For the model communications part, this means that all model variables or outputs are uniquely identified with an ID and provided with name, unit, description etc. in a table. When a model simulation is finished, the model writes all of its outputs to a table and relates each value to the unique variable ID. The next model in the chain selects only the values of the variables that it needs. The prime advantage of this approach is transparency: the same model variables can more easily be used in other parts of SENSOR, because for any given model output, the user can look up its definition in the table mentioned above.

The relational data model has the advantage that it compels the modellers to clarify the role of their models in the entire framework. It also facilitates communication between the different teams involved in data handling in SENSOR. The mere process of defining the system helps clarifying and agreeing on important concepts like for instance “response function” and “indicator function”.

The final draft of the communication protocols is now being prepared, and will be published internally as deliverable 2.4.1 before the end of the year.

The challenge to apply thresholds, target and limit principles in a regional sustainability integrated assessment

(by Laurence Jones & Nathalie Bertrand)

What is a threshold? In its purest sense it can be described as “a breakpoint or discontinuity in a system at which a rapid change occurs”. Threshold is a relative concept, firstly because a environmental, social or economic system may have different thresholds depending on the local characteristics, and secondly can be strongly driven by local preferences and political objectives.. This makes identification of regional thresholds more exciting and more relevant, but adds considerably to the complexity of the task.

The crucial question is: **what constitutes an unacceptable consequence?** Or, in other words, what are the sustainable limits of a system? In order to include the sustainable concept in our threshold analysis in SENSOR, we will consider ‘sustainable limit’ as the main term and threshold for specific cases. Therefore, the definition and identification of environmental and socio-economic ‘sustainable limits’ is the challenge for the sustainable regional assessment within Module 3 in SENSOR.

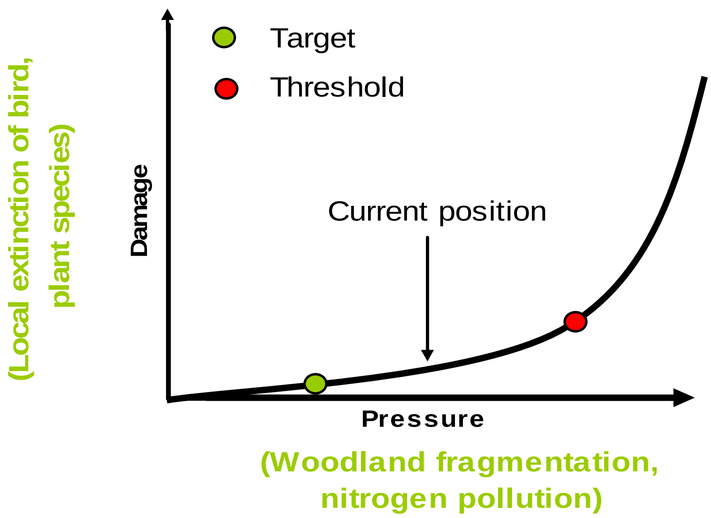

Figure 1. Relationship between thresholds and targets in environmental systems

When reviewing the literature about thresholds, we find that in natural systems there are different definitions of thresholds which include: distinct boundaries marking catastrophic shifts between alternative stable states, breakpoints in non-linear relationships and, using a wider definition of the term ‘threshold’, the point beyond which there are unacceptable consequences. On the other hand, in social and economic systems the concept of threshold as previously defined is rarely recognised.

In addition, thresholds for natural systems can be linked to environmental economy, where threshold is closely related to an optimum value (e.g. costs/benefits relation to society) which is linked to social preference, pressure, market context or even policy decision. This optimal value may also be related to environmental critical limits. This opens the on-going economic debate of trade-offs between human and natural capitals. Therefore, in socio-economic approaches, the emphasis is usually on identifying optimum positions linked to political objectives and social preferences rather than identifying unacceptable limits within a system, and the concept of target is probably more appropriate.

In SENSOR Module 3, we are trying to identify positions along a response function which mark the critical points of change in a system with regard to the increase of a pressure In environmental systems these thresholds usually relate to limits, beyond which we see unacceptable consequences and the desire is to remain as far from that limit as possible (see Figure 1). On the other hand, in social and economic systems, the critical point or limit usually relates to targets and the desire is to move towards them or attain them (see Figure 2).

In addition, there are other challenges regarding the threshold definitions, e.g. (i) the consequences of exceeding the threshold (e.g. how reversible are climate change, or collapse of fish stocks); (ii) how to take into account the legal and international obligations defining boundaries within the locally defined thresholds; (iii) how to deal with indicator sensitivity towards the assessment of the change; (iv) data relevance, particularly when national average data is disaggregated and used to identify regional thresholds for indicators.

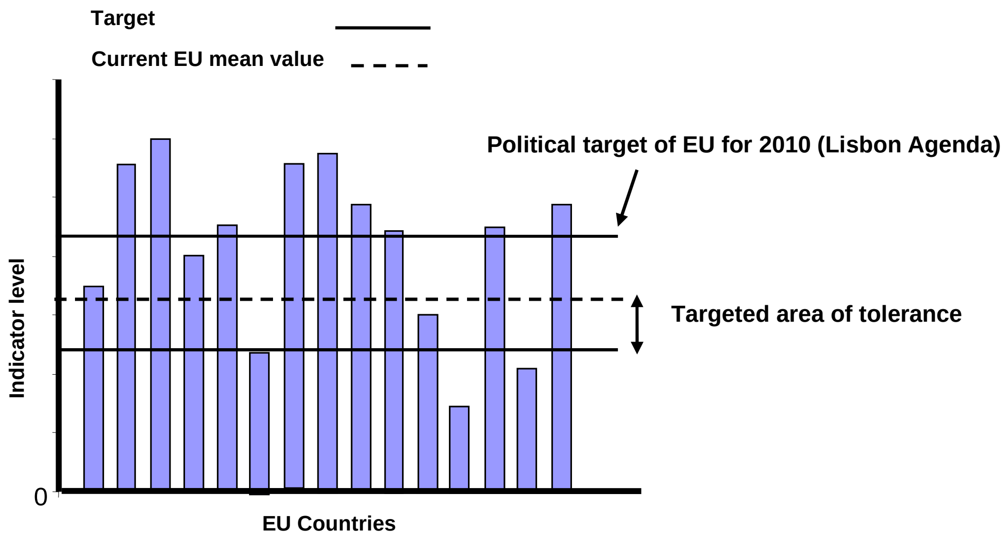

Figure 2. Targets in socio-economic systems

The identification of sustainable limits in M3 would be ideally done through a comprehensive pan-European stakeholder dialogue exercise. We would follow then an iterative process of stakeholder consultations within each NUTS-x region, which would identify by consensus with stakeholders where the acceptable limits should be placed for each of the indicators. In practice, that task alone would probably take the entire resources of SENSOR. Therefore, in reality, the social, economic and environmental scientists in SENSOR will identify limits at the level of defined cluster regions (environmental and socio-economic homogeneous groups of NUTS-X regions) using 'expert judgement' and taking into account indicator heterogeneity within NUTS-x regions.

The characterisation profiles being constructed for each cluster region will also guide limit setting. The issue of how representative the cluster regions are will be approached in the group and internet valuation in Test Regions and in the regional case studies, supported by the stakeholder consultation exercises. A similar approach to assessing limits is taken by the UN-ECE with the Critical Load thresholds for atmospheric nitrogen pollution. There, expert judgement is used in cases where little information exists, and then followed by gradual modification of the Critical Load ranges and improvement of the reliability weighting attached to those values as the evidence base accumulates.

The role of land use functions in the SENSOR regional sustainability impact assessment (by Marta Pérez-Soba & Sandrine Petit)

SENSOR Module 3 is developing an innovative methodology to assess the impact of policies on the sustainability of land use at regional level. The method relies on a set of 27 cluster regions that cover EU25+ Norway and Switzerland, which are defined according to the coherence of their bio-physical and socio-economic characteristics (cluster regions are defined more extensively in the article on the Spatial Regional Reference Framework previously published in Newsletter 3). The cluster regions are currently being characterised using socio-economic and environmental characteristics in order to identify social, economical and environmental issues (as listed in the EC Impact Assessment Guidelines, 2005) that are likely to be affected by the SENSOR scenarios. The 'impact issues' are assessed by a set of key indicators, which values are provided by Module 2 after running the macro-economic, sectoral and land use allocation models chain.

In order to translate the European assessment, i.e. the individual values of the indicators, into an integrated regional assessment, we introduced the concept of 'Land Use Functions' (LUFs). LUFs are the goods and services that the different land uses provide, which are linked to indicators as long as they are meaningful at the regional level. In principle, we have considered and defined nine main LUF, balanced among the three pillars (see Fig. 3). Most individual indicators contribute to several LUFs, sometimes across several pillars.