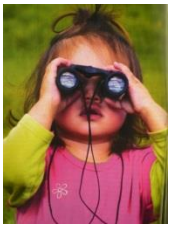


Visions of the future and the environment

Major categories of scenarios emerging from international environmental foresight studies

Questions regarding the future of our planet weigh heavily at the moment, and numerous studies have sought to predict future environmental outcomes. The continuation of past trends – whether these are represented in terms of biogeochemical mechanisms, patterns of economic production, uses of natural goods, forms of governance, etc. – results in an inexorable degradation of the climate, of biodiversity, of ecosystems, and of renewable and non-renewable natural resources. Foresight studies play a particular role in such discussions. Foresight studies offer multiple and contrasting visions of the future, in some cases suggesting strong discontinuities with regard to certain key variables. Drawing on both the environmental sciences and the social sciences, they help us reflect on how societies can (re)define their futures. To assist in its strategic thinking, the National Alliance for Environmental Research (AllEnvi) directed its transversal group (GT) "Foresight" to identify the major categories or "families" of scenarios proposed within environmental foresight studies. Identifying 11 families of scenarios across a corpus of 307 international scenarios, this analysis reveals the multiplicity of possible future societal and environmental outcomes and highlights how, even in cases where environmental questions become a priority, expected improvements in the state of the environment are neither certain, nor rapid, nor widespread.

To identify the families of scenarios appearing in international foresight studies relating to the environment, and to analyze their corresponding environmental consequences and outcomes, the AllEnvi Alliance's GT *Foresight* conducted an inventory of international foresight studies with time horizons of 2030, 2050, and 2100 (corresponding to short-, medium-, and long-term studies) and with a large-scale geographic focus (at the global level or at the level of Europe or another major world region). Of 204 studies initially identified, 99 were judged to be both relevant and rigorous. Despite their diversity, the 307 scenarios elaborated within these 99 studies most frequently identified governance (40%) or economics (25%) as their primary driving factor (see box below). The 307 scenarios could be grouped into 11 families of scenarios based on their construction logic and on the visions of the future they proposed. Three "mutant" scenarios fell outside this schema and were considered unclassifiable.

Eleven families of scenarios, corresponding to contrasting visions of the future

Relying first of all on forms and intensity of governance, and assembling additional geopolitical, economic, social, environmental, and technological factors in various ways, these 11 families of scenarios can serve as "reference visions," with varied environmental consequences.

The ScénEnvi study: Key figures

- 204 foresight studies identified, 99 of which were judged relevant.
- At least 7,700 expert authors and more than 12,000 published pages.
- 307 scenarios grouped into 11 families, 22 variants and 3 "mutant" scenarios.

The ScénEnvi study: Methodology

While not pretending to be an exhaustive survey, the 99 foresight studies considered here constitute a representative bibliographic corpus (drawn predominantly from Western, public sources) of recent (< 15 years old) foresight studies featuring environmental aspects (either in their input or output), yielding one or more scenarios, over the time horizons of 2030, 2050, or 2100, and focusing on either the global, European, or other major regional level.

The foresight studies were assessed using a "systematic review" approach, including the development of a descriptive form used to note each study's characteristics, methodology, and scenario details in a consistent fashion. Scenario analysis was standardized using a table to classify the driving factors for each prospective trajectory into 6 major categories (demographics, environment, governance, economics, society, technologies) (E. Cornish, 2006).

By initially classifying the 307 scenarios according to the nature of their two principal driving factors, we could then use an iterative process to place each scenario within the 11 scenario families.

Although the societal trajectories described by these scenario families are varied, they can nevertheless be divided into three major groups (Figure 1).

*** Scenario families of decline,** including 72 scenarios (or 23% of the total). These scenarios describe dark futures with strongly negative consequences for the environment.

In "Chaos" scenarios (33 scenarios), failure and lack of planning on the part of the governance bodies lead the world into a downward spiral of negative effects, resulting in more or less generalized conflict and, in extreme cases, the extinction of the human race.

In "Retreat" scenarios (18 scenarios), economic difficulties, resource competition, and increased migration lead to a rise of nationalist ideologies, exacerbating tensions and resulting in a marked withdrawal of nation states into political and economic isolation.

"Fragmentation" scenarios (21 scenarios) depict a multi-polar and unegalitarian world built on individual and group identities and marked by strong divisions; archetypal examples are oppositions between North and South and between rich countries and poor countries.

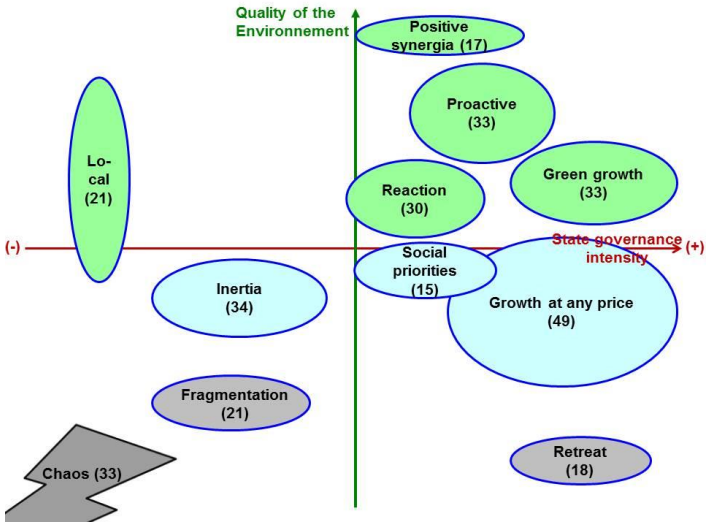
*** Scenario families not assigning priority to the environment** (98 scenarios, or 32% of the total). These scenarios either foresee a continuation of existing trends without predicting any kind of breaking point, or give precedence to non-environmental priorities. Such trajectories sometimes allow for certain improvements or limitations on environmental degradation when these are compatible with other desired objectives.

In "Growth at any price" scenarios (49 scenarios), the environment is clearly sacrificed to economic growth based on economic liberalism and active policies of deregulation as supported by a strong state or policies of "profitable" innovation.

Scenarios of "Inertia" (34 scenarios) typically describe a prolongation of existing trends without major disruptions and the absence of strong engagements in favor of the environment due to a lack of financial capacity or because of major political or societal blockages. This type of inaction can lead to serious environmental damage.

In "Social priorities" scenarios (15 scenarios), the reduction of social inequality provides the central strategy and policies of inclusion and redistribution are put in place. These trajectories can have positive effects on the environment without this being a direct objective.

Figure 1 – Positioning of scenario families according to the intensity of state-level governance and changes in environmental quality



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*** The 5 scenario families giving deliberate priority to the environment** (134 scenarios, or 44% of the total) combine, to varying degrees, state direction and the mobilization of various constituent groups of civil society.

In "Reaction" scenarios (30 scenarios), catastrophes or recurrent crises prompt governing entities to take urgent steps in favor of the environment, because they no longer have any other choice.

Scenarios of "Green growth" (33 scenarios) are based on strong public policies seeking to reconcile economic growth with environmental protection, to bring about an energy transition, or to put in place enlightened global governance structures that are favorable to the environment.

In "Proactive" scenarios (33 scenarios) states coordinate among themselves to anticipate problems and make environmental protection a priority, with citizens supporting a decoupling of growth curves for consumption and general well-being.

"Positive synergy" scenarios (17 scenarios) go further, relying on a social consensus in favor of environmental protection and long-term global sustainability. These scenarios lead to changes in values, more modest lifestyles, and greater social solidarity.

At the other end of the spectrum, "Local" scenarios (21 scenarios) develop as a reaction to the failure or the refusal to act of national or supranational levels of governance. Citizens organize themselves to act in favor of the environment at the local level and based on local dynamics, with greater or lesser success.

A limited role for research and development (R&D) within scenario families

Although minimally present among the driving factors shaping the futures described in the 11 scenario families, R&D and technological innovation receive little explicit attention in these studies. They are recognized as a driving factor in only 15% of the scenarios. When science is taken into account, it is usually considered as a provider of solutions to problems encountered by societies. Science's role in understanding phenomena of environmental degradation, and in alerting societies to the risks incurred if nothing is done to address current trends, is not invoked, even in prospective exercises such as those led by the IPCC, where the "alarm" function is most explicit.

Sustainable technologies (energy, biomass, etc.) are of course often cited among the drivers of change for scenarios considering R&D. "R&D spending and dynamics" and "the role of science and technology in society" are then taken into account.

The state of the environment infrequently recognized as a driving factor

The current state of the environment or an apprehension of its future appears as a driving factor for future outcomes in a third of the scenarios analyzed by this study. Perspectives on climate change appear as a driving factor in 50 scenarios, whereas the general state of the environment appears in 46 others. A view of recurrent or generalized crises, the anticipation of environmental degradation or the potential consequences of climate change drive trajectories with strong environmental priorities, mainly those reactive in nature. Although the role of science in initiating these trajectories is often not explicit, we can recognize here the impact of scientists' efforts (notably climate scientists) to raise awareness among both the public and government officials as to the consequences of the global changes currently underway.

In several scenarios, however, current or anticipated environmental and/or climate degradation does not lead to a recognition of environmental priorities, but instead translates into trajectories of "Chaos," "Fragmentation," "Inertia," or "Growth at any price." We conclude that, for the analysts proposing these possibilities, such scenarios serve to highlight the major challenges societies will face if these levels of environmental degradation are left to continue unchecked.

In addition to the climate and the overall state of the environment, other environmental concerns – such as biodiversity, various types of pollution (other than GHG), soil degradation, loss of water resources, etc. – only appear in a limited number of scenarios. The state of the oceans is never mentioned as a driving factor in any of the scenarios surveyed here. While the available scientific knowledge on these subjects is sufficiently alarming, the magnitude of the potential impacts resulting from this situation is underappreciated by decision-makers and other interested parties, according to the foresight study authors. Everything suggests that, contrary to the IPCC, the absence of societal coordination with regard to these environmental concerns translates into an absence of these environmental compartments in determining future trajectories.

Environmental improvement not consistently on the agenda

The diversity of the 11 scenario families highlights the fact that there is no single trajectory either toward environmental improvement or toward environmental degradation; rather, several paths exist, including in terms of recognizing the challenges presented by environmental issues.

Table 1 – Distribution of scenarios by family and by the nature of environmental impacts (positive, negative, or mixed)

Scenario families	# of scenarios with at least one measure of environmental outcomes			Total
	+	+/-	-	
Chaos	2	4	18	24
Retreat	1	3	5	9
Fragmentation	2	4	9	15
Families of decline	***5***	***11***	***32***	***48***
Inertia		3	24	27
Growth at any price	7	5	31	43
Social priorities	4		5	9
Fam. w/o env. prior.	***11***	***8***	***60***	***79***
Reaction	7	10	7	24
Local	5	5	2	12
Green growth	15	9	2	26
Proactive	13	7		20
Positive synergies	7	3		10
Fam. w/ env. prior.	***47***	***34***	***11***	***92***
Total	***63***	***53***	***103***	***219***

These scenarios offer a pessimistic overall vision of the future of our environment. Fewer than 30% of the scenarios giving a detailed account of environmental consequences conclude with an environmental improvement (Table 1), whereas close to 50% conclude with environmental degradation, and the remaining 20% foresee a combination of degradation and improvement, depending on the environmental compartment.

As would be expected, scenarios with negative consequences dominate among scenario families of decline and those without environmental priorities. Conversely, scenarios with positive consequences are for the most part those belonging to scenario families with environmental priorities, although they only account for half of the scenarios belonging to these families. The other half of the scenarios with environmental priorities either combine positive and negative environmental effects, and thus result in mixed environmental outcomes, or give rise to negative environmental consequences. The authors of these studies remain cautious with regard to the improvements to be expected from trajectories with environmental priorities, the breaking points not being radical enough to bring about a real reversal of the trends underway.

Certain environmental compartments appear especially threatened, regardless of the type of trajectory imagined. This is true particularly for soil and water, two fundamental resources for which degradation is more often predicted than improvement, even where priority is given to the environment. Similarly, regardless of the trajectory envisaged, the incidence of environmental risks is predicted to increase in future decades in 85% of the scenarios that seek to account for it.

Finally and surprisingly, impacts on forest resources and on oceans and coastal regions are rarely considered in the scenarios surveyed here. Where these impacts are considered, the trend is mainly toward degradation.

Conclusion

The environmental foresight studies considered here propose a variety of trajectories leading to both the deterioration and to the improvement of the environment. These trajectories can be differentiated by the forms of governance they assume and by the nature of the priorities adopted by society or by decision makers. In privileging the global and supranational levels, these foresight studies most likely exclude other trajectories more strongly determined by local or regional modes of governance. This analysis could thus be usefully complemented by a study of these "missing" scenarios, exploring another group of more locally or regionally focused foresight studies. In addition, the identification of "families" of scenarios has a tendency to fix perceptions of the future around mechanisms specific to each trajectory. In a number of cases, however, it is important to consider the possibility of moving from one trajectory to another. The conditions that render such changes of trajectory possible should also be explored as a complement to this work.

Even in cases where the environment is placed at the center of societal objectives, its current state and the dynamics underway do not always allow us to expect a simultaneous improvement across all environmental compartments. Water and soil resources are the most strongly threatened by degradation, whereas environmental risks of all types that are already strongly present can only intensify. The absence of studies focusing on future impacts on oceans, coastal areas, and forests suggest a need to address these lacunae within the field of environmental foresight.

Organization of the ScénEnvi study

The ScénEnvi study, conducted at the request of the Council and Committee of Scientific Direction (CPS) of the National Alliance for Environmental Research (AllEnvi), was coordinated by the facilitators of the Alliance's Transversal Foresight Group (GT Prospective): Nicolas de Menthière (Irstea), Denis Lacroix (Ifremer), and Bertrand Schmitt (Inra); joined by Audrey Béthinger (Inra) as project leader.

The study was carried out by an expert group of AllEnvi's GT Prospective: Bernard David (CEA), Christophe Didier (Ineris), Louis Laurent (Anses), Jacques Parent du Châtelet (Météo-France), and Flora Pélegrin (FRB); in association with scientific and technical information specialists (IST) Pascale Hénaut (Irstea), Morgane Le Gall (Ifremer), Marie-Hélène Pépin (Météo-France), and Isabelle Pradaud (Ineris).

Also contributing to this work were: Hervé Hanin (SupAgro), Marie de Lattre-Gasquet (Cirad), Marco Barzman (Inra), Robin Bourgeois (Cirad), Florence Carré (Ineris), Philippe Chemineau (Inra), Moussa Hoummady (BRGM), Hélène Le-Du (Ifsttar), Olivier Mora (Inra), Gilles Ragain (Cnes). Virginie Piguet (Inra) provided the statistical treatments.

For further reading:

de Menthière N. (ed.), Lacroix D. (ed.), Schmitt B. (ed.), Béthinger A., David B., Didier C., Laurent L., Parent du Châtelet J., Pélegrin F., Hénaut P., Le Gall M., Pépin M.-H., Pradaud I. (2016). *Visions du futur et environnement: Les grandes familles de scénarios issues d'une analyse de prospectives internationales relatives à l'environnement*. Rapport du GT Prospective au Conseil d'AllEnvi, Vol. 1: Rapport final de l'étude ScénEnvi, 73 pp.; Vol. 2: Recueil des fiches prospectives, 279 pp.; available on AllEnvi Alliance's website: http://www.allenvi.fr