EU-Sustainability Impact Assessment
The Sensor approach:

Conceptual design
of the first prototype for bioenergy scenarios

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  - Sustainability Impact Assessment (SIA) in Europe
  - Sensor project
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- SIA Tool
  - Defining policies
  - Impacts of policies
- Conclusions

EU – Impact Assessment (1/3)

- *Ex-ante SIA is a procedure accompanying policy development at European Commission. It is to analyse sustainability impacts and side effects of an intended policy option*

  - Identify the problem
  - Define the objectives
  - Develop main policy options
  - Analyse their impacts
  - Compare the options
  - Outline policy monitoring and evaluation

focus

Source: EC, Handbook 2005.

Sensor project (1/3)

- SENSOR

  FP6 Integrated Project
  Consortium with 33 Research Institutions in 15 EU Countries
  Project duration: Dec 2004 – Nov 2008
  Coordination: Centre of Agricultural Landscape Research e.V.

- Objective

  Cross sectoral ex-ante Impact Assessment Tools to support decision making on policy alternatives related to multifunctional land use

- Frame

  Purpose: EU policies related to land use & rural development
  Enduser: EU Policy makers
  Scale: Regional scale with European coverage
  Constraint: Use existing pan-European data

Source: SENSOR 2006

Land Use






Agriculture
Forestry
Nature Conservation
Transport Infrastructure
Energy
Tourism

Impacts

Production
Environment
Economy
Society
Culture
Ecology

Thresholds
Targets

Valuation

Sustainability Choice Space

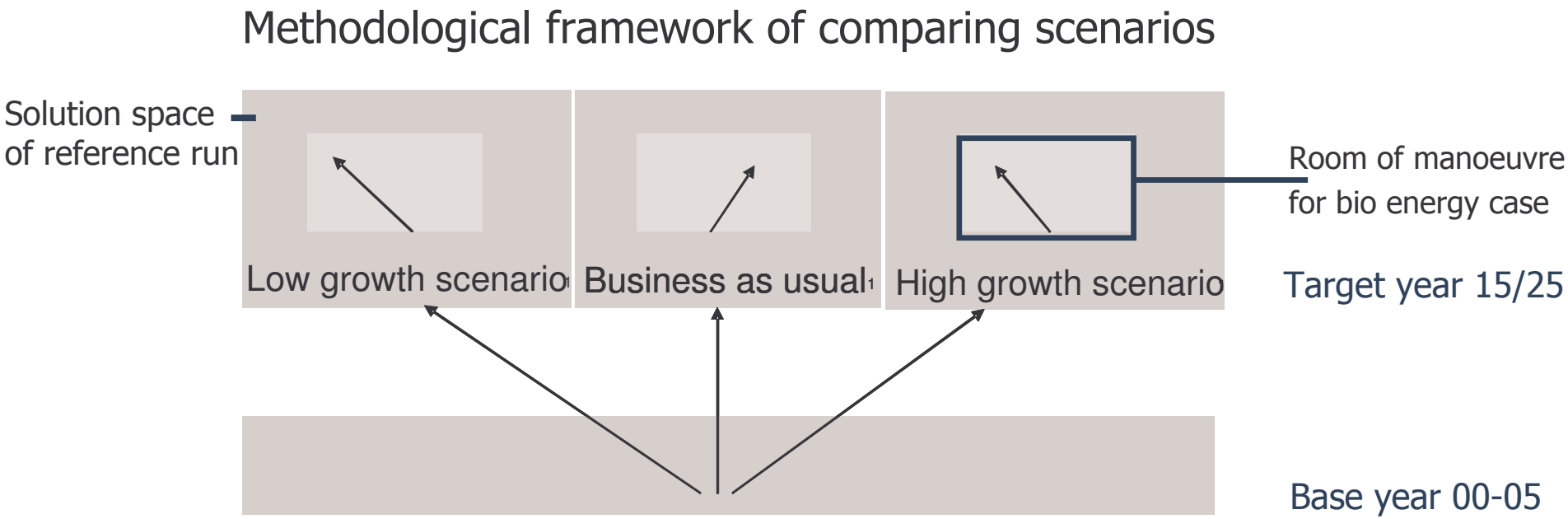
Region x
Region y
Region ...
Region ...
Region ...
Region n

Stakeholder

Source: König et al., SENSOR 2006

Scenario Development (2/3)

- Scenario methodology

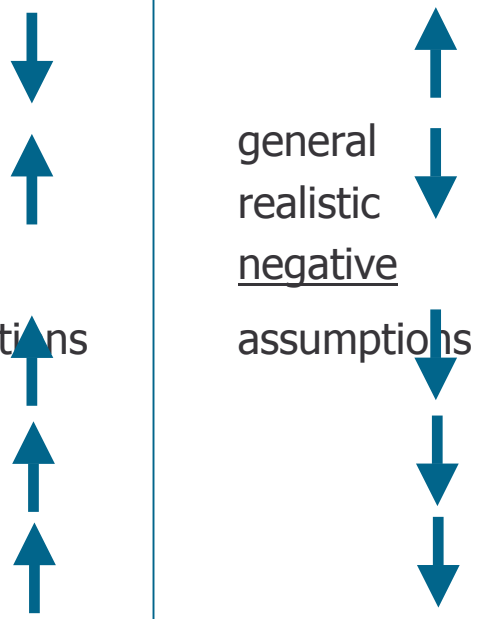


Source: SENSOR 2006

Scenario Development (2/3)

- Reference Scenarios / 5 drivers at MS-level of EU25

Baseline	baseline	high growth	low growth
oil price (in constant euros of 2004, per barrel) world GDP (in millions of constant euros of 2004) population (number) labour force (number) R&D expenditure (in millions of constant euros of 2004)	assumption of current trends	general realistic positive assumptions	general realistic negative assumptions



Source: SENSOR deliverable report 2.1.1

Scenario Dev. (2/3)

◆ Scenario solving

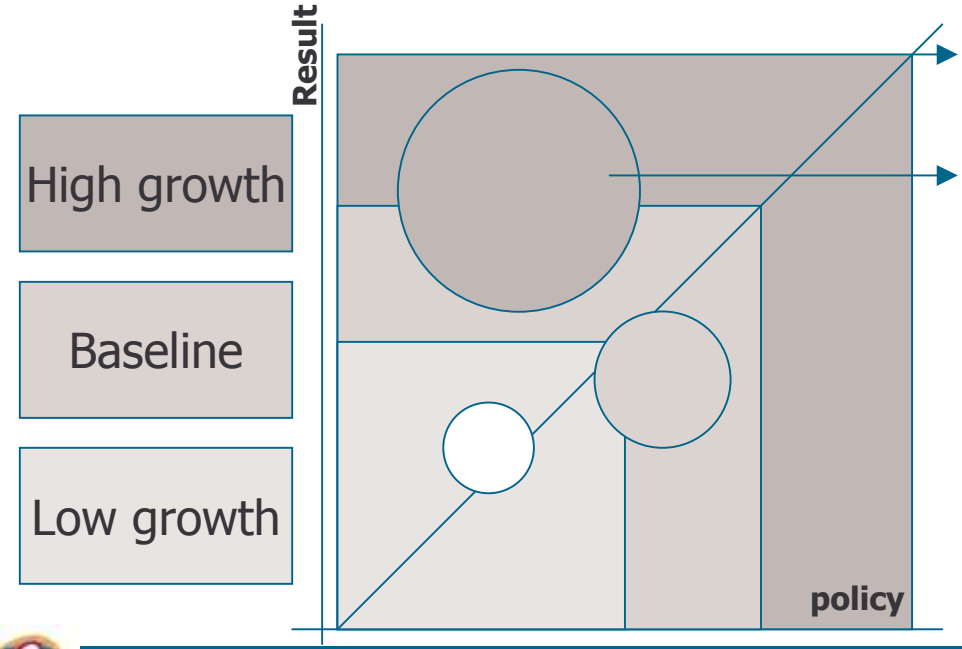
1 Reference scenario → 5 drivers in different constellation

2 Policy settings → 3 different solution spaces, in which policy cases to be simulated

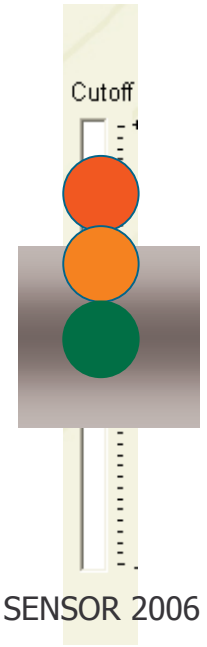
3 Impact indicators → Impact of policies by 60 indicators acc. to EU-impact issues

4 Sustainability → Critical limits / sustainability choice space

5



Difference ref. to policy scenario in target year



Source: SENSOR 2006

Aggregation to land use functions

Scenario Development (2/3)

- Method of Selection: The policy cases should …

  - present new policies
  - have a significant impact on land use
  - be relevant to multifunctionality and sustainable development
  - preferably produce significant changes in all three dimensions of sustainability
  - represent hot topics in the policy debate
  - have a long-term strategic significance
  - be realistic, i.e. within the mandate of EC policy
  - be related to new strategies (less directives), end user influence desired

Scenario Development (2/3)

- Selected cases are …

Policy Case	Issue addressed
-> Bioenergy	Biofuel (transport), biogas, heat, world trade
-> CAP financial reform	2. pillar, decoupling, cross compliance
-> Rural development	Structural and cohesion funds
-> Nature policy (biodiversity)	Natura2000, biodiversity action plans
-> Forest strategy	European forest strategy and action plan
-> Transportation	Transport policies (aviation tax)

Source: SENSOR deliverable report 2.1.2

Scenario Development (2/3)

- Reasons / concerns for promoting bio energy…

The greenhouse effect:

Better balance of CO2 releases to absorbed CO2 from the atmosphere.

The looming exhaustion:

Supply of petroleum and natural gas are finite and nonrenewable.

Security reason:

Concerns due to high risks caused by dependency on an imported resource (volatile countries).

Scenario Development (2/3)

- Relevant strategies for defining the bioenergy case:

-> Kyoto Protocol -> White Paper (EC 1997)	share of renewable energy in the EU from about 6% 1995 to 12% 2010
-> Biomass Action Plan (EC 2005)	biomass increase by 2010 at 150 Mtoe, less than White Paper
-> Green Paper, energy (EC 2006)	increase of share of energy from secure and low carbon sources

Source: EC 1997; 2004 figures: Eurostat & calculated from EurObservER 2005.

Scenario Development (2/3)

- Objectives: EU policies on bioenergy (EU-15) / Targets for renewable energy by source, 2010, in Mtoe of oil equivalent

	1995	2010	2004 (EU-25)	
hydro-power	26.3	30.6	26.1	
wind	0.4	6.9	5.0	
solar (panels)	0.3	4.0	0.6	
solar (photovoltaic cells) 0.002	0.26	0.09		
geothermal power	2.1	4.2	4.5	
heat pumps	0.4	1.0	0.9	
bio-energy	44.8	135.0	71.4	300 % increase!
total renewables	74.3	182.0	108.8	245 % increase!
total energy consumption	1366	1583	1747	
share of renewables	5.4%	11.5%	6.2%	

Source: EC 1997; 2004 figures: Eurostat & calculated from EurObservER 2005.

Scenario Development (2/3)

- Measures of the White Paper (EC 1997):

- Regulate preferential access of renewable energy to electricity networks
- Tax reduction or exemption
- Favourable tax rates for investment in renewable energy
- Further promotion of technological research
- Allow state support to renewable energy
- Incorporate renewable energy in existing programmes
- Assistance with access to credit by soft loans and guarantees;
- Standardization and labelling of products;
- Public relations: work with NGOs and local authorities, set up networks

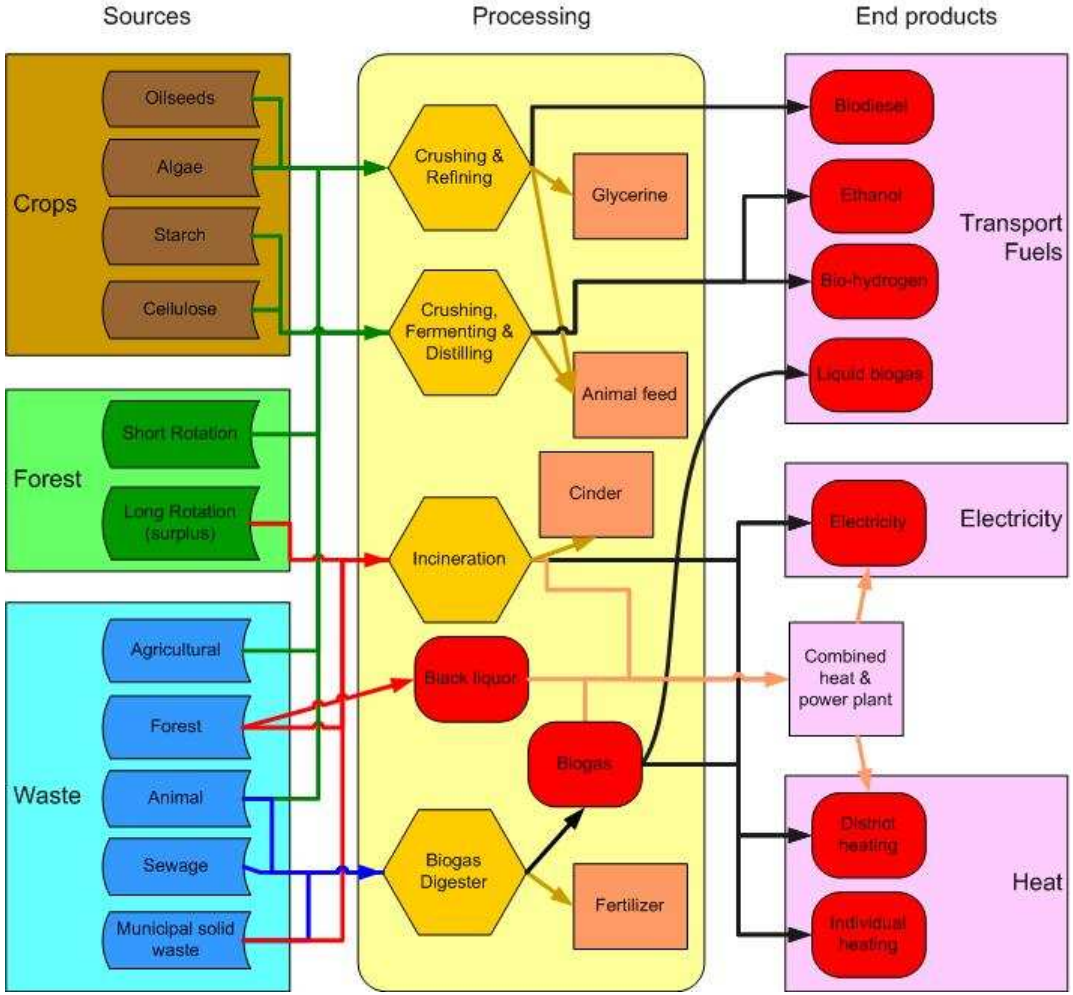
Source: EC 1997

Scenario Development (2/3)

- Technical conversion :

- Resources:
  Crops, Wood, Waste
- Processing:
  Wide range of processes
- End products:
  Biofuels, Electricity, Heat

Important: High flexibility of default conversion rates to keep pace with technical progress



Source: SENSOR deliverable report 2.1.2

Sensor SIAT (3/3)

- Policy variables of the bioenergy case in SIAT:

	Policy variable
1. Liquid biofuel obligation	% of total transport fuel
2. Subsidy / Tax exemption -biodiesel	total subsidy (supply side)
3. Biogas + wood (heat)	electricity produced
4. R&D - Second Generation Biofuels	Subsidies for promotion
5. Import Tariffs - Import (fuel)	degree of protection applied

Source: SENSOR deliverable report 2.1.2

Sensor SIAT (3/3)

- SIAT Definition

SIAT

Quick scan DSS

- Model-driven
- Data-driven
- Stakeholder-driven
- Knowledge-driven
- Trade-off-driven

Flexibility

- Mechanistic single iterations
- Simultaneous iterations
- Transparency, Traceability

C-s Meta Model

- Upstream response protocols
- Expert judgement
- Hybrid stand alone solution

End User

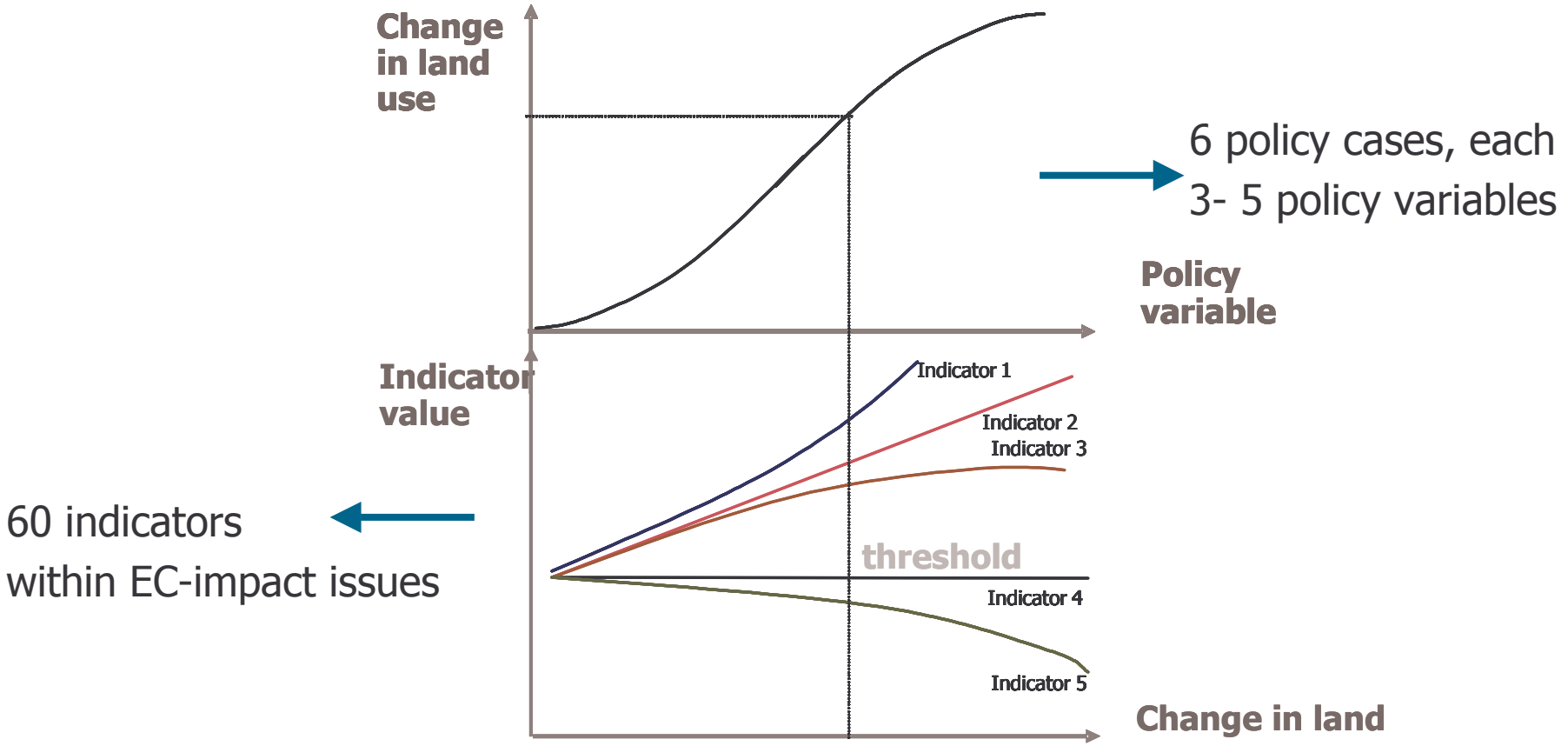
- System requirements
- Testing and evaluation
- Iterative development

Objectives

- Cross-sectoral trade offs / side effects
- Multifunctionality / Sustainability analysis

Sensor SIAT (3/3)

- SIAT operating mode



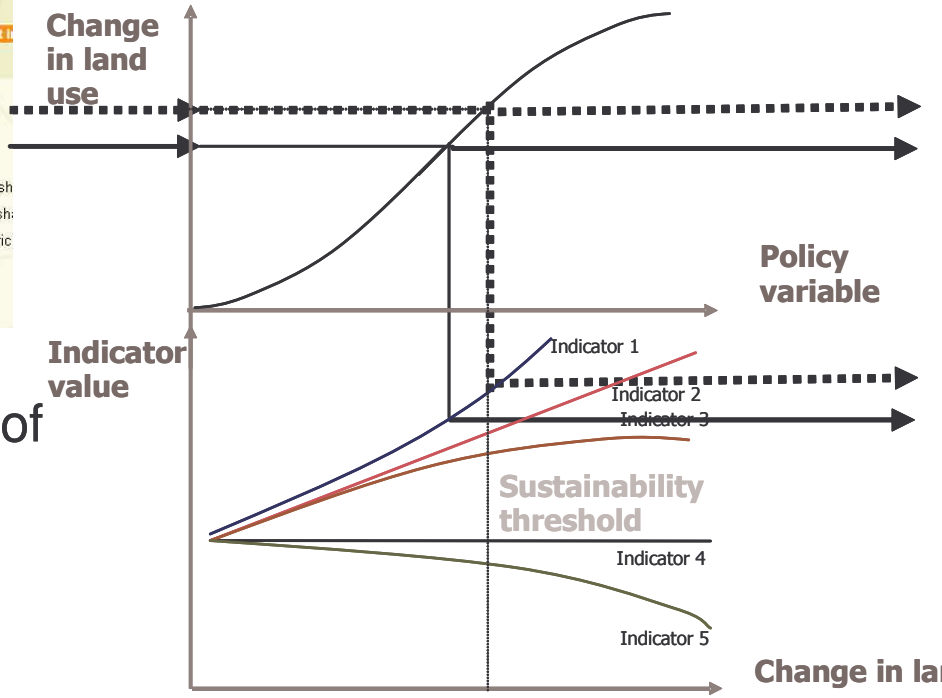
6 policy cases, each
3- 5 policy variables

60 indicators
within EC-impact issues

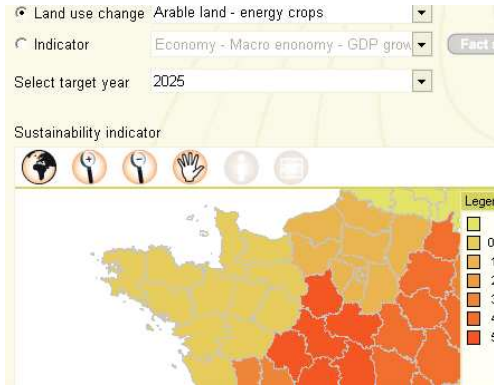
Sensor SIAT (3/3)

- SIAT operating mode

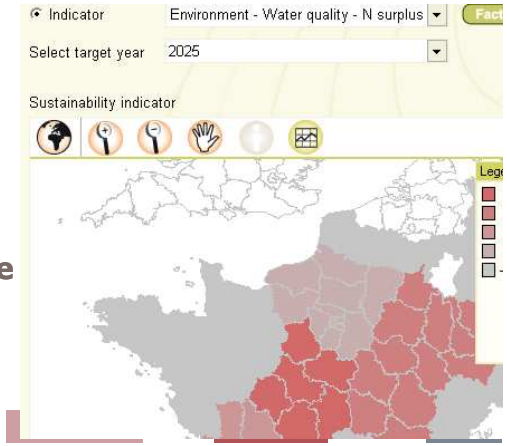
Changed value of policy variable



Changes on land use



Changes on indicator values



Sustainability Impact Assessment Tool (SIAT)

Impact assessment

Increase use of renewable energy
Bio diesel

1 Reference scenario | 2 Policy settings | 3 Impact indicators | 4 Sustainability

Impact assessment
- Current state
- Project
- **Simulation**
  - New simulation...
  - Open...
  - Remove
  - **Properties ->**
- Compare simulations

Methodology
IA regulation
Regional background
Sensor project
User manual

Simulation name

Bio diesel

Select a reference scenario for your impact assessment

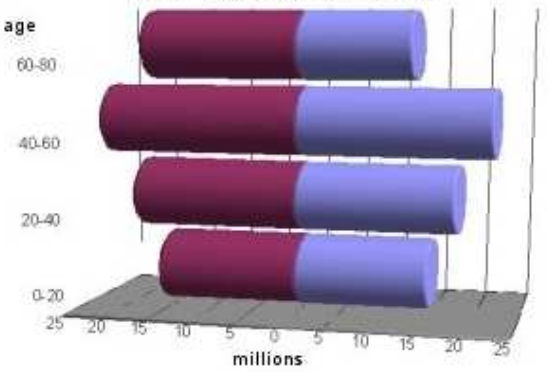
Business as usual

Business as usual
Low growth
High growth

Business-as-usual scenarios. This type is based on the extrapolation of existing trends. They assume that those trends will not change. In this sense, they are projections, not forecasts. An extrapolating scenario is not a statement of what is likely to happen, but only what will happen if recent trends continue to operate. This brings us to the following set of drivers for the baseline scenarios:

- demographic change within Europe
- the rate of participation in the labour force (in Europe)
- growth of world demand (outside Europe itself)
- the price of petroleum on the world market
- expenditure on research and development
- institutions
- cultural change.

Demography age distribution



Assumptions for three 3 drivers

		2005	2015	2025
oil price (in constant euros of 2004, per barrel)		46.8	39.8	46.5
world GDP excluding EU25 in mio of constant euros of 2004)		31,389,612	43,153,113	56,707,663
population (number)	EU-25	458,490,171	467,306,493	470,057,265

Reference scenario defines:
-general trends (eg population growth)

A factsheet informs on distinguishing topics only.
More background information can be found by selecting the 'more info' button within the factsheet.

Next

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SENSOR

Define policy

Policy case: Renewable energy

The policy case is a storyline in which you can change policy settings within a certain range

Policy settings

Premium on energy crops (euro/ha)	80	Heat share	20
Premium on managed forest (euro/ha)	110	Fuel share	60
Premium on short rotation trees (euro/ha)	125	Electricity share	20
Payment for harvested residues (euro/tons)	20		
Payment for manure (euro/tons)	25		

Change the values to create your own policy

Expert — Press 'expert' for more settings

Default — Press 'default' to revert to the reference scenario's default settings

Factsheet of policy case

Policy cases contain the range of scenarios which end users will be able to work with. A policy case consists of a description of goals, objectives and the used instruments. The instruments can be divided into direct actions of the policymaker and instruments aimed at influencing behaviour of the public. Those instruments whose effects can be measured and predicted are modelled as policy variables.

The bioenergy case considers the various sources of bioenergy (crops, forest, and waste), the various end products (transport fuels, electricity and heat), and the different methods and rates of conversion from feedstock into energy (fermenting & distilling, biogas digestion, combustion). Potential policy variables include:

1. the share of bioenergy as a percentage of total energy consumption;
2. the policy instrument used: i.e. tax rebate or mandatory standards;
3. the degree of protection of the markets for feedstock.

In modelling bioenergy, it is assumed that other policies (notably the CAP) remain constant. Existing bioenergy policies already in force are part of the baseline scenario.

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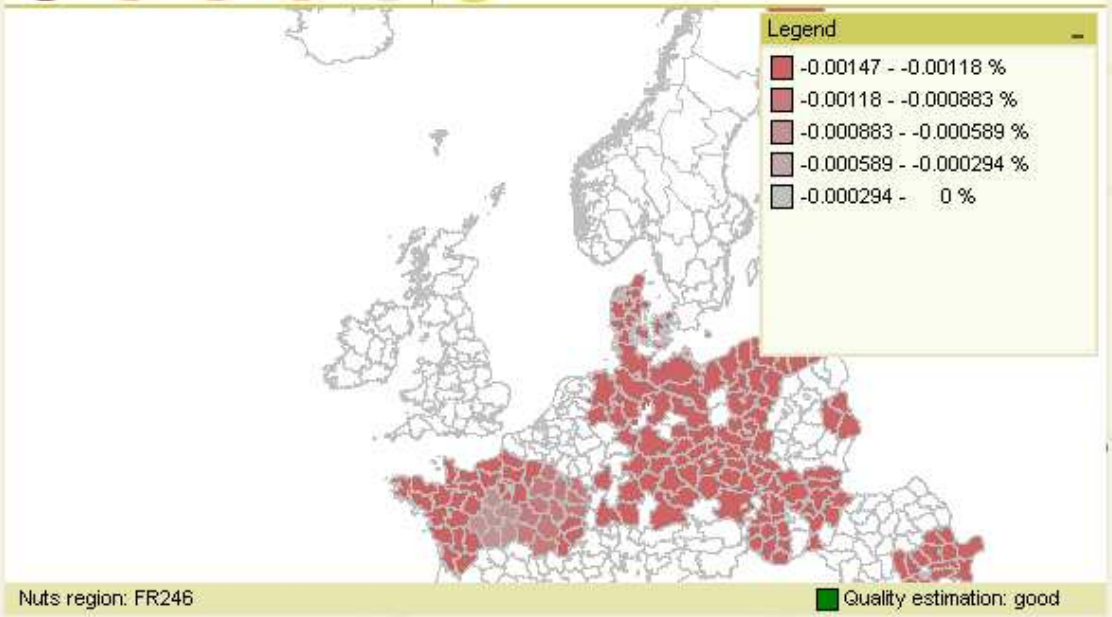
Select map
- Land use change: Arable land - energy crops
- Indicator: Social - Employment/labour - unemployment rate — Fact sheet

Select target year: 2025

Sustainability indicator



Map shows difference between user defined and base scenario

The quality estimation indicates how reliable the calculated impacts are.

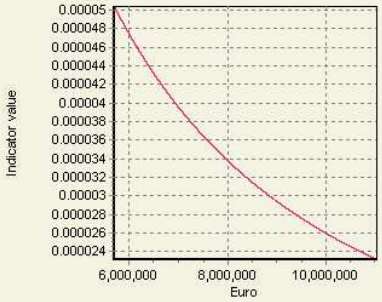
Quality is affected by 1. the available process knowledge, 2. expliciteness of the indicator, 3. data availability and 4. up and down scaling effects

Previous | Next

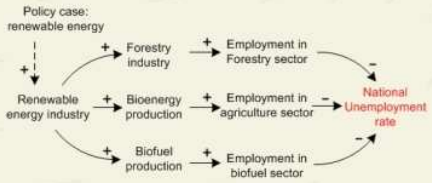
Trace indicator

Social - Employment/labour - unemployment rate

Indicator score for region FR223 is: -0.0014518259 (policy - base : 0.0441446553 - 0.0455964813)
The area biofuels for that region increases from 45 to 47.25



The graph shows indicator score related to amount of subsidy. The indicator score of your policy is relative to the reference scenario. The subsidy ranges from the reference scenario's to your simulation settings'.



The CLD is a systemic way of thinking where cause and effect are variables that either change in the same direction (indicated with a "plus") or change in opposite direction (indicated with a "minus")

Indicator factsheet

Unemployment rate

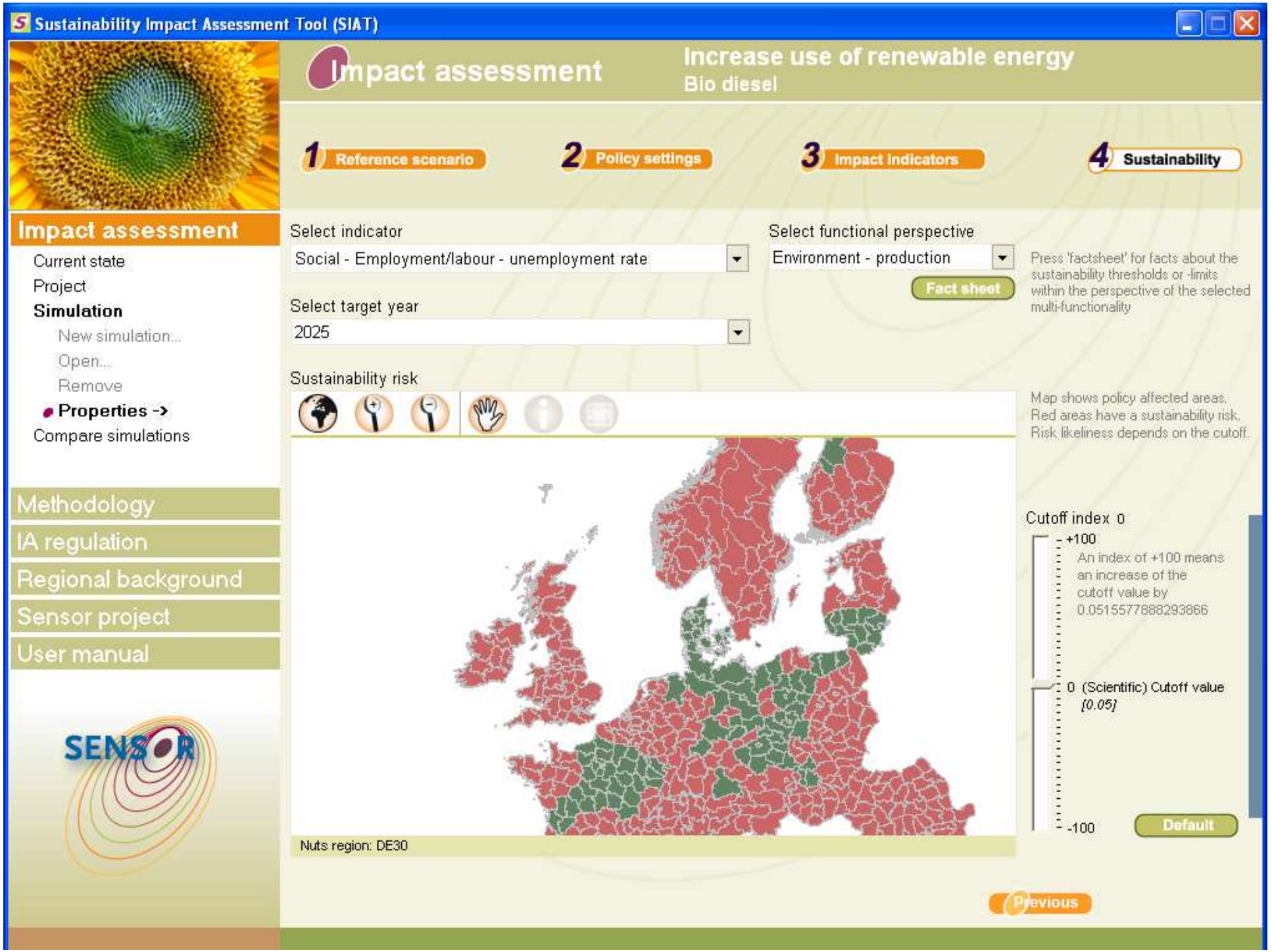
Unemployment is one of the main indicators for economic development and labour market situation.
Unemployed persons comprise persons aged 15-74 who were (all three conditions must be fulfilled simultaneously):

1. without work during the reference week
2. available for work at the time
3. actively seeking work

Economically active population is employed plus unemployed. This indicator can be further broken down according to:

- gender: Female unemployment rate
- age: Young people (aged 15-24) unemployment rate

Close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Select indicator
Social - Employment/labour - unemployment rate
Select functional perspective
Environment - production
Fact sheet
Press 'factsheet' for facts about the sustainability thresholds or -limits within the perspective of the selected multi-functionality
Select target year
2025
Sustainability risk
Map shows policy affected areas. Red areas have a sustainability risk. Risk likeliness depends on the cutoff.
Cutoff index 0
+100
An index of +100 means an increase of the cutoff value by 0.0515577888293866
0 (Scientific) Cutoff value
[0.05]
-100
Default
Nuts region: DE30
Previous

Conclusions in term of…

- Long term visions on desired future
  - IA of land use-related policies with focus on cross sectoral trade-offs at regional level
  - 6 future policy scenarios within 3 reference scenarios (5 drivers), Target years 2015/25
- Essential elements for sustainability scenarios
  - Multifunctionality approach of land use-related policies & sustainability risk assessment
  - Trade-off analysis by means of 60 indicators across 6 sectors
  - Land use function approach in order to fulfill COs and NCOs.
- Requirements and measures towards reaching scenarios
  - Deriving policy variables for scenario design directly from EU-directives
  - Use of well approved framework consisting of macro-economic and sectoral models
  - Policy scenarios should be realistic, a hot topic, have a long-term strategic significance
- Sustainability scenarios of agricultural land use (Bioenergy scenario)
  - Policy issues: biofuels for transportation, biogas, heat with relevance to world trade
  - Quantitative and qualitative indicators (social) at regional level of NUTS
  - Coverage of 4 sectors (transport, energy, agriculture, forestry) -> trade offs