GLOBAL CHANGE SCENARIOS
Fact Sheet

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What is Global Change?

In human-dominated landscapes, the combined effects of nature and society shape the composition, structure and dynamics of landscapes and ecosystems. Global Change encompasses all these factors, and ca be defined as the alteration produced by different human activities on the processes that support life on Earth. These disruptions comprise the destruction, fragmentation and overexploitation of ecosystems, the introduction of invasive species, the alteration of biogeochemical cycles, the general pollution caused by nitrogen, phosphorus and other contaminants and, above all, climate and land use-land cover (LULC) changes **(Figure 1)**.
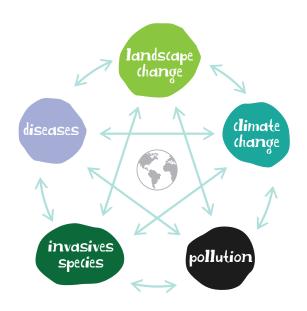

Figure 1. The complex relationships of Global Change factors drive changes on ecosystems worldwide.

The cumulative impact of these factors results in the loss of biodiversity and ecosystem services supply. The long-term functioning of the biosphere and human well-being rely in great part on the good status and resilience of natural and seminatural ecosystems of the Earth.

What is Scenario Development?

Under these global pressures, the capability of ecosystems to maintain human well-being and natural heritage needs to be addressed by evaluating the interaction of ecological processes with socioeconomic activity and management and policy mechanisms over time. These forecasting analyses, mainly based on numerical models, are known as Scenario Development and can be defined as "reliable storylines of alternative hypothetical situations that reflect different perspectives on past, present, and future developments, which can serve as a basis for management and planning". They describe plausible socioeconomic development pathways that allow experts and stakeholders to compare landscape structure, dynamics and function among a range of different situations, generally from 20 to 100 years into the future. Highlighting future changes and their related socio-economic environmental impacts may help decision makers to compromise and adopt a better decision than if they wouldn't have had this information.

What is Scenario Development?

In Global Change studies at the landscape scale, Scenario Development is mainly dependent on LULC and climate change. LULC change is a process by which human activities transform the landscape directly (for e.g. urbanization, deforestation or agricultural intensification) or indirectly (e.g. land abandonment) by changing the use of land because of socio-economic or management purposes **(Figure 2).**

Thus, future scenarios of global change need to take into account not only climatic projections but also changes on human activities that might influence LULC. The Intergovernmental Panel on Climate Change (IPCC) reports assessments on which historical data allow determining how large is the role of human activities in climate trends. Natural drivers, that only include factors such as sun activity and volcanoes, cannot explain observed patterns without including greenhouse gases and other human factors since pre-industrial levels **(Figure 3).**

Scenario Development analyses define therefore a specific range of agreed situations that allow assessing the role of biophysical and socioeconomic drivers on specific responses from a socio-ecological system. Results from these exercises address at least one of the following questions:

*1. Which environmental and socioeconomic variables contribute most to an explanation of landscape changes ⟩ **why?***

*2. Which locations can be more affected by these changes ⟩ **where?***

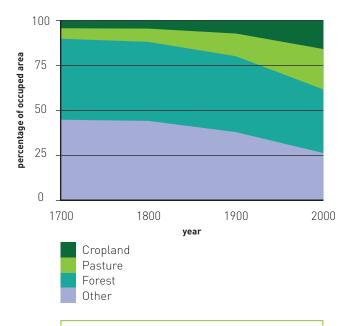*3. At which rate do changes progress ⟩ **when?***

Figure 2. Estimated change in land use from 1700 to 1980 at the worldwide level, showing the enlargement of pasture areas coupled to a decrease in forests and other land uses (mainly natural vegetation). Source: FAO 2006.
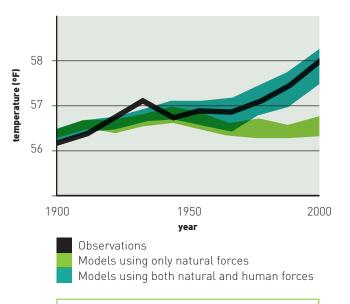

Figure 3. By comparing model outputs obtained from both human and natural forces, scientists can assess their relative contributions to observed climate changes. Observed data can only be modelled accurately by coupling natural dynamics with anthropic influence. Source: IPCC's Fourth Assessment Report.

The ALICE approach: towards a better management of Atlantic Landscapes

ALICE will carry out Scenario Development of future landscapes using both spatial modelling and participatory approaches. Two types of scenarios will be conducted and assessed. The first one will be based upon observed past trends of LULC and climate dynamics that will be extended into the future by assuming that land uses will not change. This situation, usually defined as a business-as-usual (BAU) scenario, assume that landscape changes will be expected to occur in locations with the highest probability of conversion accordingly to past biophysical and socio-economic driving forces that remain constant into the future **(Figure 4)**. The second type of scenario will assume a similar climatic and biophysical setting but will account for changes in land use and specific management strategies where Blue and Green Infrastructure Networks (BGINs) will shape different (and multifunctional) landscape patterns. In this context, the BAU scenario will be used to define a baseline against which this second type of scenarios will be assessed in terms of biodiversity and ecosystem services gains and losses.

Through the analysis of different socio-ecological systems located across the Atlantic region in **Portugal, Spain, France and Northern Ireland,** the **ALICE Project** will create Global Change Scenarios considering all the relevant biophysical and socioeconomic components driving landscape dynamics across each case study. Particular attention will be placed on understanding interrelationships of terrestrial-aquatic and land-sea interfaces by assessing, e.g., how forest dynamics and agricultural practices affect rivers and estuaries. Moreover, the project will stress on how Blue and Green Infrastructure Networks (BGINs) can enhance Ecosystem Services (ES) delivery across the different scenarios developed, including synergies and trade-offs among ES in the context set by the preferences of stakeholders consulted during participatory learning processes.
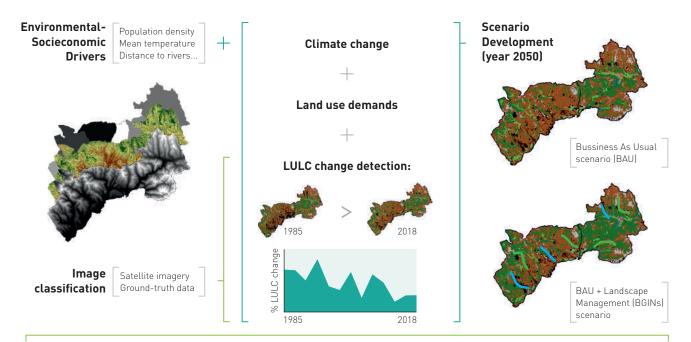

Figure 4. Flowchart describing the procedure of Scenario Development. Source: Adapted from Landscape Ecology (2010) and own work. BGINs: Blue and Green Infrastructure Networks, represented by blue and green lines across the study area.