Indicators for vulnerability assessment

The world is a complex being. The data we collect therefore is often messy. To be able to make some judgments about the current state of the world, make estimates of future trends, and finding ways to achieve set strict goals about the way the world´s future you need good indicators to evaluate the state of the world.

In the World Development Goals, set up by the United Nations and the World Bank, the aims are all dependent of indicators. The World Development Goals are to empower women by eliminating gender disparities in primary and secondary education and--by the year 2015- have halved the people living in extreme poverty; enrolled all children in primary school; reduced infant and child mortality by two-thirds; reduce maternal mortality by three-quarters; provide access to all who need reproductive health service; and to reverse the loss of environmental resources by implementing national strategies for sustainable development by 2005.

To be able to fulfill these goals, good indicators are needed.

Indicators can be divided hierarchically as, at the lowest level, direct observations and measurements. From these observations you can then make empirical correlations. and from these --in turn-- define sectorial, issue-oriented or regional indicators. One hierarchical level higher come aggregated indicators such as GDP. Above these come the summary indicators.

Many of today´s international conventions and other agreements use goals that need to be quantified by different indicators.

The U.N. Framework Convention on Climate Change has the goal to stabilize the greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climatic system. This level of atmospheric greenhouse gases should be achieved within a timeframe allowing ecosystems to adapt naturally to the changes in climate, to ensure that food production is not threatened, and enable a sustainable development of the economy.

This leads to the question of how to define dangerous anthropogenic interference and what indicators to use†:

The objective of the biodiversity convention is to conserve biodiversity, the sustainable use of its components and the fair and equitable sharing of its utilization. Further, one of the goals of the World Summit on Sustainable Development (WSSD) is to significantly reduce the decline of biodiversity by 2010.

Even without taking into account the problem with defining the concept of biodiversity (and the indicators for the same) this statement becomes difficult to interpret. A significant reduction in the decline of biodiversity by 2010 could both imply, only a minor (but significant) change in the loss of biodiversity or a severe loss until 2009 with only a slight increase in biodiversity under the year of 2010. Both of these interpretations can be seen as counter the intended goals of the WSSD.

One type of analysis that uses global indicators is Safe Landing Analysis.

A Safe Landing Analysis is an analysis used to determine the short-term emission targets

compatible with long-term goals. These are done so that short-term targets will be feasible yet leading to a bending of the curve so that long-term targets can be met. Examples of long-term targets to be met in the long-term are for example the EU temperature goal of less than 2°C dGMT, a rate of temperature change to account for limited adaptive capabilities, relevant sea level rise relevant for e.g. the Alliance Of Small Island States (AOSIS) including a maximum rate of emissions reduction to account for technological/economical feasibility. With these types of demands of future emissions you can create emission-corridors with an allowed area of emissions throughout the selected short-term period. This gives a rather large span of different emissions-futures to chose from to get to the long-term goals. However, an emission-future at the highest allowed end of the emission-corridor limits the way further restrictions of the emissions are to be done while an emissions-future at the lower end of the emission-corridor gives further freedom in how to solve the long-term goals.

Depending on how strict your long-term goals are, the emissions corridors will look very different.

The IPCC TAR-Vulnerability synthesis.
How do we determine "what constitutes dangerous"? Dangerous is a value judgement and not appropriate for analysts to determine. But we can give information on impacts that may be considered as to be dangerous. Additionally we can organize our work along "Reasons for Concern" about what may be dangerous.

For example in Reasons for Concern we can look at the relationship between **global mean temperature increase** and different elements such as: unique and threatened systems (coral reefs, polar bears, Alpine ecosystems), extreme weather events, distribution of impacts, aggregated impacts and large scale singularities

For Unique and threatened systems (Coral reefs, Polar bears, Alpine ecosystems), the concern is that they are unique systems that may be lost or severely damaged.
In term of extreme weather events the concern is that they can be very destructive (heat waves, floods, droughts, storms, hurricanes).
In term of distribution of impacts some regions, people, systems may be more adversely affected than others.
In term of aggregated impacts the emphasis is put at how to measure these impacts (monetarization or another kind of metrics).
Finally in term of large-scale singularities, the emphasis is at system changes that have a low likelihood but potentially large consequences (West Antarctic Ice sheet disintegration, thermohaline circulation, runaway greenhouse gas effects)

Aggregated ecological indicators
Here the idea is to come up with a set of ecological indicators that may describe changes on a global scale and describe how the risks that those indicators are depicting evolve globally. Some examples of such indicators are: changes in the length and start of the growing season, change in fire proneness, impact on corn yield.

As a final consideration it is important to have in mind that there is not a single approach to develop but to integrate indicators from natural and social sciences and any approach should aim to be as simple and clear as possible.

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