Indicators for Sustainable Development and Environmental Health Indicators for Flanders (Northern Belgium)

Julie De Wit, Jim Lafère and Luc Hens

INTRODUCTION

Sustainable development is considered a complex and time consuming transition which might take a few generations to be realised (NRC, 1999). Monitoring this long-term transition towards an economically, socially, and environmentally balanced development requires measures. We need indicators that give people the idea of whether or not their environment is getting better or worse. Indicators for sustainable development should be major guidelines for government and authorities on the transition towards sustainability. They should act as warning signals for decision-makers so that paths of unsustainable development can be avoided (EEA, 1999).

Different definitions of indicators exist. A pragmatic one is provided by the NRC (1999): "Indicators are repeated observations of natural and social phenomena that represent systematic feedback. They generally provide quantitative measures of the economy, human well-being, and impacts of human activities on the natural world". They are able to show trends and serve simultaneously as guidelines for policy on sustainable development, monitoring this policy and stimulating public awareness and action. They are navigating instruments on the road towards sustainable development. Therefore they are more than just figures and numbers. Indicators should be more than guiding sustainability policies and monitoring results. They should also have the potential to communicate with the public at large on sustainable development and to stimulate social learning. They should contribute to the relevant changes needed for positive and beneficial societal transition. In other words, for sustainable development indicators should shape the awareness and actions of individuals, organisations and societies for long-term activities in much the same way that economic indicators are influencing short-term behaviour.

The scientific aspects of defining indicators are related to the definition of the scope, the models or integrated systems, the analysis on which the relationships are based upon, the conditions and criteria the indicators should fulfil, and the validation of the selected measures. The decision-making processes that determine which indicators are to be used, involve the choice of the framework and themes of sustainable development.

This paper describes the scientific aspects of indicator establishment. They include frameworks and criteria which the paper applies to the establishment of a core indicator list for environmental health in Flanders (Northern Belgium).

FRAMEWORKS FOR INDICATORS

Analytical frameworks or models were introduced to define the scope of sustainable development and to describe the interrelationships between economic and environmental quality and human wellbeing. A framework has to set the scope of and the relationships between the indicators. It offers a context for interpretation. The model organises the data taking into account type, aggregation level, relevance of the problem, use and potential users (Bartelmus, 1994).

This paper provides an overview of six of these frameworks, of which five apply to an environmental and sustainable development policy at large, and one addresses specifically environmental health issues.

INITIAL FRAMEWORKS FOR ENVIRONMENTAL STATISTICS

These first frameworks were developed at the end of the seventies and aimed at describing links between environmental aspects and the US System of National Accounts. The allowed frameworks follow the stream of natural resources during the life cycle from extraction and/or exploitation to sale and environmental impacts.

The Stress-Response model (SR) (1979) belongs to this category of frameworks. This SR-model describes one by one the relationships between individual pressures or stresses on the one hand side, and environmental changes, responses or actions of the community to these changes on the other (Shah, 2000).

A FRAMEWORK FOR THE DEVELOPMENT OF ENVIRONMENTAL STATISTICS (FDES)

The UN Statistical Office developed this framework in 1984. It incorporates social, demographical and economical statistics which are related to environmental issues. The model relates environmental components to information categories, which consist of sequences of undertaken actions (Bartelmus, 1994).

The environmental components (flora, fauna, atmosphere, water, land and human settlement) are converted into statistical items. The information categories are based on the assumption that environmental problems are the result of human activities and natural events. They reflect a sequence of action, impact and reaction. Relevant information facts refer to social or economical activities, natural events, their effects on the environment and the responses to these effects by public organizations and individuals.

Each environmental component should be considered as a resource used by humans. The environment consists of natural or environmental resources on one hand, and of the human environment on the other. The framework recognises interactions between different environmental resources.

As shown in table 1, the FDES relates environmental components with information categories. The framework differentiates 4 information categories :

- Social and economic activities and natural events : The human activities and natural events included under this category may have a direct impact on different components of the environment. Human activities consist mostly of the production and consumption of goods, but could also include activities in pursuit of non-economic goals. They produce environmental impacts through direct use or misuse of natural resources or through the generation of waste and emissions. Natural events and disasters are also included in this information category because human activities frequently contribute to natural disasters and because natural events may have impacts on all environmental components.
- Environmental impacts of activities or events: The statistical topics under this information category represent impacts of socio-economic activities and natural events.
- Responses to environmental impacts : Individuals, social groups and public authorities respond to environmental impacts in different ways. Their responses are intended to prevent, control, counter, reverse or avoid negative impacts and to generate, promote or reinforce the positive ones. Responses to environmental impacts also affect the environment and human welfare.
- Inventories, stocks and background conditions: Statistical topics in this category are intended to provide benchmark data and to illustrate links with other subject areas for possible future statistical analysis of these relationships. They include the stocks of natural resources and of capital assets of human settlements and refer to environmental inventories, as well as to economical, demographic, meteorological or geographical background conditions (Shah, 2000).

PRESSURE – STATE – RESPONSE - MODEL (PSR)

The OECD developed a framework for environmental indicators in 1994. The model relates human activities to environmental conditions. It is based on the older “Stress-Response”-model. Figure 1 shows the Pressure – State – Response – model. Of core importance are the relationships between human activities and their environmental impacts (OECD, 1997; OECD WPEP, 2000). The PSR-model is based on a concept of causality. Human activities exert pressure on the environment, changing both the quality and the quantity of natural resources. These changes alter the state, or the condition of the environment. The human responses to these changes include any organised behaviour that aims to reduce, prevent or mitigate undesirable change or environmental results (OECD, 1993).

The PSR-framework establishes linear links between human activities and the environment. The elementary categorization of indicators according to the PSR-model is in three groups :

- “Pressure” indicators respond to the question “What causes the problem ?” E.g. greenhouse gas emissions when it comes to climate changes.
- “State” indicators describe the effects (both primary and secondary) of the pressures. E.g. temperature changes or altered areas where malaria is endemic as a consequence of increased greenhouse gas emissions.
- “Response” indicators deal with the question : “What has been done to alleviate the problems?” E.g. the implementation of the Kyoto protocol.

Table 1: Environmental components and information categories used by the Framework for the Development of Environmental Statistics (Bartelmus, 1994).

Environmental components	*Information categories*			
	Social and economic activities, natural events	*Environmental impacts of activities/ events*	*Responses to environmental impacts*	*Inventories, stocks and background conditions*
1. Flora 2. Fauna 3. Atmosphere 4. Water (a) Fresh water (b) Marine water 5. Land/soil (a) Surface (b) Sub-surface 6. Human statements	Production/ consumption of goods and services	Depletion or discovery of natural resources	Preventing, controlling and countering negative impacts	Environmental inventories
	Activities in pursuit of non-economic goals			
	Use/misuse of natural resources or generation of waste and emissions in production and consumption processes	Changes in ambient concentrations of pollutants in the air	Stimulating and reinforcing positive impacts	Economic, demographic and meteorological or geographical background circumstances
	Natural events and disasters	Deteriorating or	improving living conditions in human settlements	

- In case the environment is impacted in a limited way, the natural feedback systems can cope with the situation. In other cases policy measures such as regulations (managerial or economic) governing pollution or new technologies might offer a response ("response"-indicators).

More detailed classification of indicators framing in this PSR is equally possible, e.g. in 14 different issues or themes : climate changes, depletion of the ozone layer, eutrophication, acidification, toxic contamination, the environmental quality of the city, biodiversity, landscapes, waste, water supplies, forest supplies, fishing supplies, soil degeneration and global indicators. (OECD, 1997; OECD WPEP, 2000).

The approaches of the FDES- and the PSR-frameworks are similar in various ways. Table 2 shows similarities between both models (Bartelmus, 1994). The FDES-model relates the components of the environment to information categories. Components of the environment for the FDES-framework consist of the natural environment, such as flora, fauna, atmosphere and the man-made environment, including human settlements. For the PSR-model, instead of components, the terms "issues" are used.

In the FDES-model the information categories are based on the recognition that environmental problems are the result of human activities and natural events. The information categories are herein divided into four categories. The PSR-framework has three categories (pressure, state and response) and these categories are cross-related to issues.

The main difference between FDES- and PSR-models is the "state" category in the PSR-model and the breakdown, the scope and the coverage of the different categories. In the FDES-model this category is divided into two parts, the impacts and the inventories/stocks/background condition while in the PSR-framework these two parts are combined to make one "state" category (Bartelmus, 1994 ; Shah, 2000).

DRIVING FORCES – STATE – RESPONSE – MODEL (DSR)

The United Nations Committee on Sustainable Development (UN CSD) adapted the environmental PSR-model to the needs of sustainable development. The result was the DSR-model. The "pressure"-

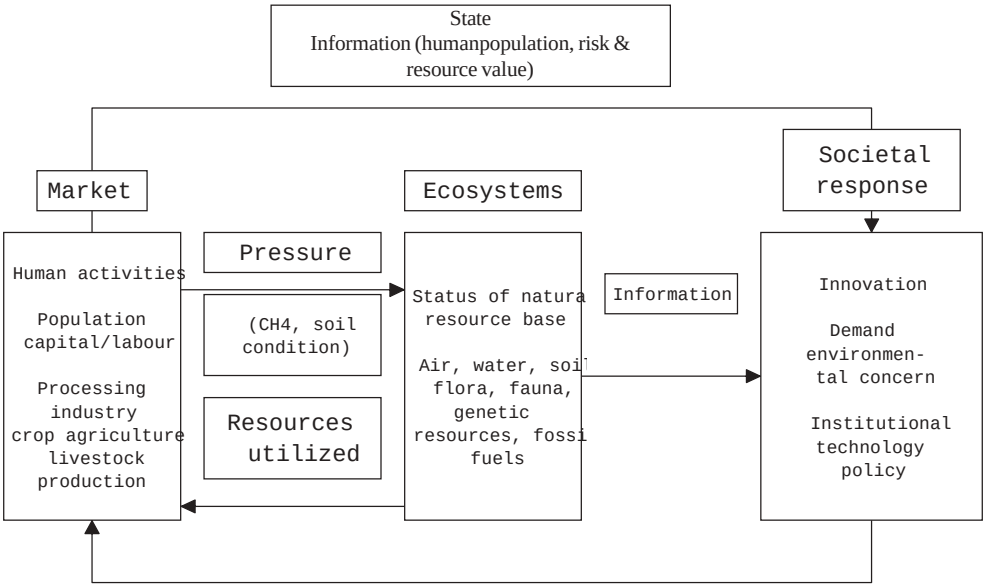

Fig. 1. The PSR-model (after OECD, 1993).

indicators of the OECD model became "driving forces"-indicators (see Fig. 2). This more neutral term refers to both positive and negative impacts of sustainable development.

On this basis indicators for sustainable development were developed. They were subdivided over the four pillars of sustainable development : the social category, the economic category, the environmental category and at least the institutional category. They cover all chapters of Agenda 21 (UN CSD, 2001).

DRIVING FORCES – PRESSURE – STATE – IMPACT – RESPONSE – MODEL (DPSIR)

The European Environmental Agency (EEA) developed a conceptual framework which refined the PSR-model, the DPSIR-model. This framework allows to analyse mutual related factors which influence the environment.

As shown in table 3, the framework relates driving forces with environmental pressure, state, impact and policy response.

Industry, transport and production processes are sectors belonging to the category of the "driving forces". The "pressure"-category is on loads and stresses on the environment, such as emissions of pollutants. The loads and stresses lead to the degradation of the environment ("state"). This environmental degradation induces impacts on the human health and the ecosystems ("impact"). The last category of indicators describes actions and measures ("response"). The above mentioned terms are showed in figure 3.

Table 2: Comparison between the PSR- and FDES frameworks. (Bartelmus, 1994).

PSR-framework	*FDES-framework*
Pressure	Social and economic activities/ events
State	
Response	Impacts and effects Answers on these impacts
Background (inventories and stocks are mostly classed in the "State"-group of indicators)	Inventories, stocks and background circumstances

DRIVING FORCE – PRESSURE – STATE – EXPOSURE – EFFECT – ACTION – MODEL (DPSEEA)

The previous frameworks are general models describing key components of environmental policies and sustainable development. For much more specific aspects, these frameworks need adaptations. To describe the environment-health relationship, the DPSEEA-model has been proposed (WHO, 1999). Defining environmental issues is a complex task

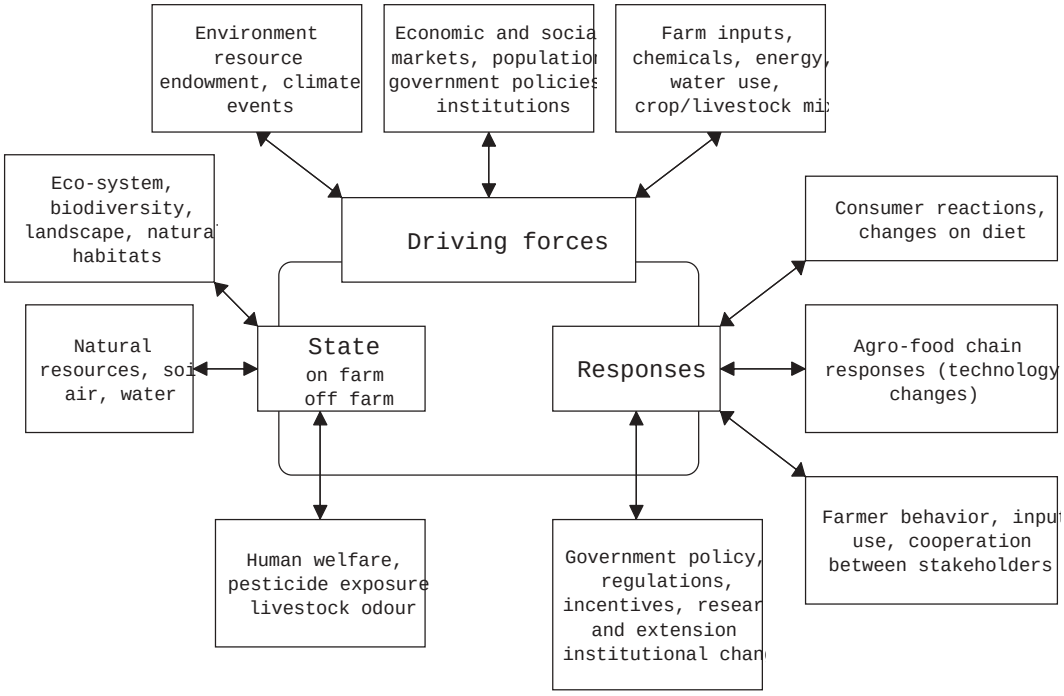

Fig. 2. The DSR-model (after OECD, 1996).

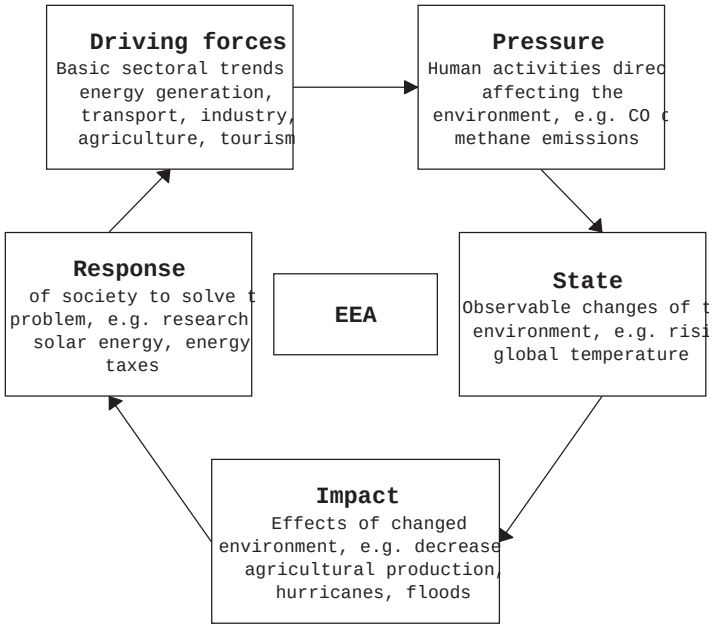

Fig. 3. The DPSIR-model (after Jesinghause, 1999).

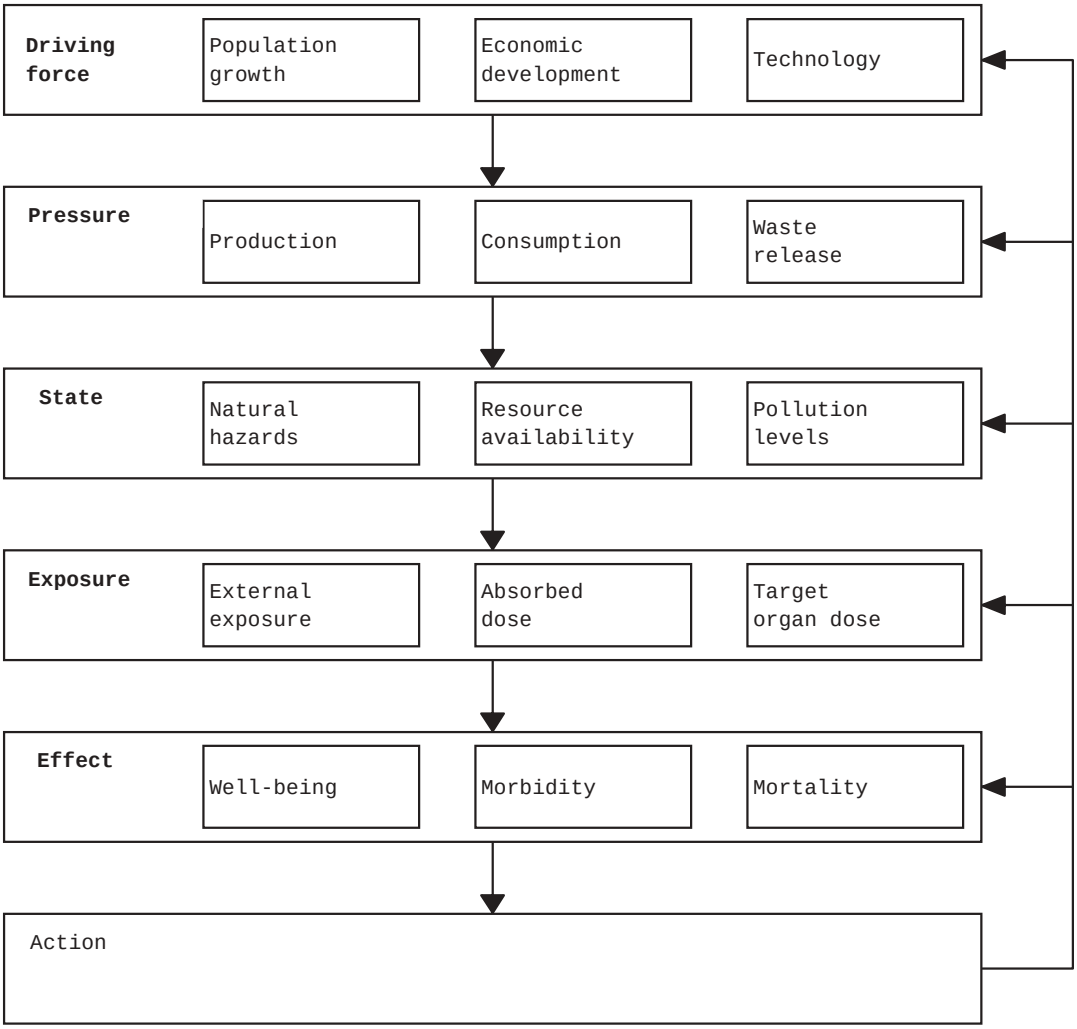

Fig. 4. The DPSEEA-model (after WHO, 1999).

Table 3: The concepts of the DPSIR-models (Jesinghause, 1999).

Driving forces	*Pressure*	*State*	*Impact*	*Response*
Causing changes in production and consumption values Performing a Pressure on the environment Most important driving forces : - population growth - changes in needs and activities of individuals	- Emissions of chemicals -Waste to air, water and land - Noise - Radiation - Changes in land use - Soil cultivtion	Information about the value, the quality physical, biological and chemical events in a specific area on a specific moment	Describing the effects of changes in the environment stte	Reations of the society or the policy makers to the changes in the environment

which is characterised by a number of choices. There is no universal single set of environmental health goals. There are no distinct borders between different themes. The themes are always interconnected and overlapping. WHO developed a framework to guide regular reporting and assessment for environment and health. The framework can be used both on the European as well as on the national level. The goal is to have an accessible monitoring system on environment and health for the member states.

As shown in figure 4, the framework consists of the following steps (WHO, 1999; WHO, 2000; WHO, 2001):

- Driving forces: The driving forces quantify the processes, the activities and the practices which have a positive and negative impact on public health. Technological and economic developments, policy interventions and population growth belong to this group of indicators.
- Pressure: The driving forces lead to pressures on the environment. They are the result of human activities in the environment (industry, energy production, transport, tourism, agriculture and forestry).
- State: The state of the environment changes in response to the pressures (quantity and quality of natural resources). The changes can be complex and a wide scope of environmental aspects are potentially involved :
- Air quality. Emissions of pollutants from diffuse and point sources cause changes in the environment.
- Noise can impair human health on both a physical and a physiological way.
- Other state indicators relate to pollution in water, soil and food.
- Exposure: Exposure refers to the interaction between humans and environmental pollution. It occurs by inhalation, ingestion and dermal absorption and involves different organs. External exposure refers to the number of pollutants at the interface between the recipient (the human) and the environment. The absorbed dose refers to the quantity of pollutants, absorbed in the human body and transported via blood to different target organs. The absorbed dose depends on the duration and the intensity of the exposure.
- Effects: Health effects caused by environmental pollution differ in type, intensity and size. They depend mainly on the target organ and the concentration in this organ.
- Actions: This refers to the measures which have to be taken to limit the consequences.

Based on the DPSEEA-model, the WHO selected a number of core indicators for international and sub-national level use. In addition to this limited set, they also developed an extended list of environmental health indicators for regional and local use. The selected indicators include outdoor air pollution, indoor air pollution, housing, noise nuisance, waste water and soil pollution, radiation, drinking water, hygiene, food safety, chemical safety, land use and urban planning and workplaces.

CRITERIA FOR SELECTING INDICATORS

Models open a wide set of options to select indicators. Consequently, the question arises “How to define the best choice among the different existing options?” Anderson et al (1999) suggested seven criteria that may determine a good indicator:

- The availability of data: The data from which the indicator is calculated should be readily available or should be accessible via acceptable cost-benefit analysis. The data should be updated on a regular basis.
- Simple and clear: The indicator must be relatively easy to understand. Indicators are essential to inform a society on its way to sustainable development. The easier one can understand an indicator, the better it serves this communication target.
- Sensitivity: Does the indicator show changes over time ? Does the indicator detect differences between scenarios ? Are limited changes in the environmental quality reflected by the value of the indicator ? The course of the environmental quality has to be present for a period of different years. In this way it is possible to describe trends of the environmental quality. The summaries of such graphics can be introduced in evaluating scientific and policy documents. The indicator should be based on information that can be used to compare different geographical areas. Comparison capacity between areas, regions, countries, or sectors provides an indicator with extra strength. This allows to define priorities, but it also has back-draws.
- Validity: Does the indicator describe in a fair way the phenomenon ? The indicator has to be appropriate for the goal it has to reach. The indicator should go to the core of the problem.
- Period: There should be only a short time lag between the state of affairs referred to and the indicator becoming available.

- Objectivity and reliability : Does the indicator reproduce the same results as studies on other population groups in similar circumstances ?
- Specificity: Does the indicator only reflect specific changes or does it describe a large field of possible effects ?

There are several other issues related to the development of indicators. Indicators should also be appropriate for the following aspects *(WHO, 1996)* :

- Relevancy: Is it possible to associate the indicator to one or more core policy fields or is the indicator related to important quality objectives or aims ? Does the indicator evaluate improvements or declines in relation to environment and health ? Does it support existing actions and programs ?
- Dynamic: Indicators have to be dynamic. Updating should be possible when there are changes, such as in the state they are describing, but also changes in the availability of data, in the knowledge of scientists, in the needs of users or indicator systems (WHO, 1999).
- Reduced to basis results: It has to be possible to construct the indicator starting from sub-indicators. By aggregating the sub-indicators we have to preserve most of the background information that should be reserved in the resulting aggregated indicators.

A pertinent discussion relates to the question whether an indicator should reflect a simple measurement or be composed of a set of single measurements and thus reflect in one number a more complex reality. In particular in the area of the complex, multiple indicators several innovative measures have been described: the "green" adjusted Net National Product (NNP) (Hartwick, 1990), Ecological Footprints (Wackernagel and Rees, 1996; Wackernagel and Yount, 2000), the Index for Sustainable Economic Welfare (Daly and Coble, 1989), the demand of human activities on the environment (Wetterings and Opschoor, 1992 ; Opschoor and Wetterings, 1994), the concepts of environmental space (Opschoor and Wetterings, 1995), environmental rucksacks (Karlsson, 1997) and material input per service (Schmidt-Bleek, 1993). Table 4 provides examples of multiple and single indicators to measure different aspects of sustainable development.

Table 4: Overview of sustainable development indicators (Moffat et al., 2001).

Sub-area	*Type*	*Examples of indicators*
Economic	Single	Unemployed
	Multiple	GDP
Environmental	Single	NO_x
	Multiple	Human appropriation of net primary production
Social	Single	Literacy levels
	Multiple	Index of sustainable economic welfare

The previous criteria point to the complexity of developing "ideal" indicators. The most important prerequisites however are that indicators use existing data, or data already collected. Indicators should mirror reality in a fair way, not deforming the underlying truth, neither lose vital connections and dependences.

Today there is no worldwide consensus on a standard of indicators for environment, sustainable development or environmental health. Neither a common scientific basis for choosing among them exists. Rather there is a wide range of measures describing the scope of sustainable development today. Current lists of indicators show at least two main trends :

- Long lists of indicators, aiming at summarising sustainable development in a wide range of complex aspects.
- Short lists, aiming at establishing core indicators. In particular these latter ones point to common themes in different countries. This is an interesting basis for the establishment of international, region-wide indicators.

ENVIRONMENTAL HEALTH INDICATORS

Environmental health indicators are measurable units. They summarize in an understandable and relevant way a core aspect of the relation between environment and health. They describe scientific knowledge in a way which allows decision makers to make more informed and more appropriate choices and conclusions.

An environmental health indicator is more than an environmental indicator or a health indicator. It starts from environmental or health aspects but it equally entails the exposure relationship. At best, it presumes a unique and linear cause-consequence relationship.

Indicators are a measure of the evolution towards a specific goal or aim. Environmental health indicators provide a representative picture of the quality of the environment and allow to identify potential health risks. They allow to compare countries and areas in terms of the environmental health situation and to identify and develop

recommendations to improve this situation.

Health effects are secondary environmental effects. They reflect the primary changes in the environment. The kind and the seriousness of the effects depend on the extent of the changes and on the way by which the body is exposed. A second factor concerns the extent to which the human body absorbs and metabolises the exposure. Numerous health effects are indirect effects and therefore are difficult to estimate in a direct way. It might be difficult to prove the causal relationship between the pollutant and the effect. Distal causes can activate proximal causes which in the human body result in health effects. The distal causes are located in the environment and are frequently detected, while the proximal causes are characterised by the individual exposure and are more difficult to assess.

The vagueness of particular complaints, the latency period and the differences between individual sensitivity and vulnerability make it difficult to identify the causes of some diseases. Also multifactorial nature of diseases might make it hard to prove a causal relationship between disease and exposure. Therefore environmental health indicators do not show the whole reality but just a part of it.

ASSESSMENT OF ENVIRONMENTAL HEALTH INDICATORS FOR FLANDERS (NORTHERN BELGIUM)

Environmental health indicators for Flanders (Northern Belgium) have been developed. They are based on international reports describing frameworks and methodologies for environmental health indicators (WHO, 1999 ; WHO, 2000), reports on indicators for sustainable development and sustainable transport (TERM) (EEA, 2001 ; Worldbank, 2000; OECD 2001 ; EEB et al., 2001) and the lists of environmental indicators and indicators of sustainable development of the United Nations (UN SD, 2001). Indicators corresponding to priority policy themes on environment and health and to specific problems of environmental health in Flanders were selected.

The indicators have to comply with the previously described selection criteria. They were tested for seven core quality criteria :

- Policy relevance
- Availability of data
- Simplicity
- Sensitivity
- Validity
- Specificity
- Reliability

For 188 of the 226 indicators proposed by the international and regional reports for environmental health, data are available. Out of the 226, 116 indicators were not relevant for the policy in Flanders. 21 indicators were not sensitive enough. (Table 5)

Table 5: Overview of number and percentage of rejected indicators proposed by international and regional reports.

Criteria	*Number of indicators rejected*	*Percentage of rejected indicators (%)*
Policy relevance	116	51,3
Availability of data	38	16,8
Simplicity	5	2,2
Sensitivity	21	9,3
Validity	7	3,1
Specificity	13	5,8
Reliability	4	1,8
Total	204	90,3

As a result of the selection process, a limited list of 22 environmental health indicators remained. A short list of indicators is considered effective in communicating changes and raising awareness, without overburdening people with large numbers of indicators. Obviously the list should fit the priority problems and policy priorities.

Table 6 lists the selected environmental health indicators who were identified to be useful and compatible with the quality criteria in order to assess the environmental health situation in the Flanders. The strength of this list is its feasibility and its quality. The main limitation is its incompleteness. The latter is impaired manly by the selection of indicators for which data are readily available.

To deal with the limitation of incompleteness, a second more extended list of indicators was developed. This list entails relevant and necessary indicators for the assessment of the Flemish environmental health situation, even if the necessary data to use them are currently not available. To obtain the data, it is important to introduce a large-scale biomonitoring campaign on population groups exposed to different environmental conditions (industrial, agricultural, urban). It is also essential to set up a specific environmental health databank. The biomonitoring study as well as the development of a databank will be realised as part of the activities of the Centre of Environmental Health for the Flanders during a period of 5 years from 2001 until 2006.

Table 6: Overview of the selected environmental health indicators for the Flanders.

Issue	*Indicator*	*Position in DPSEEA -model*
Outdoor air quality	Kilometres driven per transport mode per person	D
	Emissions of air pollutants SO_2, PM_{10}, NO_x and NM VOC (Non Methane Volatile Organic Compounds)	P
	Emissions of Pb, primary PM_{10}, NO_x and benzene in urban areas	P
	Ambient concentrations of NO_2, PM_{10}, SO_2 and 8 h O_3 (population-weighted) in relation to reference values	E_1
	Ambient urban concentrations of NO_2, PM_{10}, TSP (Total Suspended Particles), O_3, SO_2 and Pb : population-based exposure	E_1
	Infant mortality due to respiratory diseases	E_2
	Infant morbidity due to respiratory diseases	E_2
	Mortality due to respiratory diseases, all ages	E_2
Indoor air quality and housing - settlements	Urbanisation rate	D
	Number of people exposed to sources of indoor air pollution	E_1
	Incidence of asthma including lower respiratory infections (LRI) in children	E_2
	Mortality due to diseases of the circulatory system, all ages	E_2
Noise	Number of people exposed to noise levels above a standards (day/evening/ night) in noise level categories	E_1
	Population annoyance by certain sources of noise	E_2
Radiation	UV light index	E_1
	Incidence of skin cancer	E_2
Waste and contami-nated lands	Hazardous waste generation	P
Water and sanitation	Waste water treatment coverage	P/A
	Exceedance of recreational water limit values for microbiological parameters	S
	Exceedance of WHO drinking water guidelines for microbiological parameters	S
	Exceedance of WHO drinking water guidelines for chemical parameters	S
Food safety	Food-borne illness	E_2

Table 7 overviews the indicators which are most relevant for Flanders, but for which currently statistical data are not available.

In particular the extended list has a dynamic character and will be further extended and updated in the years to come by indicators responding to future needs.

Table 7: Overview of most relevant indications for the Flanders for which curent data fail

Issue	*Indicator*	*Remarks*	*Position in*
Outdoor air quality	Number of hospital admission for respiratory diseases	This indicator will be developed as soon as the integrated environmental health databank is accessible.	E_2
	Number of hospital admission for asthma per 100 000 people per year	This indicator will developed as soon as the integrated environmental health databank accessible.	E_2
	Number of hospital admission or diseases of circulatory system	This indicator will developed as soon as the integrated environmental health databank is accessible.	E_2
Noise	Number of people with hearing problems	This indicaor will be developed as soon the integrated environmental health databank is accessible.	E_2
Waste and contami-nated lands	Percentage of childre with lead values in blood above to µg/dl	The indicator will be based on the results of the investigations on umbilical cord and adolescent blood.	E_1
	PCB-values in blood	"PCB-values in blood will be used as an indicator for exposure from industrial activities and waste incineration.	E_1
	Concentration of cadmium in blood	Cd in umilical cord blood and in blood of adolescents indicates the acute exposure to Cd.	E_1
	Concentration of cadmium in urine	Cd in urine of adults relates to chromic exposure to Cd.	E_1

DISCUSSION

This paper discusses the scientific process behind indicator development for environmental health. As shown in table 6, indicators should be based on available data and have to be policy relevant, simple, sensitive, valid, specific and reliable. Even when these conditions are hard, the experience in Flanders shows that it is possible to develop a basic, incomplete list of indicators. This list should be extended to represent in a fair and more complete way the environmental health issues in the area to cope with new data and new policy needs.

Once a basic list has been established, only a part of the targets is reached. The resulting environmental health indicators have to be checked by policy objectives and target values and they have to be evaluated in time and space. Further scientific improvement comprises the application of

Geographical Information Systems (GIS) to link specific regional and local environmental circumstances with health situations. On the basis of the resulting values of indicators and trends in the Flanders, recommendations will be formulated concerning environmental health policies.

Moreover scientific quality and rigor is only part of the indicator development process. To be of real policy use, indicators should also fit a set of societal criteria including communication capacity and societal relevance. To achieve this, the proposed lists should be evaluated by societal groups or their representatives. After taking their comments on board, a political decision should finalise their use as an instrument for up-to-date policies for environment, sustainable development and health.

KEYWORDS Natural Resources. Population Growth. Biomonitoring

ABSTRACT Sustainable development is considered a complex and time consuming transition which might take a fex generations to be realised. Monitoring this long-term transition towards an economically, socially and environmentally balanced development requires measures and indicators.

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Authors' Address: **Julie De Wit, Jim Lafere and Luc Hens,** Human Ecology Department Free University of Brussels (VUB) Laarbeeklaan 103, B – 1090 Brussels, BELGIUM
E-mail : human.ecology@vub.ac.be