

A systems perspective on the environment in the SEEA CF

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Abstract

As the global standard on environmental-economic accounting it makes sense that the SEEA Central Framework should base accounting concepts, structures and rules on the global standard for national accounting, the SNA. On the other hand, the SEEA does not take a similarly structured and systemic approach when considering the environment itself. The purpose of this paper is therefore to present and compare a number of existing structured frameworks for considering the environment and environmental impacts ("systems perspectives on the environment") and to demonstrate how such a framework could improve the structure of the SEEA CF. Examples of such frameworks include the ReCiPe life-cycle environmental impact assessment method, the planetary boundaries and a number of similar structures used in overarching environmental policy across the globe. It is proposed that such a framework could build further on the existing SEEA CF depiction of economic interactions with the environment through residuals and natural resource use. From the perspective of physical flow accounts a structured framework for the environment can establish a context as to why certain flows are more environmentally significant than others. From the perspective of monetary accounts, the paper will propose how systems perspective on the environment can be applied to facilitate the scoping and identification of environmental activities in the economy. The London Group is invited to contribute to this development and discuss how it could support the development of the SEEA CF going forward.

Questions for the London Group:

- What other systems perspectives on the environment of SEEA relevance could be considered?
- In what way can the systems perspectives considered better support the identification of environmental activities for specific policy areas?
- How can the systems perspectives be used to highlight activities that have both positive and negative environmental consequences?

1 Introduction

In the course of recent discussions amongst the global environmental accounts community it has become apparent that the systems perspective concerning the environmental part in the SEEA Central Framework has received little attention. In light of this, the aim of this paper is to demonstrate the policy and scientific relevance of a systems perspective on the environment in the SEEA and to propose next steps for achieving this.

To achieve these aims, the paper adopts the following structure:

1. A brief review of systems perspectives on the environment in science, environmental assessment in practice (specifically life cycle assessment) and overarching environmental policy initiatives
2. A brief review of the most relevant current treatments of a systems perspective on the environment in the current SEEA CF and related standards
3. A discussion of how systems perspectives from policy, science and elsewhere could be applied to strengthen the SEEA.

2 Systems perspectives on the environment in policy, research and environmental assessment

2.1 Policy

There is increasing international policy interest in overarching environmental strategies, including:

- The Swedish Environmental Quality Objectives (Swedish Environmental Protection Agency, 2012), see also below
- England's environmental improvement plan (see also below)
- The EU 8th Environment Action Plan (EAP) – Including 6 priority objectives for climate, regenerative growth, zero pollution (air, water and soil), protecting, preserving and enhancing biodiversity, reducing environmental pressures related to production and consumption (European Environment Agency, 2026)
- The Canadian Federal Sustainable Development Strategy – 17 goals explicitly based on the Agenda 2030 goals (Government of Canada, 2026)
- Japan's 6th Basic Environment Plan – see e.g. (Ministry of the Environment, Japan, 2024)

For illustration, the Swedish environmental quality objectives and England's environmental improvement plan are presented in more depth below. It is further worth noting that whilst other countries may not use a similarly integrated overarching strategy (and systematic environmental perspective) as the examples noted above, they have nevertheless adopted environmental

strategies with a similarly systematic perspective. Finland for example has an overarching strategy for sustainable development with 8 high-level objectives (Finnish National Commission on Sustainable Development, 2026). Finland also has environmental strategies in areas such as water resources (Ministry of Agriculture and Forestry, Finland, 2022), air pollution (Ministry of the Environment, Finland, 2019) and chemicals (Ministry of the Environment, Finland, 2026).

2.2 Swedish environmental quality objectives

The purpose of the environmental quality objectives is to describe the quality of the environment that Sweden wished to achieve. They include an overarching “generational goal” as follows:

“The overall goal of environmental policy is to hand over to the next generation a society in which the major environmental problems have been solved, without increasing environmental and health problems outside Sweden’s borders.”

(Swedish Environmental Protection Agency, 2012)

Under the overarching generational goal, 16 specific environmental quality objectives are specified including:

- reduced climate impact
- clean air
- water bodies free from eutrophication and acidification
- non-toxic environment
- protective ozone layer
- safe radiation environment
- good groundwater quality
- good built environment
- well-functioning ecosystems (farmland, forest, mountains, wetlands, lakes and streams, marine ecosystems)

Each objective includes a number of “specifications” indicating the environmental state to be achieved. A complete list including each separate environmental quality objective is presented in the appendix to this paper.

2.3 England’s Environmental Improvement Plan (EIP)

The EIP was last updated in 2025 and is presented as “a strategic framework for improving England’s natural environment up to 2043” (DEFRA, 2018). It contains 10 goals in the following areas:

1. Restored Nature
2. Air Quality
3. Water Quality
4. Chemicals and pesticides
5. Waste
6. Resources
7. Climate Change
8. Environmental Hazards
9. Biosecurity
10. Access to Nature

For more information on the goals please see the appendix to this paper.

2.4 Life cycle impact assessment

Life Cycle Assessment is an internationally standardised method for evaluating “the environmental impacts of products and processes across their entire life cycle, from raw material extraction to end-of-life disposal or recycling” (European Commission Joint Research Centre, 2010), (Kaynak et al., 2025). It is widely applied to assess and compare environmental impacts of products and services in a standardised and systematic way. According to ISO standard 14044, Life Cycle Assessment (LCA) includes four stages:

1. Goal and scope definition – what is the product/service that is to be evaluated, expressed in terms of a functional unit (e.g. kWh of electricity etc.)
2. Life cycle inventory – “systematic collection and quantification of all relevant inputs and outputs associated with a product system across its life cycle” , in SEEA terms an inventory of the resource use and residuals associated with the product/service in question.
3. Life cycle impact assessment (LCIA) – Actual environmental impacts due to inputs and outputs quantified in the LCI are calculated
4. Interpretation

Of specific interest here is the LCIA stage. In this stage, resource use and emissions are first assigned to categories of environmental based on their potential to contribute to environmental problems (a procedure called *classification*). This potential is then quantified using *characterisation factors*.

Figure 1 shows a typical LCIA structure. In this figure, resource use and emissions (often called residuals in the SEEA) are assigned to midpoint environmental indicators. The midpoint environmental indicators are in turn connected to endpoint environmental indicators, or areas of protection. What is interesting is that areas of protection are identified as the ultimate areas that society aims to protect from environmental damage (Dewulf et al., 2015). In the case of Figure 1 these are human health, natural environment and natural resources. Figure 2 meanwhile shows midpoint impact categories, damage pathways and endpoint areas of protection according to the ReCiPe2016 LCIA method (Huijbregts et al., 2017) which is widely used in LCA practice.

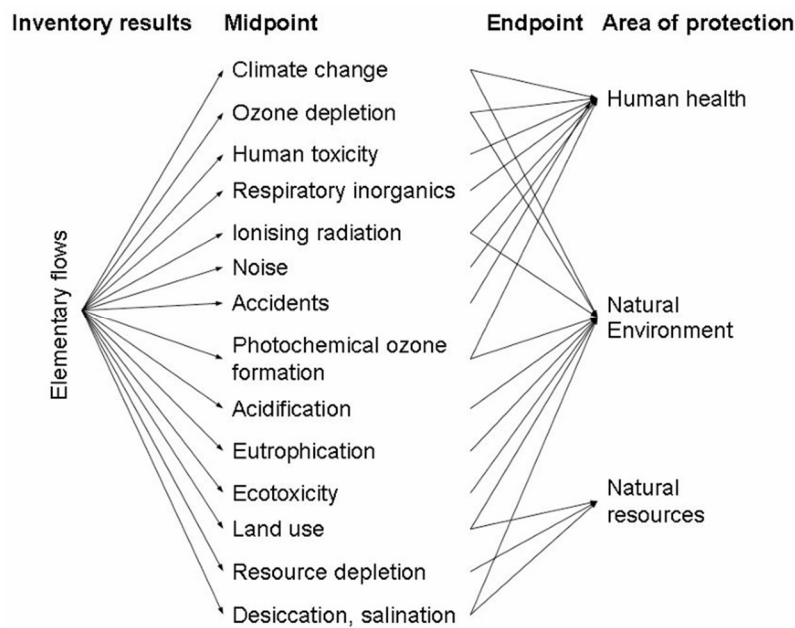


Figure 1: Environmental impacts presented in the (European Commission Joint Research Centre, 2010)

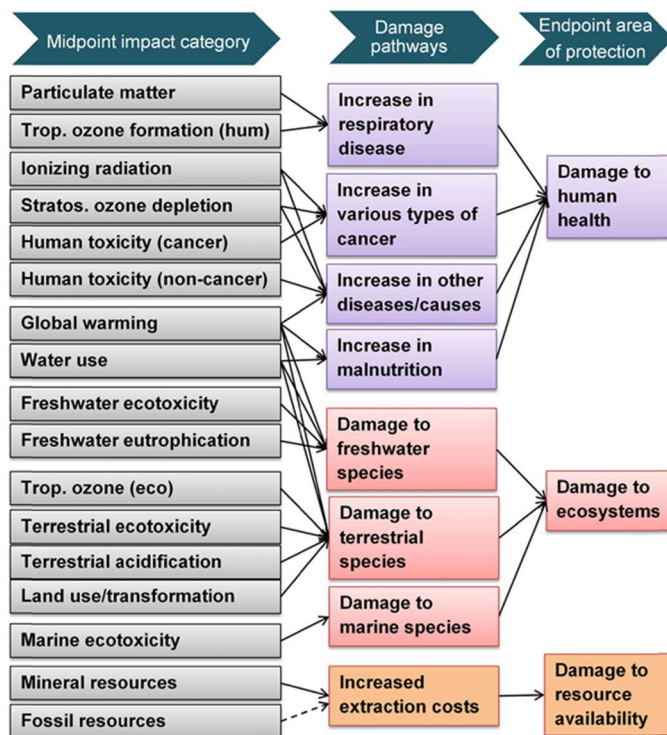


Figure 2: Midpoint impact categories, damage pathways and endpoint areas of protection according to the ReCiPe2016 LCIA method (Huijbregts et al., 2017)

2.5 The planetary boundaries framework

The planetary boundaries framework was first introduced in 2009 and was most recently revised in light of latest knowledge in 2023. The framework defines a “safe-operating space for humanity” by

identifying quantitative limits for 9 critical Earth system processes that regulate the stability and resilience of the planet (Richardson et al., 2023). These processes are:

1. Climate Change
2. Biosphere Integrity (biodiversity)
3. Land-System Change
4. Freshwater Change
5. Biogeochemical Flows (nitrogen and phosphorus)
6. Ocean Acidification
7. Stratospheric Ozone Depletion
8. Atmospheric Aerosol Loading
9. Novel Entities (synthetic chemicals, plastics, etc.)

In 2023 evaluation, it was found “that six of the nine boundaries are transgressed, suggesting that Earth is now well outside of the safe operating space for humanity. Ocean acidification is close to being breached, while aerosol loading regionally exceeds the boundary. Stratospheric ozone levels have slightly recovered. The transgression level has increased for all boundaries earlier identified as overstepped” (Richardson et al., 2023).

3 Environmental structure in existing standards and classifications

3.1 Environmental activities

Several existing standards and classifications address the question of what constitutes environmental activities, products and expenditures. In environmental activity accounts (monetary environmental accounts) there are a number of standards and classification that describe how environmental activities should be identified. The analysis in this paper has focussed on the United Nations' Classification of Environmental Purposes (CEP) (European Commission, 2023) because it is one of the most recent relevant classifications and connects both to higher level statistical standards and in particular the SEEA CF 2012 (United Nations, 2012) and to lists of products such as the EU's “Indicative compendium of environmental goods and services and of economic activities” (European Commission, 2015).

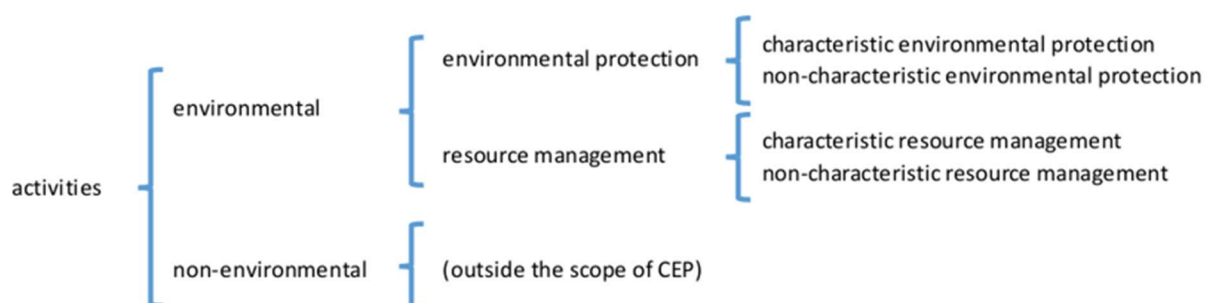


Figure 3: Categories of activities according to the CEP (European Commission, 2023).

Figure 3 delineates the scope of environmental activities according to the CEP. CEP text accordingly defines the scope of characteristic environmental activities in the following way:

“The economic activities whose primary purpose is to reduce or eliminate pressures on the environment or to make more efficient use of natural resources are called characteristic environmental activities. These are the environmental activities defined in SEEA CF, §§ 4.11 – 4.13.”

Meanwhile, it defines non-characteristic environmental activities in the following way:

“Besides the activities with a primary environmental purpose, under CEP scope are also certain other activities that do not directly serve an environmental purpose but produce specifically designed products whose use serves an environmental purpose. They are called non-characteristic environmental activities.”

These definitions apply equally to environmental protection activities as to resource management activities. The CEP further makes reference to the equivalence of characteristic environmental activities and “primary purpose environmental activities” and between non-characteristic environmental activities and “secondary purpose environmental activities”. Further text does suggest that this may not be an exact equivalence, however, the equivalence is satisfactory for the purposes of this paper.

The scoping of the CEP concludes with the recognition of the potential for environmental activities to also have negative environmental impacts:

“An additional issue is that even activities or products, with a primary environmental purpose may have negative secondary effects (a.k.a. externalities) for the environment. These possible unwanted negative effects are not assessed as classification criteria in the CEP approach. For example, energy production from wind fits within the scope of CEP because it serves the purpose of minimising the intake of fossil resources through the production of energy from a renewable source and regardless of possible noise caused or hindrance to biodiversity.”

According to the CEP, the motivation of the agent who engages in production activities is the ideal way of determining the environmental purposes, but simultaneously recognises that motivation is difficult to discern. Therefore it lists a number of operational aspects that can be used to determine purpose:

- Technical nature – inputs, production process and output for a given activity. This is preferred as the de facto basis for determining purpose, for its neutrality
- Intention, motivation or presumed effect
- Legislation, for example purpose stated in provisions or preambles of the legislation
- Real effect, or objectively proven consequences on the environment of an activity or action. Noted as a last resort

An interesting addition to the CEP classification text is the Annex that demonstrates the potential to select specific categories from the CEP classification in order to identify activities corresponding to each of the environmental dimensions of the EU taxonomy:

- climate change mitigation
- climate change adaptation
- sustainable use and protection of water bodies

- circular economy
- pollution prevention and control
- protection and restoration of biodiversity and ecosystem

Guidance notes on environmental activity accounts produced in the ongoing SEEA CF update do take up certain issues related to the scope and definition of environmental activities, such as primary and secondary environmental purposes (Guidance Note C4), and also an extended scope of environmental activities (Guidance Note C3) that uses the concepts of secondary purposes to expand the scope so as to ensure comprehensive SEEA coverage of climate change mitigation and circular economy. However, they are not treated or discussed in depth in this paper as they do not seem to add greatly to the conceptual perspectives not already expounded in the CEP definitions for the purposes of this paper.

3.2 Physical flow accounts

The description of physical flow accounts in the SEEA CF 2012 gives some consideration to the relationship between the economy and the environment. According to the schematic in Figure 4 below, the economy affects the environment by using natural inputs (natural resources) and putting back residuals. Elsewhere in the chapter on physical flow accounts, natural inputs are defined according to about two dozen different types covering separately natural resource inputs, inputs of energy from renewable resources and other natural inputs (see Table 3.2, SEEA CF 2012). A detailed list of “typical components” for groups of residuals is presented (see Table 3.4 SEEA CF 2012). Having said that it is clear that the list is intended to be indicative rather than definitional, prescriptive and comprehensive.

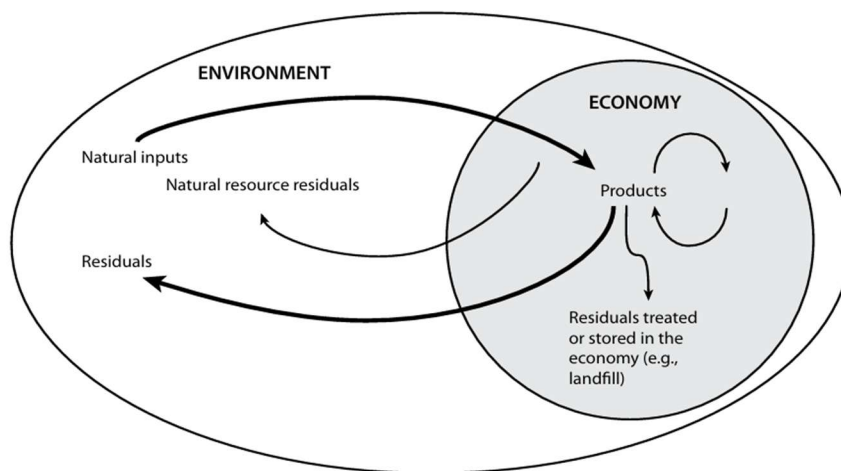


Figure 4: Physical flows in relation to the production boundary of the economy, SEEA CF 2012 p. 40. (United Nations, 2012)

4 Discussion

The brief overview in preceding sections has demonstrated that the systems perspective of the environment is well-established in research (i.e. the planetary boundaries perspective), and that methods for expressing the environmental impacts according to this perspective are likewise well-established (i.e. in LCA). It has also been shown that there is policy interest across the globe in applying this perspective. Indeed, a brief review of the environmental dimensions considered in the planetary boundaries, life cycle impact assessment and in overarching policy instruments for the environment that they largely consider the same issues, for example:

- Climate change
- Eutrophication
- Acidification
- Biodiversity
- Toxicity and hazardous substances
- Radiation
- Use of natural resources, including land, water,
- Particulate matter

The review has also shown that this perspective does arise in the current SEEA CF 2012 and related standards and classifications, but that they are not very consistent in so doing. On the one hand, the SEEA CF 2012 does describe the conceptual relationship between “the economy” and “the environment” through the use of natural resources from the environment to the economy and the emission of residuals from the economy to the environment. This features both in the overarching scoping of the SEEA CF 2012 (Ch. 2 Accounting Structure) and in the physical accounts (Ch. 3 Physical Flow Accounts). Ch. 3 even lists many of the residuals (i.e. emissions) that are critical for the environmental systems that are known in science, life-cycle impact assessment and overarching environmental policy, which is good. Having said that, the lack of the systems perspective on the environment well-applied outside the SEEA when presenting these physical accounts leads to the SEEA standard not being able to reason specifically why it is important to produce statistics on these residuals and by extension seems to miss an opportunity to strengthen the policy relevance of the SEEA.

The relationship between the systems perspective on the environment and the environmental activity accounts is more complex since environmental activity accounts are monetary in nature and do not directly involve interactions between the economy and the environment. Indeed, identifying the scope of environmental activities and determining the products, activities and expenditures that fall within this scope is already a complex task. Nevertheless, there is an important connection between the systems perspective on the environment presented in this paper and the scoping and identification of environmental activities. This is because the resource use and residuals arising from the monetary activities in the economy is an important element in identifying environmental activities from the rest of the economy.

The categories of the CEP for example are not particularly well-aligned to the systems perspective on the environment at present. Having said that, this mismatch has to some extent been recognised in the CEP document by proposing policy areas (building on the EU taxonomy) that build on subsets of the CEP classifications.

In light of these considerations, the next question is how SEEA standards and related classifications could be strengthened by incorporating the systems perspective on the environment. A number of amendments could be considered. A relatively low hanging fruit would be to establish the systems perspective on the environment in introductory texts in the SEEA CF, e.g. the current Ch. 2 Accounting Structure, and in Ch. 3 on physical flow accounts. This would strengthen the SEEA by providing further confirmation of its policy relevance, e.g. of residuals that are already explicitly mentioned.

As noted earlier, the role of the systems perspective on the environment is more complex for the environmental activity accounts. Potentially the best next step in light of the current state of the SEEA and related classifications is to build further on the “policy area” approach already in the CEP and taken up in some of the guidance documents in the SEEA CF 2028. Where the “policy area” approach currently focusses on the EU taxonomy (which in and of itself includes a recognition of the systems perspective on the environment) a question for further work is what this policy area approach would look like if a “planetary boundary” approach were to be applied? Such an exercise would be time-consuming and necessarily limited in light of its complexity, but the outcome could be of value for the SEEA community in better understanding how the scoping and identification of environmental activities could better serve policy needs.

Finally, a number of relevant issues have not been addressed in this brief document. Potentially the most significant is the relationship between the SEEA and the Framework for the Development of Environmental Statistics (FDES) (United Nations, 2017). The FDES does not either use a systemic approach of the kinds presented here in policy and science. On the other hand, the FDES does explicitly recognise the significance of the relationship between the SEEA and the FDES. Indeed, in one schematic in the FDES the SEEA is presented and a flow chart as a go-between between the SNA and the FDES. This relationship would also need to be considered in discussions on how to go forward with a systems perspective on the environment in the SEEA.

Questions for the London Group:

- What other systems perspectives on the environment of SEEA relevance could be considered?
- In what way can the systems perspectives considered better support the identification of environmental activities for specific policy areas?
- How can the systems perspectives be used to highlight activities that have both positive and negative environmental consequences?

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6 Appendices

6.1 Sweden Environmental Quality Objectives

Table 1: Sweden's environmental quality objectives. See e.g. <https://www.sverigesmiljomal.se/> (Swedish) och <https://www.sverigesmiljomal.se/environmental-objectives/> (English summary)

No.	Objective	Description
1	Reduced Climate Impact	Limit greenhouse gas emissions and contribute to stabilizing the global climate.
2	Clean Air	Air quality should not harm people, animals, plants or cultural assets.
3	Natural Acidification Only	Acidification from human activities should not exceed natural limits.
4	A Non-Toxic Environment	Protect human health and biodiversity from hazardous substances.
5	A Protective Ozone Layer	Safeguard the ozone layer from depletion.
6	A Safe Radiation Environment	Minimize harmful effects of radiation.
7	Zero Eutrophication	Reduce nutrient pollution in land and water ecosystems.
8	Flourishing Lakes and Streams	Maintain ecologically sustainable freshwater systems.
9	Good-Quality Groundwater	Ensure safe and sustainable groundwater resources.
10	Balanced Marine Environment	Protect healthy seas, coasts and archipelagos.
11	Thriving Wetlands	Preserve wetland ecological and water-regulation functions.
12	Sustainable Forests	Conserve biodiversity while enabling sustainable forestry.
13	Varied Agricultural Landscape	Maintain biodiversity and cultural values in farmland.
14	Magnificent Mountain Landscape	Preserve mountain ecosystems and natural values.
15	Good Built Environment	Create sustainable and healthy cities and communities.
16	Rich Diversity of Plant and Animal Life	Conserve biodiversity and ecosystem resilience.

6.2 England: The environmental improvement plan 2025

Table 2: Goals included in England's environmental improvement plan 2025 (DEFRA, 2018)

Goal	Goal summary
1. Restored Nature	To halt and reverse the decline in species abundance in terrestrial, freshwater and marine ecosystems. Create a network of bigger, better and more resilient habitats to help nature thrive.
2. Air Quality	Achieve clean air
3. Water Quality	Clean, resilient and plentiful rivers, lakes, groundwater and coastal waters.
4. Chemicals and Pesticides	Minimize environmental risks from harmful chemicals and pesticides to people and nature.
5. Waste	Minimise waste by designing it out of the system, reusing and recycling materials wherever possible.
6. Resources	Ensure that natural resources are produced, managed and consumed sustainably
7. Climate Change	Reduce greenhouse gas emissions to accelerate to net zero and work to prepare the natural environment for the effects of climate change
8. Reducing Environmental Hazards	Reduce the risk of harm to people, the environment and the economy from natural hazards (e.g. wildfires, floods and droughts)
9. Biosecurity	Enhance biosecurity to protect our natural environment and boost the health and resilience of plants, animals, ecosystems and people.
10. Access to Nature	Ensure inclusive access to nature and protect nature's beauty and heritage

6.3 Japan: Sixth Basic Environment Plan

Table 3: Summary of focussed measures in the Sixth Basic Environmental Plan (Ministry of the Environment, Japan, 2024)

Climate change measures	Consideration of the review of the Plan for Global Warming Countermeasures once every three years
Establishment of sound material-cycle society	Formulate the Fifth Fundamental Plan for Establishing a Sound Material-Cycle Society by the summer of 2024 and accelerate transition towards a circular economy
Securing biodiversity and living in harmony with nature	Put forward various measures following the five basic strategies described in the National Biodiversity Strategy and Action Plan of Japan 2023-2030 Realize the "nature-positive" mission, which means to halt and reverse biodiversity loss by 2030
Environmental conservation of water,	Protection of human lives and the environment, creation of a good environment, enhancement of scientific findings, human resources

air and soil, and environmental risk management	development, and the development and succession of technologies Promotion of international cooperation, chemical substances management, environmental health measures (promotion of measures on Minamata disease, etc.)
Various Basic Measures	Environmental impact assessment, environment research and technology development, environmental education, ESD, collaborative efforts, environmental information, etc.