aid Policy Framework*" (2014)³. The Aid Policy Framework confirms that the three thematic priorities – democracy and human rights, environment and climate, and gender equality and the role of women in development – remain fixed priorities and guide the direction of Swedish aid policy. The Aid Policy Framework also states that "A better environment, limited climate impact and greater resilience to environmental impact, climate change and natural disasters" is one of six sub-objectives.

In addition, all Swedish development cooperation builds on two perspectives: (i) the perspective of the poor, and (ii) the rights-based perspective.

Sida's regional team for environment and climate change development cooperation with Sub-Saharan Africa is currently based at the Embassy of Sweden in Nairobi. They will likely be involved in the process of drafting a new strategy proposal for the Sub-Saharan region. This assignment constitutes an input to that preparation.

1.2 Purpose

The purpose of the assignment is to support Sida's regional team at the Embassy of Sweden in Nairobi and Addis Ababa to initiate preparations of the future regional development cooperation in Sub-Saharan Africa. This assignment is related to the first step of the preparations and includes an attempt to answer the following questions:

- What is an environmental problem?
- What is a *regional* environmental problem?
- How can we recognise an emerging regional environmental problem?
- Why do some regional environmental problems receive attention while others don't?

¹ This report was written by Gunilla Ölund Wingqvist at Sida's Helpdesk for Environment and Climate Change during August-October 2014, upon the request of Maria Vink and Patrik Stålgren at the Embassy of Sweden in Nairobi. The views expressed in this report are those of the author and do not necessarily represent the views of Sida.

² The term 'problem' is used throughout the document instead of the term 'challenge', which otherwise is the more common concept used in development cooperation. The reason is that the theme of the document is the 'problem' as such, and that the problem will constitute a challenge or can translate into a development opportunity.

³ Government communication 2013/14:131, Aid Policy Framework – the direction of Swedish Aid

- Identify categories and criteria to describe and/or prioritise between the environmental problems

The next step in the preparations will be an analysis of the situation in Sub-Saharan Africa. That analysis is likely taking the form of an Environmental and Climate Change Policy Brief for Sub-Saharan Africa. In the policy brief, the regional environmental problems that Sub-Saharan Africa is facing will be identified and described alongside their impacts on poverty, health, and economic growth. Furthermore, the priorities, responses, and capacities of the inter-governmental organisations assigned to manage these problems will be described and assessed. That is, however, another assignment.

1.3 Method

The assignment was carried out as a desk study during June - October 2014 and contains the following tasks:

- Literature review
- Expert-group meeting

The literature review was mainly performed through a search of publicly available research articles, assessment reports and books. The Expert-group meeting was arranged as a facilitated two-hour discussion with researchers from different disciplines (see Annex 1).

2. Definitions

Environment: The word *environment* derives from the French ‘environ’ and means everything that surrounds us. Commonly, the concept *environment* refers to the biophysical environment including natural resources (e.g. biological, abiotic, water, air and land resources), ecosystems⁴ and their services. The common use of the term ‘environment’ generally refers to the overall condition, or health, of our planet.

Ecosystem services are “benefits provided by ecosystems that contribute to making human life both possible and worth living”. Examples of ecosystem services are food, building material, buffer against storms or extreme weather, water regulation and purification, pollination, aesthetic values, etc.⁵

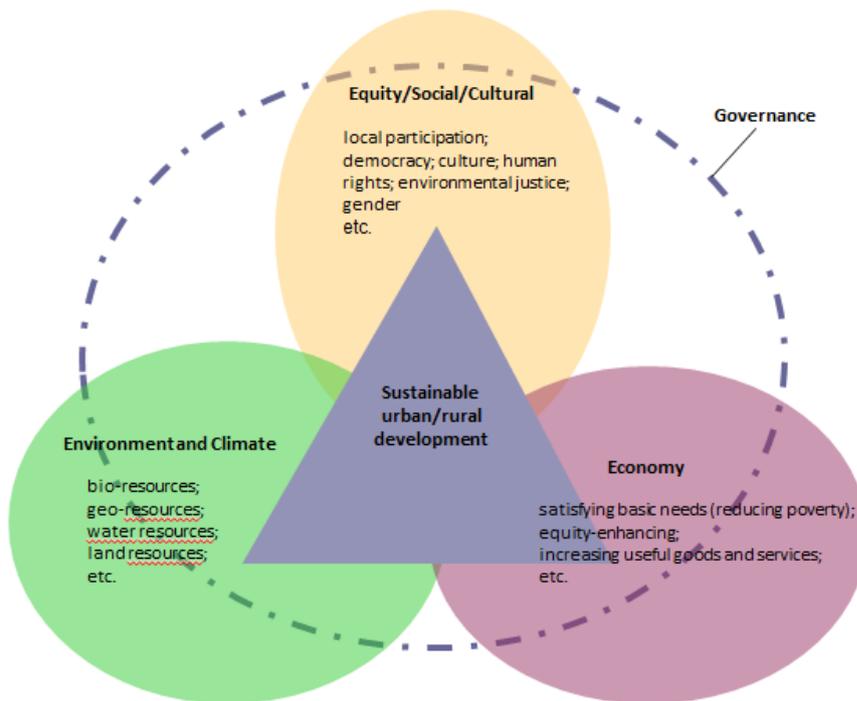
Sustainable development was defined in the ‘Brundtland report’ (WCED, 1987) as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.

The ‘needs’ in the definition is particularly referring to the *needs of the poor*. The definition implies that there is a limitation to the environment’s ability to meet present and future needs. The concept of sustainable development is often divided into three pillars: economic, social and environmental sustainability (see Figure 1).

⁴ An ecosystem is a functional unit of interacting animals, plants, micro-organisms and their physical environment, e.g. a lake or forest (Stockholm Resilience Centre website)

⁵ Millennium Ecosystem Assessment (2005)

Figure 1. The concept of sustainable development



Source: Based on Olsson, G.A. (2010), modified by author

Environmental problem: There are different definitions of an ‘environmental problem’. Before determining what is considered to be an environmental problem, it is important to note that the definition is subject to values and perceptions. Negative impacts on the environment are not necessarily considered to be a problem unless viewed as a problem by a significant set of people. For instance, clear cutting forest was considered ‘progress’ in the 1700s but is considered a problem today.

Another complexity for defining an environmental problem is related to the linkages between the three pillars of sustainable development. Sometimes it is difficult to separate the environmental problems from the economic and social problems. Therefore, many prefer to talk about sustainability problems or sustainability challenges instead. In this report we will continue to refer to environmental problems as we will put more focus on the green pillar of sustainable development, although bearing in mind the difficulties with overlapping system boundaries. The environmental problems have important socio-economic implications and often the responses to the environmental problems go beyond the environmental confines.

Below, a summary is listed of key aspects associated with an environmental problem.

An environmental problem⁶:

- Is associated with a negative impact on the quality or quantity of the environment.

⁶ The Expert group (Annex 1); Mitchell (2009); and FAO (2005).

- Refers to environmental unsustainability, i.e. a negative influence on the environment's ability to meet the needs of the present and future generations.
- Is affecting human welfare.
- Is in general caused by human activities (e.g. snake bites are not considered to be an environmental problem).
- Can include natural disasters (hurricanes, droughts, landslides, etc.) or other naturally-generated events (e.g. spreading of vector- or water borne diseases) when they are caused, exacerbated or altered by human activities.

3. Environmental problems

The *environment* is a fundamentally multi-dimensional concept and there are many different ways to describe a (regional) environmental problem. This section presents multiple ways of describing, understanding, categorising and prioritising regional environmental problems.

First, a regional environmental problem is described as a wider concept than merely being a problem that crosses a boundary. The next section summarises lessons from early warnings and how environmental problems have been detected during the last century. Thereafter, categories are presented that describes the type of environmental problem, and suggests that certain safeguard areas must be protected to achieve human development and poverty alleviation. The fourth section presents criteria for prioritisation, and the last section adds the political dimension and a categorisation that is based on likelihood for cooperation. All these different ways to cut the cake should be integrated and taken into consideration when giving priority to what actions to take and what type of support to provide.

3.1 What is a regional or international environmental problem?

A region refers in this document to a geographic area larger than one country. It can, for instance, refer to a continent (such as the pan-African region), or a geographic/political/economic integration area (e.g. the European Union, EU, or the Southern Africa Development Community, SADC-region), or a transboundary river basin.

Mitchell (2009) defines 'international' environmental problems as environmental problems that "have either a transboundary or international commons aspect".⁷ According to Mitchell, an environmental problem is "international if the responsible activity, the impacts of that activity, or the concern about (and solutions to) those impacts do not all exist within one country's borders".⁸ According to this definition, the *regionality* (or internationality) of an environmental problem, can be linked to the *cause*, the *impacts* and/or the *responses*.⁹

Although the direct *cause* of an environmental problem usually is local (e.g. caused by industrial pollution, urban sprawl or agricultural activities), the underlying causes can be regional or international in our globalised world with integrated markets. For instance, a problem in one country can depend on demand in another country, for example increased demand for construction material in one part of the world can lead to deforestation in another

⁷ Mitchell (2009), chapter 2

⁸ Mitchell (2009), chapter 2

⁹ This view correlates with the Pressure-State-Impact-Response (PSIR) framework used by various environmental authorities and international organisations (e.g. the Swedish EPA, the European Environmental Agency, the OECD, UN-bodies including the FAO, and more) to analyse and measure environmental issues. Here, the drivers or pressure relates to human activities resulting in a changed environmental state (pollution or land-use change, etc.) and an impact (e.g. productivity losses or health problems). Responses are the reaction in human society to manage these environmental problems.

part. Furthermore, different countries can experience the same types of challenges and barriers, be subject to the same types of structures and incentives that promotes or hinders certain behaviour and creates a similar type of problems.

The *impacts* of an environmental problem can be seen at local, national, regional, and global levels. Mitchell (2009) argues that even environmental problems that originate from activities that take place wholly within the borders of one country can become an international concern due to different reasons, listed as follows¹⁰.

Firstly, an environmental problem can become an international concern if the *impacts cross a national border*. Environmental impacts, such as water course pollution, acid rain or marine pollution, thus become an international concern once their impacts cross a border and are detected.

Secondly, activities resulting in negative impacts on *global commons* (e.g. atmospheric ozone depletion or climate change), become an international problem once the impacts are discovered and concerns start to grow.

Thirdly, an environmental impact that causes local problems can become a regional or international problem if it *occurs in many countries*. These impacts can become regionalised if regional cooperation appears to offer advantages in understanding or addressing the problem.

Fourthly, impacts that are felt at the national level can become an international problem if *citizens in another country are concerned* about those impacts. Loss of biodiversity and ecosystems are such examples; protecting endangered species or pristine ecosystems have become international priorities.

Lastly: in general, transboundary environmental impacts are unintended consequences of human economic activities. However, they can also derive from *intended activities*, such as export of hazardous waste including the growing export of electronic waste. In this case, a local environmental problem becomes an international concern.

Also the *responses* can be arranged at local, national, regional or international level. The type and level of the response is generally linked to the type and level of the environmental challenge to be managed. A regional problem requires a joint response at regional level. All of the above mentioned types of environmental problems, related to cause and different types of impacts, are examples of when a joint, regional or intergovernmental response, is considered more effective than unilateral responses.

Although implementation is commonly done at the national or local level, the responses to regional problems are often negotiated, coordinated and monitored by intergovernmental institutions at global (e.g. UN-bodies), regional (e.g. pan-African) and sub-regional level (e.g. West, East or Southern Africa) or an area based on an ecosystem or a biome (e.g. river basin organisations). These organisations deal with issues that are relevant beyond the nation-state, and coordinate efforts, contribute to a common understanding of the regional problems and promote and facilitate joint responses. The issues that these organisations deal with can vary and are not necessarily merely linked to environmental problems that cross national borders but to all the different types of international or regional sustainability challenges for which a joint response is considered more effective. The regional cooperation can be linked to coordinating efforts, promoting enhanced knowledge for better informed decisions, awareness

¹⁰ Mitchell (2009), chapter 2

raising, trust building, facilitating negotiations, and joint responses, etc. In some cases, issues dealt with at the international level can be coordinated at regional level by an intermediary regional institution, to help translate issues of global concern to the specific contexts and to assist with implementation, especially when national capacity is weak.

Hence, in addition to being more effective, regional cooperation can also be more efficient due to sharing costs (and avoiding multiple costs for parallel functions), gathering competencies and capacities, enhancing political will, promoting public demand, and enhancing accountability.

3.2 How to recognise an emerging environmental problem

Depending on their character, environmental problems in the past have been detected in different ways and by different actors. Often, environmental problems are recognised by the individuals or communities affected by them, for instance through impact on health or reduced productivity. In other cases, the problems are not visible to the eye, and are thus harder to detect. To generalise, local environmental impacts are more visible than regional or global impacts. Local impacts can often be identified through our senses, while regional or global impacts can be more or less invisible and are often identified by the scientific community. Being harder to detect does not mean that they are less important or significant; on the contrary, slow changes (e.g. reduced soil fertility, climate change or diffuse pollution from agrochemicals), can have large negative impacts on long-term productivity and the livelihood opportunities of current and future generations.

The European Environmental Agency (EEA) summarised in 2001 lessons learnt from early warnings on environmental hazards of various human economic activities, from 1896 to 2000. Four examples are listed in Annex 3, briefly informing about how the environmental and health problems were detected in the respective cases. The four examples provide information related to a global environmental problem (stratospheric ozone depletion), a regional problem (acid rain), a health hazard (asbestos), and natural resource depletion (overfishing).

A key lesson from these cases is that *research* is crucial to either detect the environmental problem or to describe the causal linkages, and that *monitoring* is of great importance to detect problems as well as to influence decision makers through public pressure. Another lesson is that long-term effects are more difficult to act upon than immediate impacts.

As regional environmental problems often are more difficult to detect than local ones, monitoring and research related to the state of environment for “less visible” impacts is of particular importance related to regional environmental development cooperation. And vice versa: regional cooperation can be utilised as a cost-efficient vehicle to promote both high quality research and monitoring activities.

3.3 Categories to describe environmental problems

The *environment* is linked to natural principles, such as gravity and thermodynamics, while social systems are driven by *inter alia* demographics, ideology, capital accumulation, competition and technological change.¹¹ Although different in theory, the environment is a fundamentally multi-dimensional concept, intertwined with social, economic and cultural aspects, affected by human activities and decisions that are based on economic considerations, values, knowledge, risk assessments and many other factors.

¹¹ Jerneck et al. (2011)

Due to the complexities, it can be useful to categorise the environmental problems, or the sustainability challenges, in order to make more sense of them. There are a number of methods for categorisation of environmental problems, where different methods cut the cake in different ways. Two methods of categorisation ('Planetary boundaries' and 'Environmental Performance Index', EPI) are presented in Annex 2.

The overarching objective of Sweden's development cooperation is to "contribute to an environment supportive of poor people's own efforts to improve their quality of life". The perspective of the poor and a rights-based perspective constitute the foundation.¹²

The environment matters greatly to peoples' opportunities to improve their living conditions, especially to people living in poverty. The poor are most affected by environmental degradation and climate change due to their vulnerability, high dependence on natural resources, and low capability to cope with external shocks, such as floods and droughts. Protecting the environment is important for human development, poverty reduction and long term economic growth. It can also contribute to improved gender equality, as women in developing and transition countries are found to be more dependent on common property resources and more vulnerable to the negative externalities of natural resource degradation¹³.

The expert group presented a way of thinking about what constitutes an environmental problem that could be helpful for Sida's thinking.

Table 1. Safeguard areas important to promote human wellbeing

Main Category	Description
Human wellbeing and health	Access to environmental assets and healthy ecosystems are key to human wellbeing, livelihood opportunities and health aspects.
Sub-categories	
Climate	<ul style="list-style-type: none"> - Reduce or prevent emissions of greenhouse gases - Reduce vulnerabilities and build resilience to the impacts of climate change
Ecosystems, their functions and services	<ul style="list-style-type: none"> - Maintaining the functions of ecosystems e.g. the water cycle, land productivity, forests, etc. - Maintaining ecosystem services, including provisioning, regulating, cultural, and aesthetic services
Biological diversity	Protection of terrestrial and marine areas, habitat, (flora and fauna) as well as threatened or endangered species
Abiotic resources	Careful management also of the "non-living" resources, such as land, water, air, minerals and fossil fuels are strived for.
Buildings and constructions	Also human-made constructions can be affected by environmental and climate change impacts.

Based on expert group suggestions (26 June 2014)

If any of the safeguard areas listed in Table 1 is harmed, the effect is an environmental problem. Different problems may have more or less impact on human wellbeing and health and prospects for poverty reduction and therefore their relevance for Sida may differ.

¹² Swedish Policy for Global Development (2003).

¹³ Hallegatte et al., 2011

The proposed safeguard areas are human-centred, anchored in the green pillar of sustainable development but connected to the social and economic pillars. Human wellbeing is a key dimension to ensure inclusion of the poverty- and rights-based approaches; all people, also those living in poverty and oppression, have the right to opportunities to improve their lives.

These safeguard areas are more or less consistent with the EPI categories and have a high degree of overlap with the concept of planetary boundaries where nine "planetary life support systems" essential for human survival are identified. The safeguard areas cover a broad spectrum of environmental issues that can be relevant at local, national, regional and global levels.

3.4 Criteria for prioritisation

Swedish development cooperation is grounded in the perspectives of the poor and the rights perspective, which means that priority shall be given to the people most in need, to the people that lacks voice and power. Concerning environmental problems, aspects related to type, scale, space, time, duration, and who is affected, are important criteria for prioritising responses and support.

The *type* of the environmental problem is important in relation to poverty reduction and development cooperation. For instance, livelihood opportunities and good health are fundamental rights and closely linked to all of the other environmental categories/safeguard areas, particularly a stable climate, well function ecosystems and biological diversity, but also abiotic resources such as air. These natural assets can also be fundamental engines of growth if managed wisely. Another important aspect is the *irreversibility* of the environmental problem (when thresholds are passed beyond which the effects will be irreversible, such as the melting of polar ice or loss of rainforests). Development cooperation could give priority to those types of environmental impacts that disproportionately affect people living in poverty. Furthermore, prevention should be prioritised before mitigation, particularly for irreversible environmental problems when the likelihood of occurrence is high.

The *scale* of an environmental problem is another important feature. Typically, the larger the scale, the more severe the problem. Singular events such as floods or chemical accidents tend to be very visible and receive a lot of attention. Also local impacts, which are easier to detect (people are getting ill, the fish disappear, the lakes die), are generally given priority action – often through end-of-pipe solutions (such as building higher chimneys or adding a filter). However, many of the greatest environmental challenges (climate change, nutrient loss, desertification, etc.) or health impacts (e.g. the asbestos diseases described in Annex 3) have a large scale but are not that visible in the short term. It could be argued that development cooperation prioritises those environmental problems that have a large scale, even those that are not immediately visible.

Also spatial features should be included in the prioritisation: *where* the environmental problem is situated: in a wealthy or a poor country, in a crowded or sparsely populated area, in a sensitive or resilient ecosystem, etc. It is, for instance, probably more important to act on environmental problems occurring in densely populated than in a sparsely populated areas. However, the type of problem is also important. For instance, spatial attributes are not that important for emissions of green-house gases, but for emissions of heavy metals or hazardous materials, the spatial attributes will be quite important.

Another important aspect relates to *who* is affected by the problem, and who will benefit from the response. As mentioned above, poor and marginalised groups are often more directly affected by environmental degradation and ecosystem deterioration than richer segments of society. However, when stakes are high (e.g. when mitigation costs are high), it might be

easier to overlook problems if the affected groups lack voice and power. For these groups regional actors can provide important entry points to improved situations in their home countries, by putting forward demands and giving the issues international weight.

In addition to the type of impact, the visibility, scale, and space, another important aspect when prioritising support relates to *time* (*when* are impacts seen and felt) and duration. Impacts visible here and now are more likely to be responded to than impacts visible only in the future, affecting future generations. Again, using climate change as an example; even if climate change impacts are becoming visible, most victims of climate change will be the future generations, a societal group with a lack of voice and rights. We suggest that development cooperation prioritise the people that live in poverty, and the vulnerable, voiceless and powerless, including future generations.

The EEA assessment report from 2001 concludes that barriers to action often are related to information challenges: there is a need for improved information related to impacts and risks (type, scale, space, time, and who is affected). Among the challenges listed are *scientific uncertainty* and *ignorance*, underpinned by a lack of data and information and lack of transparency and accountability combined with a fear that increasing costs will affect the economic growth. For all these aspects a regional perspective would enable a focusing of resources, information sharing, awareness raising, monitoring, and open channels for improved governance (transparency and accountability).

3.5 Determinants of action

There are examples throughout history when environmental impacts have been detected, described and considered to be a problem, but still do not receive adequate attention or response measures. It is useful for Sida to understand more about when a problem receives attention, and which the barriers to action are.

In order to explain why some international environmental problems receive attention while others don't, Mitchell (2009) adds yet a dimension, besides the environmental, social and economic aspects, namely the *political*. Based on game theory and political economy Mitchell argues that the power, interests and knowledge of states, the incentives, as well as the capacities, are central to understanding the regional and international environmental problems and the (lack of) responses and implementation.

Mitchell (2009) identifies two overarching distinctions of environmental problems:

1. Overappropriation as distinct from degradation, and accidentally-harmful problems
2. Tragedy of the commons, as distinct from upstream/downstream situations and incapacity problems

A bit simplified the first distinction can be said to be related to the *type* problem (e.g. over extraction, pollution, accidents) while the second distinction is more related to the *situation* in relation to political and economic aspects. The distinctions are not clear cut and not always easy to make, especially related to complex problems. The distinctions, summarised in Table 2, suggests that the type and situation linked to the environmental problem will affect the likelihood of them being addressed and in what way.

Distinction 1: Overappropriation, degradation and single events

People derive value from (renewable and non-renewable) natural resources in three ways: through consumptive use¹⁴, through non-consumptive use¹⁵; and through simple knowledge of the existence of the resources. Excessive consumptive use (hunting, fishing, mining, river-water for irrigation, etc.) reduces the quantity of the resource, while excessive non-consumptive use tends to result in degradation problems.

Overappropriation is directly linked to the actual activity (e.g. unsustainable logging is linked to deforestation), while degradation problems are more likely a side-effect (an externality, for instance pollution from mining activities). Overappropriation commonly results in immediate and visible shortages and is likely to generate more political conflict than degradation problems. Conflicts linked to over-appropriation often relate to current allocation of the resource rather than how current use levels impact on future generations.

Furthermore, environmental impacts can also derive from accidents, or large single events with huge consequences. These are likely to receive more attention than low-intensive degradation problems¹⁶.

Distinction 2: Tragedy of the commons, upstream/downstream, and incapacity

The other distinction made by Mitchell (2009) is that between problems associated with the ‘Tragedy of the commons’¹⁷ and problems associated with asymmetric upstream/downstream situations. This distinction is linked to the incentives that lead to the environmental impact and the possible reactions. Both these types of problems are different from problems associated with incapacity.

In the *Tragedy of the commons*-situations, the victims of the environmental degradation are also the perpetrators of the impact. For instance, the herders that let their cattle graze on a common field will also be the victims if the field is overgrazed. As the perpetrators are also the victims, they are likely positive to seeing the problem resolved – even if they would prefer not to contribute themselves.

The *upstream/downstream situation* is different in this regard. Here, the victims are separate from the perpetrators. The upstream actor has weak incentives to act whereas the downstream actor often lacks the ability or power to act. An example is an upstream water extraction for irrigation resulting in reduced water volumes downstream. International efforts to protect an endangered species in a third country, is more of an upstream/ downstream situation than a Tragedy of the commons.

There is no strict compartmentalisation between the different distinctions. One problem can also be associated with all the different distinctions. For instance, unsustainable agricultural practices can be associated with degradation problems through pollution from agro-chemicals and overappropriation-problem through unsustainable irrigation practices. These can be of a tragedy of the common-type of situation, e.g. if a shared watercourse is affected, or an upstream/downstream situation if a downstream country or community is affected.

¹⁴ An example of consumptive use is to extract water from a river so that the water volume will be reduced downstream. Consumptive use affects the quantity.

¹⁵ An example of non-consumptive use is to use the river for washing. The water volume is not affected, but there might be an impact on the quality of the water.

¹⁶ Expert group (See Annex 2).

¹⁷ Hardin (1968)

Table 2. Distinctions of international or regional environmental problems

Distinction		Character of conflicting interests	Likelihood that the environmental problem is addressed
Distinction 1: Overappropriation – degradation and accidents			
Over-appropriation	Overappropriation relates to consumptive use when the harvest is larger than the rate of regeneration, thus reducing the quantity of the resources available to others.	Action likely to generate political conflict, often over current allocation rather availability for future generations.	Environmental problems associated with over- appropriation are generally an inherent part of the action itself. Change in volume is required to manage these types of problems, rather than changes in process (the way the activity is conducted).
Degradation	Excessive non-consumptive use exceeds the resource’s ability to restore itself resulting in decreasing quality of that resource available to others.	Politically, generally less conflict as the side-effect can be targeted, not the actual activity. However, there can be political resistance towards taking economically difficult decisions.	Pollution and other types of degradation are often unintended effects of activities undertaken for other reasons. The will to manage these unintended effects will depend on <i>i.a.</i> costs, alternatives, power balances, etc.
Accidents	Accidents, or large singular events, can have huge consequences.	Generally more cooperation- than conflict prone.	Often easier to mobilise interest and likely to receive more attention than low-intensive degradation problems
Distinction 2: Tragedy of the commons – upstream/downstream situations and incapacity			
Tragedy of the commons	The victims of the environmental degradation are also the perpetrators of the impact.	Lower conflict probability although risk for free riders.	As the perpetrators are also the victims, they are likely positive to seeing the problem resolved and likely to receive international attention. Higher incentives to cooperate, although it requires collaboration and trust.
Upstream/downstream situations	The victims are different from the perpetrators. The perpetrator gains the benefits from the resource use but experience none of the costs, while the victim generally sees none or few of the benefits but experience all of the costs.	Victims often less power to act. Cooperation more difficult to achieve.	Once the problems are detected, they must be considered serious enough to motivate a mobilisation for action. Only if and when the victims bring sufficient pressure on the perpetrators, sometimes with foreign support, there will be action. Requires a high degree of trust.
Incapacity problems	Problems linked to (technical, administrative, financial, and institutional) incapacities rather than incentive structures.	Low conflict probability. Commonly difficult to attribute to the exact cause.	Tend to become international issues of concern, when one country brings it up to the international arena and other states are interested to contribute to address the problems jointly with their own similar domestic problem.

Source: Author, based on Mitchell (2009), Daly (1990), and expert group (Annex1)

Furthermore, the distinctions are not static and can change over time. For instance, in the acid rain problematic described in Annex 3, the issue went from being viewed as an upstream/downstream problem to a tragedy of the commons situation: Initially, the Scandinavian countries bore the costs of the damages of the SO₂-emissions and it was easy for them to argue for action. The UK, on the contrary, was less keen on action initially, as they felt that they would bear the costs without receiving any benefits for action to reduce the long-distance transportation of sulphur emissions. It was only when it was appreciated that acid rain had costs closer to home (i.e. the problem changed from being viewed as an upstream/downstream situation to a tragedy of the commons problem) that the political climate changed.¹⁸

For both types of situation, environmental problems are caused because those responsible for the problems lack sufficient *incentives* to address them effectively. Many times environmental problems in developing countries are further aggravated by *incapacities*, in addition to incentive problems.

Hence, understanding the type of environmental problem will improve our understanding of the incentives driving the problems and the incentives to address them. In some cases, our understanding of the environmental problems can be enhanced through analysing its different parts as we often try to deal with a complex mix of issues at the same time.

These distinctions add yet a dimension to the multi-dimensional concept of environment, and shows that aspects related to the political economy are important for prioritisation of regional environmental support. Development partners can play an important and complementary role by providing support also to politically difficult, conflict prone and “risky” cooperation.

4. Conclusions and recommendations

Rather than being objectively described, environmental problems are subject to values, culture and priorities; an impact may be perceived as an environmental problem by some, but not by others. It may also be perceived as a problem but not be given much priority, of different reasons, for instance if the costs to address the problems are assessed to be too high or if the benefits will be hard to obtain. Viewing what an environmental problem is might therefore vary over time.

Also the concept of ‘regionality’ is subject to values and priorities and the interpretation varies over time, as will the interpretation of what a regional environmental problem entails. In this section the concept of a ‘regional environmental problem’ is discussed in the context of Swedish development cooperation, and suggestions are made to broaden the definition. Thereafter, an attempt is made to draw some conclusions from the various ways of categorising a regional environmental problem that could be relevant from a Swedish point of view. Finally, some issues for Sida to consider are presented.

4.1 Interpreting ‘regionality’ in Swedish environmental development cooperation

A regional environmental problem can be linked to the cause, the impacts or the responses to the environmental problem. A regional response is generally *required* when the impact of a problem is transboundary or related to global commons. However, there are other instances

¹⁸ EEA (2001)

when the regional response is not required but would be *preferred* as it provides *effectiveness and/or efficiency gains*. This is often the case when the impacts are common to many countries, implying that jointly addressing them offers advantages such as efficiency gains (e.g. of advantages of scale, pooling of resources and cost reductions) or when the likelihood to solving the problems increases (effectiveness gains).

To sum up, an environmental problem can be classified as regional if:

- the underlying *causes* to a problem is similar or related in many countries, for instance when
 - different countries have similar incentives, structures or barriers that promote or hinder certain behaviour and thereby develop the same types of problems.
 - in a globalised world and with integrated markets one country is affected by supply and demand in another country.
- the *impact*
 - crosses a border;
 - affects global commons negatively;
 - is similar in many countries
 - is an international concern (e.g. stopping deforestation of rainforests, of preserving gorillas, etc.)
 - derives from intended actions that must be regulated regionally or internationally
- the *responses* are required or preferred at regional level:
 - for a cross-border impacts or an impact on the regional commons
 - for increased effectiveness, when finding and implementing solutions to common problems can be facilitated through joint action;
 - for increased efficiency, when pooling of resources will enable capacitated institutions.

The current Swedish strategy for regional development cooperation with Sub-Saharan Africa includes support to “improve the capacity and conditions for intergovernmental communities, countries and actors to manage regional trans-boundary challenges or issues common to several countries, in the case where best results can be expected through recourse to regional cooperation”¹⁹. Thus, the current Swedish strategy largely encompasses the same view of ‘regionality’ as this document conveys. As an interpretation of the strategy, Sida commonly supports two types of regional environmental development cooperation: (i) those where the impacts are transboundary, or (ii) those where the responses require cooperation. This document also argues for the inclusion of common issues (impacts and underlying causes) where a regional response is required or preferred due to increased effectiveness and/or efficiency gains.

The Swedish Aid Policy Framework does not define ‘regionality’ but appears to have narrowed the interpretation of it further. It refers explicitly only to transboundary resources, particularly marine and freshwater resources²⁰.

However, as a thematic priority, it can be argued that environmental and climate change considerations should be integrated into all relevant regional and international development cooperation. There are regional cooperation areas in the Aid Policy Framework where it

¹⁹ Sweden, Government Offices (2010).

²⁰ Swedish Aid Policy Framework, sections 5.3.2 (Strengthened institutional capacity in environmental management and environmental institutions), and 5.3.5 (Sustainable management of ecosystems and sustainable use of ecosystem services).

would be particularly relevant to integrate environment and climate change considerations, for instance when *promoting integration in the regional and international markets for agricultural and other products*, and for *research cooperation*²¹. Agricultural market development has many interlinkages with environment and climate change (for instance related to productivity, the use of agrochemicals, water-energy-food nexus, virtual water, climate change adaptation/resilience, etc.), that is beneficial to pursue at a regional level (monitoring, guidelines, standards, knowledge building, information sharing, and more).

The Aid Policy Framework also refers to support to build *capable institutions* at local, national, and regional level²². It should therefore be possible to include other types of support under the strategy for regional development cooperation.

In conclusion, we suggest that the ‘regionality’ could be interpreted in a wider sense, to include not only support to transboundary resources and research, but also to finding joint ways for countries and other actors to respond to ‘common issues’. This could be related to underlying causes to a common environmental problem, such as a common approach to regulation and taxation of foreign investments, or development of policy instruments to promote greener decisions, for instance cooperating around similar conditions, rents and safeguards for extractive industries. The common issues could also relate to getting more information on and responding to impacts, such as pooling up resources, monitoring, knowledge building, awareness raising, identifying and negotiating joint responses, etc.

4.2 The importance of data, information and monitoring

In general, access to information and reliable data is a large problem, not least in developing countries. Without data, it is difficult to detect emerging environmental problems, assess their magnitude and importance or monitor implementation of environmental legislation and other measures. This is particularly true for regional environmental problems, as they commonly are less visible than local problems. Even when data do exist the information might be managed and organised in different ways in different countries or organisations, thereby making it difficult to compare information in time and space.

The importance of monitoring and setting up appropriate institutional arrangements to coordinate, monitor, and manage environmental problems cannot be over emphasised. At the regional level countries can agree on what to measure, the format and frequency, etc, which likely will enhance effectiveness. Pooling of human, technical, financial and administrative resources could offer efficiency gains.

With the rapid expansion of ICT-technologies it should be underlined that lay people can play an increasing and important role in monitoring the quality of key ecosystems. Observations by civil society can provide a cost effective complement to governments’ monitoring efforts. Regional organisations may provide a comparative advantage in setting up such schemes.

4.3 Prioritising regional environmental problems

Most economic activities affect the environment in one way or another. One of the greatest challenges of our time it to achieve an economic growth that lifts billions of people out of poverty without passing the boundaries of our planet. Human welfare is directly depending on

²¹ Swedish Aid Policy Framework, sections 5.2.4 (More liberalised trade), 5.2.5 (Improved food security), 5.2.6 (High-quality research relevant to the fight against poverty).

²² Swedish Aid Policy Framework, section 5.1.2, p 20.

well-functioning ecosystems. If these are harmed, there will be consequences on human welfare and health as well as on the economic opportunities.

This document presents a few different ways to categorise an environmental problem in order to enhance our understanding of the problem and help prioritise support. Firstly, the type of problem can be identified: if human welfare and health is negatively affected by a change in the environment or climate, there is an environmental problem. The document furthermore suggests different ways of identifying a *regional* environmental problem; if the *impacts* of an activity, or the *concern* about (and *solutions* to) those *impacts* do not all exist within one country's borders.

Furthermore, a number of criteria have been identified to help prioritising between supports to manage different environmental problems. Who is affected by the environmental problem should be analysed, as well as aspects related to type, scale, time, and space.

- Who
- Type
- How large (scale)
- When (time)
- Where (space)

It is important to understand *who* is affected by the environmental problems, focusing on the people living in poverty and vulnerable groups. Who is affected, who will benefit from the response, who will bear the costs of action and the costs of inaction? Do the affected individuals or groups of individuals have a voice; do they have the confidence to use their voice, knowledge to understand the consequences of the environmental problems, and act on them? Sida gives priority to the people living in poverty, who lack voice and power, including future generations.

The *type* of the environmental problem is important in relation to poverty reduction and development cooperation. It can be argued that Sida should give priority to the environmental impacts that: (i) disproportionately affect people living in poverty, (ii) are likely to occur; (iii) have irreversible impacts. In addition, prevention is better than mitigation.

The *scale* of the environmental problem is important: how many people are affected and how severe are the impacts in terms of human wellbeing. Here, it is important to remember that the visibility is not always proportional to the hazard. Singular events or acute local impacts are often more visible than long-term and diffuse environmental problems, but not necessarily larger in scale. Sida may want to provide priority also to the less visible types of environmental problems that commonly are regional and that risk being overlooked.

Time and duration are other important aspects. When and for how long will the impacts be visible? Currently, priority is generally given to present generations, while future generations receive less attention. This is a key aspect of the effects of climate change: the present generations are starting to experience a changing climate but the large impacts will only be visible in the future. When the long-term impacts are uncertain, as it is for climate change, OECD (2009) recommends that priority is given to “no-regret” support, i.e. activities that are beneficial today also without future environmental/climate change effects.

A geographic aspect, *space*, is the next important criteria: where does the environmental problem take place? In a wealthy or a poor country, in a crowded or sparsely populated area; in a sensitive or resilient ecosystem, etc. Is there a risk that thresholds are passed leading to irreversible changes in the ecosystems (e.g. depletion of fish stocks or loss of habitat affecting food security and access to energy and building materials).

The final issue providing information to the prioritisation includes the economic-political dimensions; to understand why certain international/regional environmental problems are addressed while others are not. Understanding the incentives for cooperation and the conflict proneness of the specific situation prior to providing support is critical. Development cooperation partners like Sida are able to take on environmental problems that are complex and where the incentives to cooperate are low, as well as supporting responses to those types of problems where there is a great chance that the situation will improve from support by external, neutral partners. These could relate both to over-appropriation and degradation problematic, to tragedy-of-the-commons as well as upstream/downstream types of situations. Long-term support is particularly important for regional development cooperation as these situations often are complex. Furthermore, lack of capacity is a major constraint to many regional and national organisations and institutions in developing countries. Providing capacity-building support regionally can improve not only the finding of joint solutions but also the implementation at national or local levels. One can argue that long-term development cooperation is of great importance in these types of complex situations.

4.4 Issues for Sida to consider in the strategy process

One key challenge related to regional or international development cooperation is that support is provided at regional level, but implementation is often done at the national. Although some of the MEAs (e.g. trade in endangered species and ozone depletion) have been successful, national implementation of most multilateral environmental agreements have been largely insufficient, and are failing to halt escalating environmental degradation²³. There are many reasons for this implementation gap, but inadequate governance, inadequate political priority, and incapacity are among the explanations²⁴.

Development cooperation is not an easy endeavour. As Sida is well aware of, it is not enough to identify common problems, but there must also be a minimum level of ownership, a will to prioritise and resources to implement. The analyses, methods, priorities, the institutional capacities at regional as well as national levels are important. These aspects will be included in the Policy Brief (to the extent possible of a desk study).

This said a few issues are presented below, for Sida to consider during the upcoming process of furthering the regional analysis and developing the strategy proposal for regional development cooperation in Sub-Saharan Africa.²⁵

- Sida may want to consider taking a broader approach to what is ‘regional’ environmental problem, to include also other aspects besides transboundary water resource management. Both over-appropriation and degradation problematic and upstream/downstream and tragedy of the commons situations will occasionally require external support. In our globalised world, consumer choices or national policies in one country can have large impacts in another. Many of the serious environmental problems are common to many countries, even if the problems are not crossing borders. Different countries may experience similar environmental problems that would benefit from joint action, through improved effectiveness or cost-efficiency gains.

²³ Biermann et al. 2011; Young, 2011; Sharma, 2009

²⁴ Ölund Wingqvist et al. (2012)

²⁵ It should be noted that the stated issues are primarily suggested for internal use, and should not be imposed on Sida’s development partners.

- One example relevant for Sub-Saharan Africa is to promote joint standards for regulation of foreign direct investments in natural resources (e.g. in mining, bio-fuel, logging, etc), related to emission standards, chemical use, taxation, etc. Agreeing on appropriate standard regulation would obstruct the move of industrial operations to “brown havens”.
- Regional environmental problems tend to be less visible than local ones. Visible environmental problems are often given more attention than less visible ones. Hence, there is a risk that (i) regional environmental problems are not managed or detected, or that (ii) regional environmental problems are not given adequate attention. Long-term environmental and health monitoring and research is key to reduce ignorance and uncertainty and improve risk assessment.
 - Environmental monitoring is essential to manage environmental problems, understand the trends and to overcome barriers to act. Regarding monitoring of regional environmental problems, one important first step could be to agree on and establish institutional arrangements and monitoring structures at regional level (or support existing ones). Efforts should be made to include not only short-term but also long-term needs for environmental and health monitoring. Standardising environmental monitoring, including agreeing on what to monitor and how, is a key element of improving monitoring²⁶. Sweden has a long experience of this type of standardisation work.
- Experience show that even when there were early and loud warnings of environmental and health hazards, the society did seldom react as quickly and forcefully as could have been expected – at least in hindsight. Again, the lack of firm action can be associated with uncertainties in combination with the fear that high costs will affect economic growth. The economic pillar is important to detecting and acting on environmental and health hazards. The Helpdesk recommends that Sida, when possible, includes economic aspects in the analysis of regional environmental problems, to enhance the understanding of the obstacles to act.
- Other examples of regional environmental problems of concern to Sub-Saharan Africa could be found in regional environmental treaties: are there environmental problems of regional concern that are specifically highlighted?
 - Sida might want to consider promoting efforts relating to environment and climate change monitoring, and the implementation of regional decision at national level. The State of the Union (SOTU)²⁷ is a coalition of civil society organisations working together to hold African Governments accountable for the ratification and implementation of African Union decisions at the country level. For instance SOTU monitors national implementation of regional (including environmental) treaties, a much needed endeavour.
- The Environment Helpdesk recommends Sida to utilise the categories, criteria and distinctions suggested in this document in the upcoming strategy process for regional

²⁶ Regional cooperation and standardisation of environmental monitoring was an important first step for European countries to establish air pollution regulation.

²⁷ <http://www.sotu-africa.org/>

development cooperation in Sub-Saharan Africa, in order to be able to assess the usefulness.

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Annex 1. Expert-group meeting (summary notes in Swedish)

Lunchsamtal om miljöproblem torsdagen 26 juni kl 11.30 – 13.30 på GMV.

Deltagare:

- Håkan Pleijel, Biologi och miljövetenskap, GU
- Bengt Steen, Miljösystemanalys, Chalmers
- Daniel Slunge, Nationalekonomi med statistik, GU
- Gunilla Almered Olsson, Humanekologi, GU
- Marie Stenseke, Kulturgeografi, GU
- Petra Andersson, Filosofi och lingvistik, GU
- Olof Drakenberg, Sida's Miljö- och klimathelpdesk
- Gunilla Ölund Wingqvist, Sida's Miljö- och klimathelpdesk
- Maria Vink, Sveriges Ambassad i Nairobi

Frågor som diskuterades:

1. Vad är ett miljöproblem?
2. Hur kan vi känna igen ett miljöproblem när vi ser det?
3. Finns det kriterier för att beskriva, och eventuellt prioritera bland miljöproblemen?
4. Vad är ett regionalt miljöproblem? Är 'regionalt' kopplat till orsak, effekt eller åtgärd, eller annat?

Forskarna enas om att det kan vara bättre att prata om *hållbarhetsutmaningar* (eller hållbarhetsproblem) än om miljöproblem, eftersom det ofta är svårt att särskilja miljö från sociala och ekonomiska aspekter – de hänger ihop.

Hållbar utveckling: utgå ifrån Brundtland och definitionen av hållbar utveckling, inkl de tre pelarna (ekonomisk, miljömässig, socialt hållbar utveckling). Även om hållbar utveckling ska innehålla alla de tre aspekterna, kan fokus läggas på miljömässigt hållbar utveckling.

Diskussion kring miljöproblem

- Miljöproblem uppstår av mänskliga aktiviteter och är kopplade till etiska eller till människors existens.
- Även kopplat till skala, rum och tid, samt VEM som drabbas.
- Det kan vara hjälpsamt att tänka på skyddsobjekt (något vi vill skydda tex biologiskt mångfald, människors hälsa). Om människans förhållanden leder till att skyddsobjekten påverkas negativt så har vi ett miljöproblem.
- Miljöproblem måste angripas i sitt sammanhang, för och nackdelar, all politik, inte för snäv avgränsning till det gröna för att det inte blir användbart för åtgärdsarbete
- Systemgränser är viktiga
- För mig är miljöproblem förknippade med basbehov (mat, skydd, vatten, osv).
- Effekter på välfärd
- Ekosystemtjänster är användbart för ekonomer
- Ekosystemtjänster: den största förtjänsten är pedagogisk. Svårigheten är att alla definierar olika EST

Skyddsobjekt (skyddsvärda miljöområden?)

- Människors hälsa och välbefinnande
- Biologisk mångfald
- Ekosystemen och dess funktioner (vattnets kretslopp, fotosyntes, produktion, osv)

- Byggnader och konstruktioner
- Klimatet
- Abiotiska resurser

Fokus bör ligga på *människors hälsa och välbefinnande, idag och i framtiden*. Fattigheds och rättighetsperspektivet är utgångspunkten.

Prioritering

- Överlevnad eller välmående?
 - o Hållbar utveckling handlar inte bara om överlevnad, utan bör inkludera välmående
- Ur ett ekonomiskt perspektiv är abiotiska resurser och klimat stora frågor.
-

Hur känner vi igen miljöproblemen?

- Skalan spelar roll
 - o Singulära katastrofer: ofta rapporteras mycket från händelser (som Bhopal) som ger akuta och stora skador lokalt.
 - o Överlag ges lokala miljöproblem ofta stor uppmärksamhet eftersom konsekvenserna är lätta att upptäcka (människor blir sjuka, fisken försvinner, sjön dör, osv). Dessa är naturligtvis viktiga och åtgärdas ofta först, ofta m h a ”högre skorstensmodellen”
 - o När stora grupper utsätts för måttlig påverkan kan det ändå vara ett stort problem, men det får ofta mindre uppmärksamhet.
 - o De värsta miljöproblemen ser vi inte
 - o Globala el regionala problem som är svåra att upptäcka är oftast forskarstyrda (till skillnad från lokala, där människor i samhällen som drabbas oftast uppmärksammar dem)
- Skala, rum och tidsperspektiv är viktiga aspekter
 - o Liv i stor fara, akuta situationer bör ges hög prioritering
 - o Rumslig kontext
 - o Utfall olika grupper (vem drabbas, vem tar del av åtgärder)
- Det handlar om att bygga kapacitet i regionen att kunna analysera vad som är stort och smått och undvika brandkårsutryckningar.
- Det behövs forskning, av nyfikna forskare
- För att prioritera rätt måste det finnas miljöövervakning, t ex:
 - o mäta ämnen i luften eller intervjua människor om hur de upplever sin omgivning.
 - o Övervakningen bör inte bara mäta det uppenbara, kopplat till lokala effekter, utan även fånga upp mer diffusa saker. Annars risk för en fortsätter jobba med vad vi redan vet.
 - o Sverige har en starkt tradition av att bygga upp sådant. Det kan vara inriktat på direkta hälsofaktorer, markförstöring, väder och klimatdata.
 - o Undersök folkligt förankrade metoder (typ ”fenologiväktare”). Finns möjlighet att mobilisera iakttagelser från frivilla och intresserade rapportörer; intressant ur ett demokratiskt perspektiv. (en referens till ”kollegerna i Lund”)
 - o Exempel: floraväktare (en person räknar antal växter och djur på en avgränsad yta, t ex 1 m², regelbundet).
-

- Kanske kan *Pressure-State-Impact-Response* (PSIR) utgöra en del i systematiken? Koppla till övervakning?
- Hur använda redan befintlig information, t ex från satellitövervakning
-
- Vidga mätningar för att bli bredare än BNP. HDI är ett steg på väg.
- Förslag på indikator: tillgång till ved, skogsutbredning, osv.
-
- Finns kapacitet i afrikanska länder att koppla upp sig till globala satellitdata och använda informationen?

Regionalt

Vad är regionalt; är det kopplat till orsak, effekt, åtgärd?

- Sidas syn hittills: Problem som man bäst löser genom regionalt samarbete. Hittills mest kopplat till gränsöverskridande naturresurser, som marina frågor och sötvattenresurser .
- Orsaken är oftast i någon mån lokal. Effekterna och åtgärderna kan vara lokala, nationella, regionala, globala. Drivkrafter kan ju vara regionala eller globala i den mån att samhällena har liknande politiska strukturer och därmed får likartade problem.
- Exempel på regionala problem:
 - o Ökenspridning
 - o Urbanisering
 - o Mineralanvändning
 - o Näringslivet
 - o Jordbruket/matsäkerhet
- Kapacitetstutveckling på regional nivå; kan vara relevant för miljö-övervakning. T ex skapade vi i Europa ett samarbete kring övervakning / gränsöverskridande övervakning. Länderna har kommit överens om vad och hur de skulle mäta och utvärdera. Detta utgör en central del av att skapa en standard.

Kolla upp: Det finns en afrikansk konvention för biologisk mångfald om de finns befintliga strukturer.

- Handel hanteras ofta regionalt, och det är förknippat med miljörelaterade problem, t ex ökad spridning av kemikalier från jordbruket. Kolla upp vilka institutioner som finns för samarbete.

Viktigt om konflikter och miljö:

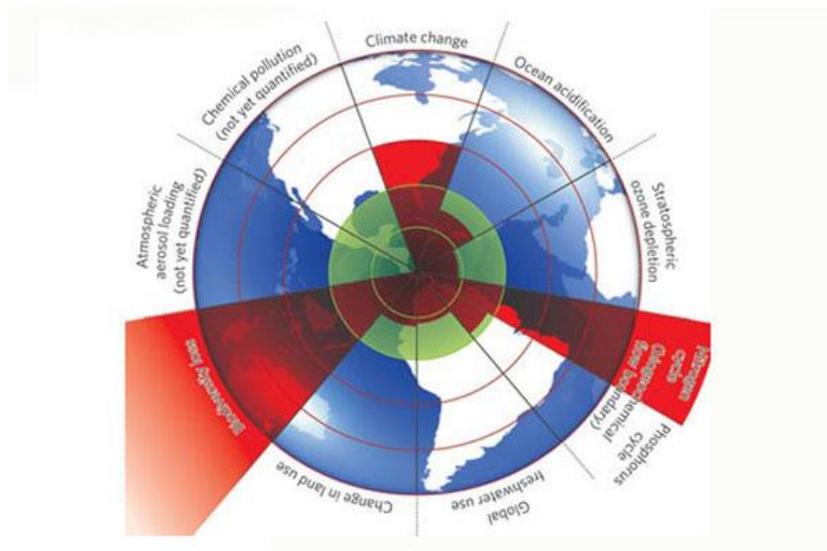
1. Aktörer: Vilka deltar i konflikten? Dessa bör alltid vara representerade, t ex i nationella styrgrupper
2. Aktörer ska ha en röst; vem har en röst och vem har det inte?
3. Möjlighet att transformera konflikten; alla måste ha något att vinna på samarbete.

Annex 2. Examples of categorisation of environmental problems

Planetary boundaries and the Anthropocene debate

Human activities are influencing the Earth at an unprecedented scale, affecting the grand cycles of biology, chemistry and geology, including global water cycles, nitrogen and carbon circulation. Almost all the ecosystems of our planet are affected. In 2000 researchers proposed that human activities had driven the world into a new geological epoch, and launched the unofficial concept of the “Anthropocene”.²⁸ The concept has received lots of attention in the scientific community. The Anthropocene is assumed to be less stable than previous epochs: we are creating a hotter, stormier and less diverse planet.²⁹ Recent research states that humanity will leave lasting marks (i.e. traces that will last tens of millions of years) on the Earth, for instance from habitat destruction and the introduction of invasive species causing widespread biodiversity loss; ocean acidification, changing the chemical balance of the oceans; and urbanisation, which is vastly increasing rates of sedimentation and erosion.³⁰

Figure A2-1. Beyond the boundary.



Source: Rockström et al. (2009)

Associated to the concept of the Anthropocene, researchers have identified planetary boundaries, which define the “safe operating space for humanity” related to nine identified earth system processes. The earth system processes are:

- Climate change
- Ocean acidification
- Stratospheric ozone depletion
- Nitrogen and phosphorus cycles
- Global freshwater use
- Changes in land use
- Biodiversity loss
- Atmospheric aerosol loading

²⁸ Crutzen and E. F. Stoermer (2000).

²⁹ <http://www.anthropocene.info/en/home>

³⁰ Zalasiewicz et al. (2010).

- Chemical pollution

The proposed safe operating space for the nine earth systems are illustrated as the inner green shading in Figure A2-1, while the red shading marks the estimated current position of each variable. As can be seen from the Figure, the boundaries in three systems (rate of biodiversity loss, climate change and human interference with the nitrogen cycle), have already been exceeded. Information for Chemical loading and Atmospheric aerosol loading is not yet available.

Environmental Performance Index (EPI)

Another way to categorise environmental problems is the **Environmental Performance Index**³¹ (EPI), developed by Yale and Columbia Universities. The Environmental Performance Index (EPI) is constructed through the calculation and aggregation of 20 indicators reflecting national-level environmental data. These indicators are combined into nine issue categories, each of which fit within one of two overarching objectives. The two objectives that provide the overarching structure of the 2014 EPI are Environmental Health and Ecosystem Vitality. Environmental Health measures the protection of human health from environmental harm. Ecosystem Vitality measures ecosystem protection and resource management.

1. *Environmental health* (measures the protection of human health from environmental harm), including:
 - Health impacts (child mortality)
 - Air quality
 - Water and sanitation
2. *Ecosystem vitality* (measures ecosystem protection and resource management), including:
 - Water resources
 - Agriculture
 - Forests
 - Fisheries
 - Biodiversity and habitat
 - Climate and energy

The issue categories are extensive but not comprehensive (for Data Gaps and Deficiencies, see <http://epi.yale.edu/our-methods>). The EPI ranks and rates countries, based on their environmental performance.

Figure A2-2, below, illustrates the 2014 EPI framework and the objectives, issue categories, and indicators.

As can be seen, the EPI categories are more “human centred” than the planetary boundaries earth system processes. The EPI categories are easy to link to impacts on human health and livelihoods, natural resource management, and state’s policy responses, while the earth system processes are more linked to global processes and functions of ecosystems, and are more difficult for a layperson/non-expert to relate to impacts on humans. However, there are also similarities. Some of the EPI categories resemble the earth system processes (i.a. climate change, biodiversity loss, water resources, land use changes/ agriculture, and forestry).

³¹ <http://epi.yale.edu/our-methods>

Figure A2-2. Environmental Performance Index (EPI2014)



Source: <http://epi.yale.edu/epi> and

Annex 3. Lessons learnt from early warnings

The European Environmental Agency (EEA) summarised in 2001 lessons learnt from early warnings on environmental hazards of various human economic activities, from 1896 to 2000. Four examples are listed below, briefly informing about how the environmental and health problems were detected in the respective cases. The four examples are derived from EEA (2001) and provide information related to a global environmental problem (stratospheric ozone depletion), a regional problem (acid rain), a health hazard (asbestos), and natural resource depletion (overfishing).

Stratospheric Ozone Depletion: The stratospheric ozone layer was discovered by scientists in the beginning of the 20th century, and by 1930 it was quite well investigated. Around the same time a laboratory experiment showed the decomposition of ozone photosensitised by chlorine. In 1974, American scientists issued a warning that an ozone destroying chain reaction would result from the emissions of CFCs (so called “freons”). A debate started that continued for over two decades. In 1985 evidence was gathered to confirm the warning: Ozone depletion over Antarctica was measured, and it was much more severe than the previous predictions. This environmental problem thus required the scientific community to be identified.

Acid rain: As a result of the increasing energy consumption in Europe during the 1960's, emissions of sulphur dioxide (SO₂) increased dramatically. Initially it was believed to be non-harmful, as it would be diluted and dispersed. A team of researchers, while aiming at investigating the linkages between plant nutrients and precipitation in Europe, happened to notice that the precipitation was becoming more acidic due to the increasing SO₂ emissions. This new knowledge was coupled with the observations of acidification of Swedish rivers. Was it possible that the SO₂-emissions in England could affect the water quality in Scandinavia, causing fish deaths and reducing forest production?

Despite strong scientific evidence and a large concern in Scandinavia, the problem was not given much priority in England initially. The value of the lost fish population and timber production was small in economic terms, although cost-benefit analyses showed high costs of damage to buildings and constructions. However, when dead fish and dying forests were found also in remote areas in other parts of Europe and North America, the public pressure grew.

In this case, the environmental problem was detected by scientists ‘by accident’, while doing other research. Public opinion was important for giving the problem of acid rain political priority.

Asbestos: The first warnings of the health hazards of working with asbestos came already in 1898, from a factory inspector. After that, a number of studies took place confirming the hazards of asbestos. However, it was not unusual that – even as late as during the 1960s – the researchers that issued warnings were discredited. By 1986, almost a century after the first warning, the World Health Organisation concluded that all three types of asbestos (blue, brown and white) were carcinogenic and that there were no known safe levels of exposure. Both mining and user countries are continuously affected by health and contamination costs. Asbestos is still in use, currently largely in developing countries.

Asbestos is by far the largest (known) occupational industrial carcinogen, and it is estimated that some 250 000 – 400 000 cases of asbestos related deaths will occur in the EU between

2000 and 2035. There are many lessons to learn from the asbestos mismanagement, including the following:³²

- The experience of victims, lay people and ‘competent observers’ such as factory inspectors can be important for detection and should be taken seriously by governmental and other authorities and followed up by appropriate investigations.
- Long-term environmental and health monitoring rarely meets the short-term need of anyone, thus requiring particular institutional arrangements if it is to meet society’s long-term needs.
- The initial asbestos regulations from the 1930s in the UK were largely unimplemented and unenforced (the sanctions were trivial) until the regulation was amended in 1969. The situation was similar in many other countries.
- One of the main reasons for the failure to implement control measures is associated with the time (10-40 years) between the asbestos exposure and the diseases. Commonly to all long-latent-period hazards, it shows the errors of assuming that ‘absence of evidence of harm’ means that there is ‘no evidence of harm’.

Overfishing: Classic signs of overfishing include, catches that no longer increase in proportion to the increasing effort, decreasing average age of the fish, and the need for ships to travel further and fish longer. However, as the abundance of many marine species is subject to natural variations, it was initially difficult to accept that fisheries could exacerbate these natural cycles and actually have an effect on the fish stocks. As an example, the President of the Royal Society and Inspector of Fisheries, Thomas Huxley, stated in 1883 that “marine fisheries are inexhaustible”. So, even if the fish disappeared it was believed that it could well be due of natural causes and not be linked to human behaviour.

Problems with overfishing became more obvious when the industrial fishing developed during the 20th century. Amongst others, it led to collapses in North Sea Herring, California sardine, and Newfoundland cod fisheries.

³² EEA (2001)