



Report

## Monet project consultation document

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**Publication Date:**

2001

**Permanent Link:**

<https://doi.org/10.3929/ethz-a-004310467> →

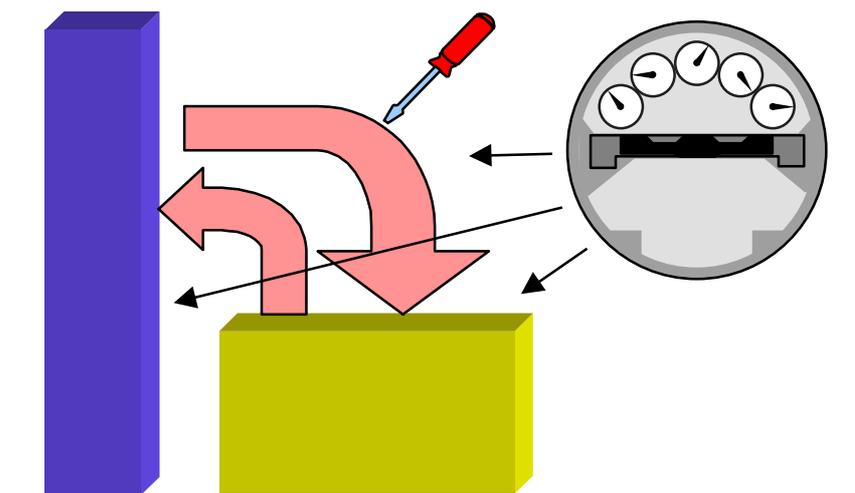
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# MONET project

## Monitoring of Sustainable Development



### Structure of indicator system and selection of indicators

consultation document

Provisional version



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Neuchâtel, September 2001

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**This document is a provisional consultation document. It reflects the state of our work and reflections on September 30 2001 and will be subsequently adjusted and supplemented.**

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	SAEFL	Swiss Agency for the Environment, Forests and Landscape
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<b>Languages</b>	English, German, French	

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## 1 Introduction

Unlike a simple list of indicators, an indicator system is based on a clearly defined structure which provides a logical and systematic framework for the selection of indicators. This document describes the structure selected in the MONET project (description of MONET project, see box). The system takes the form of a grid (section 2), the two axes of which combine two different approaches to sustainable development (sections 3 and 4). The individual indicators must then be inserted into this grid and must correspond to additional criteria (section 5).

The following considerations were fundamental to defining the structure<sup>1</sup>:

- The indicator system should provide the most general and comprehensive possible model of the sectors or topics of relevance to sustainable development in Switzerland.
- The structure of the system should allow subgroups of indicators to be selected in line with the needs of differing target audiences.
- It should be possible to create links with other indicator systems by incorporating existing indicators into the system (open structure).
- If necessary, it should be possible subsequently to add new indicators (extendable structure).

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<sup>1</sup> SFSO and SAEFL 2000: MONET project - project description and schedule.

## The MONET project

The schedule for the 1999-2003 session of the legislature, the Swiss Federal Statistical Office's 1999-2003 programme and the Federal Council's sustainable development strategy all call for the definition of a sustainable development indicator system. The Swiss Federal Statistical Office (SFSO), the Swiss Agency for the Environment, Forests & Landscape (SAEFL) and Swiss Agency for Spatial Development (ARE) have jointly addressed this task by setting up the MONET project (which, in German, stands for Monitoring of Sustainable Development).

The aim of the MONET project is to develop an indicator system enabling Switzerland's development with regard to the social, economic and environmental aspects of sustainable development to be observed and documented. The indicator system used should be open and developable. On the basis of results from a pilot study<sup>2</sup> and existing sets of indicators, the intention is to compile a systematic grid which, with the assistance of the government agencies and the institutions concerned, can be filled with individual indicators.

The indicator system should be available by September 2002. Publication of interim reports is planned.

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<sup>2</sup> SFSO and SAEFL 1999: Sustainable development in Switzerland –Materials for an indicator system, Neuchâtel 1999.

## 2 The grid

In existing indicator systems for sustainable development, a distinction may be drawn between those which are structured by topic and those which are structured by process<sup>3</sup>.

The topic approach starts by asking the question as to which content is relevant with regard to sustainable development and should be illustrated with indicators. The process approach, in contrast, focuses on mechanisms and causal connections and attempts to record these in a model. The purpose of creating various indicator types corresponding to the individual variables of the model is to create as complete a model as possible of the processes which have an influence upon sustainable development.

Both of the stated approaches are of importance in an indicator system and the intention in the MONET project is accordingly to combine them in a grid (Figure 1): the columns of the grid correspond to five different indicator types (section 3), while the rows correspond to the topics to be illustrated (section 4). The cells of the grid are then filled with appropriate indicators while taking account of certain criteria (section 5).

Topics	Indicator types				
	L	C	$\Delta$	D	R
				indicators	

Figure 1: The grid

Structured in this manner, the indicator system is comparable with the system of the United Nations Commission on Sustainable Development (CSD), which to some extent has such a

<sup>3</sup> A review of structuring options may be found, for example, in Hardi (1997).

two-dimensional structure<sup>4</sup>. The MONET system, however, is based on a more refined indicator typology (section 3).

The grid is, however, subject to limitations. In particular, it should be noted that:

- the grid is not intended as a means of communication but instead is only used to permit systematic selection of the indicators.
- the grid is idealised and the ultimate indicator system will reflect certain limitations (availability of data etc.) and will thus exhibit gaps.

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<sup>4</sup> United Nations (1996): Indicators of Sustainable Development – Framework and Methodologies, New York.

### 3 Indicator types (columns of the grid)

#### 3.1 The model

The indicator classification developed for the MONET project is based on a stock-flow model, which describes the dynamics of the operations of relevance to sustainable development (Figure 2).

The model has similarities with the "driving force-pressure-state-impact-response" model<sup>5</sup> used in some indicator systems. Unlike the latter, however, it is not tailored to the requirements of environmental applications, but is also applicable to social and economic topics.

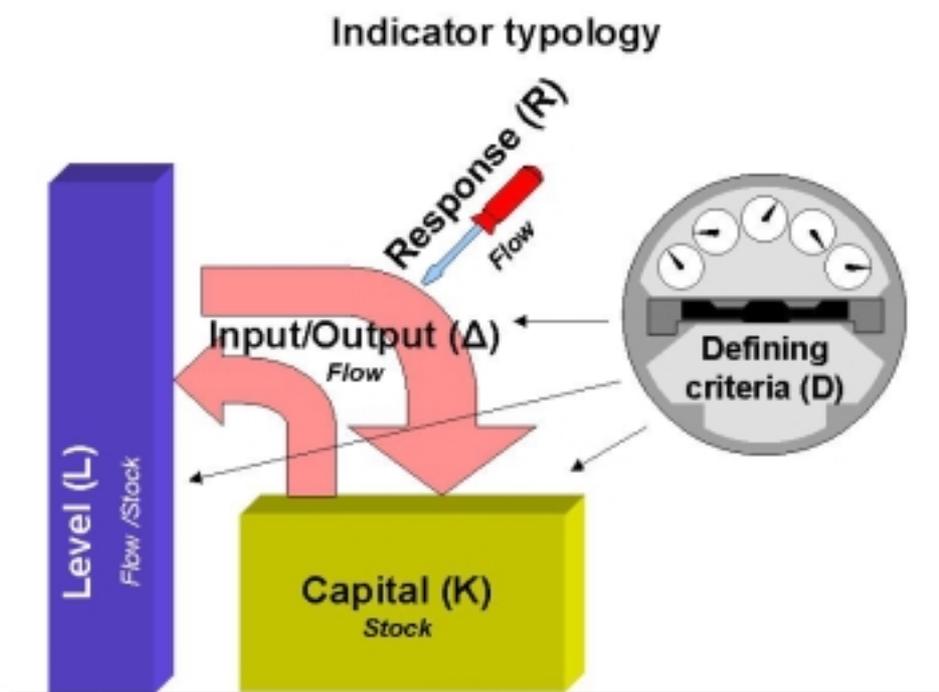


Figure 2: Indicator typology

<sup>5</sup> The D-P-S-I-R model is an extension of the "pressure-state-response" model developed in the 1970s for environmental applications. It is used, for example, by the European Environment Agency (EEA) for classifying environmental indicators (see European Environment Agency 1999)

### 3.2 Description of the indicator types

(See Appendix A for a mathematical explanation of the interrelationships)

#### L: Level

Extent to which the needs of the individual and society are met.

*Central issue: to what extent is a human need met?*

This is described by fundamental variables, only few of which are required: level of consumption or living conditions (mobility, home heating levels, nutrition, housing, education, culture, participation etc.).

Unit of measurement: "Level" variables are generally flow variables, which are often stated in relationship to other variables (e.g. GDP per capita, living space per capita, distance travelled per capita, unemployment rate). The variables are not broken down by population group or region.

Differentiation from other indicator types: a "level" indicator measures the extent to which a need is met and not the continuous consumption of resources required for that purpose ( $\rightarrow\Delta$ ).

#### C: Capital

Status and potential of (environmental, economic and social) resources.

*Central issue: what degree of provision is available to satisfy a particular need?*

To be able to meet the needs described under "level", appropriate provision of natural, economic and social resources, i.e. "capital", is required. "Capital" includes, for instance, production facilities, infrastructure, social and cultural institutions, environmental resources or knowledge. It also includes obligations (debts) to future generations.

Unit of measurement: "Capital" is measured using stock variables. These may be represented as absolute values (drinking water supply, newspaper circulation figures) or relative values (proportion of threatened species, hospital beds per capita). They are not broken down by population group or region.

Differentiation from other indicator types: capital indicators estimate stocks and the (chronological) accumulation or decline thereof, but not consumption (flow  $\rightarrow\Delta$ ).

### **Δ: Input/Output**

Flows originating from "capital" in order to meet the needs described under "level", together with appreciation or depreciation of "capital" (e.g. through investment or pollutant emissions).

*Central issue: to what extent does the capital appreciate or increase or depreciate or diminish?*

Meeting the needs described under "level" generally requires consumption of a proportion of the capital and is often associated with emissions. Meeting human needs thus has an effect on the capital (or on various kinds of capital). Conversely, measures are taken to maintain or even improve total capital (e.g. in the form of net investments in the economy or environmental protection measures). "In- and outputs" may thus have positive or negative effects on capital.

Unit of measurement: These are always measured by flow variables. They may be represented as absolute values (e.g. greenhouse gas emissions in tonnes) or relative values (e.g. proportion of GDP spent on education, phosphorus input per hectare). They are not broken down by population group or region.

Differentiation from other indicator types: measurement relates to continuous consumption (flow), but not accumulation or decline ( $\rightarrow C$ , stock)

### **D: Defining criteria**

Assessment of "in- and output" relative to (economic, social and environmental) efficiency and of disparities in the meeting of needs ("level) or in the provision of "capital".

*Central issue: to what extent is the capital used in a socially responsible and (economically and environmentally) efficient manner?*

Depending on the form taken by the "in- and outputs", particular needs may be met to varying degrees of sustainability. In other words, this section deals with the effects on sustainability in relation to the improvements achieved in meeting needs. Defining criteria are<sup>6</sup>:

- Economic, environmental and social efficiency: this describes what environmental, economic and social resources have to be used to meet particular needs. A well-known example is environmental efficiency, expressed in the case of motor vehicles, for instance, as fuel consumption per 100 km. The proportion of particularly sustainable behaviour choices involved in meeting certain consumer needs also provides information on efficiency. Examples are the proportion of journeys made using public transport (modal split), of cars with catalytic converters, of recycled drinks packaging or of foodstuffs produced under socially responsible labels.

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<sup>6</sup> These criteria may be derived from the definition of sustainable development: fairness among and between present and future generations involves both efficient use of resources and social justice.

- Disparities: These relate to the distribution of met needs and capital between various population groups (young and old, men and women, etc.) or between individual regions (town and country, peripheral regions, etc.).

Unit of measurement: "Efficiency" is always expressed as a relative variable (e.g. nitrogen oxide emissions per km) or defined as a proportion (e.g. proportion of journeys made using public transport). The description of "disparities" is broken down by population group (e.g. proportion of women completing tertiary education) or region (e.g. regional economic output) or distribution index (Gini income distribution index). The "defining criteria" often use the same measurement variables as are used for the L, C or  $\Delta$  indicators, but always in relation to the use of resources or broken down by population group or region.

Differentiation from other indicator types: efficiency indicators describe consumption (or investments, emissions) in relation to the result, but never as an absolute value ( $\rightarrow\Delta$ ). Disparity indicators demonstrate distributions, but never average values for the total population ( $\rightarrow$ L, C).

## **R: Responses**

Social and political measures aimed at influencing in- and output.

*Central issue: how have the social and political systems reacted in their efforts to influence development?*

This heading comprises measures of an institutional kind with which society hopes to influence certain developments. They include legislative and fiscal measures together with efforts aimed at achieving voluntary changes in behaviour (e.g. information, labelling, voluntary declarations). These "responses" have an impact – usually delayed – on "in- and outputs".

Unit of measurement: "Responses" are recorded using flow variables (e.g. transfer payments to the poor) or descriptive absolute or relative values (e.g. number or proportion of local communities charging a refuse collection fee). They are not broken down by population group or region.

Differentiation from other indicator types: the decisive factor in differentiating institutional "responses" from "in- and output" is whether an institutional measure taken in response to an undesirable development is involved. For example, the indicator "number of local communities charging a refuse collection fee" falls under "responses", while the indicator "waste disposal expenditure" falls under "inputs".

The following Table (Table 1) contains a summary of the characteristics of the five types of indicator:

<b>Indicator type</b> <b>Characteristics</b>	<b>Level (L)</b>	<b>Capital (C)</b>	<b>Input/Output (<math>\Delta</math>)</b>	<b>Defining criteria (D)</b>	<b>Response (R)</b>
<b>Description of meaning</b>	Extent to which needs are met	Status of and changes to resources	Use and influencing of capital	Efficiency, disparities	Social and political measures
<b>Stock or Flow variable</b>	Stock/Flow	Stock	Flow	Stock/Flow	Flow
<b>Relative variables</b>	yes	yes	yes	yes	yes
<b>Absolute variables</b>	no	yes	yes	no	yes
<b>Breakdown by population group or region</b>	no	no	no	yes	no
Counterpart in <b>DPSIR</b> model	Driving force	State	Pressure/ Impact	None	Response
<b>Differentiation from other indicator types</b>	$\neq$ continuous consumption of resources ( $\rightarrow \Delta$ )	$\neq$ variable for measuring consumption ( $\rightarrow \Delta$ )	$\neq$ variable for measuring accumulation or decline of stock ( $\rightarrow C$ )	$\neq$ absolute variable ( $\rightarrow \Delta$ ) $\neq$ average of the total population ( $\rightarrow L$ )	

Table 1: Indicator types and their characteristics

Table 2 contains hypothetical indicators for various topics, intended as an illustration of the indicator types. Important criteria (e.g. clear measuring concept, data availability) were not taken into account in the selection process.

<b>Indicator type</b> <b>Topic</b>	<b>Level (L)</b> Degree to which needs are met	<b>Capital (C)</b> Status and potential of resources	<b>Input/Output (Δ)</b> Use and influencing of capital	<b>Defining criteria (D)</b> Efficiency, disparities	<b>Response (R)</b> Social and political measures
<b>Mobility</b>	Annual per capita distance travelled in km (1)	Number of private motor vehicles  Public transport infrastructure (e.g. number of kilometres of track)	Per capita fuel consumption in road transport	Modal split (proportion of annual per capita distance travelled on public transport in km)  Average fuel consumption per 100 km	Revenue from the heavy vehicle fee
<b>Education</b>	Measurement of skills  Average school life expectancy (2)	Total library provision  Number of places in tertiary education	Annual number of lessons given  Proportion of GDP spent on education	Proportion of women completing tertiary education  Comparison of educational grants between regions	Expenditure on educational campaigns
<b>Competitiveness</b>	GDP per capita (3)	Average school life expectancy (2)  Number of patents in force  Ratio of foreign debt to GDP	Net investment  New patent applications per annum  New borrowing	Regional GDP (3)  Labour productivity (GDP/working hour)  Comparison of borrowing between regions	
<b>Soil</b>	Living space per person	Proportion of undeveloped land	Annual soil sealing in m <sup>2</sup>	Population density factor (living space per built-up area)	
<b>Water</b>	Daily water consumption per capita	Quality of watercourses  ppm nitrate in drinking water	Annual nitrogen input per hectare	Proportion of households connected to sewage treatment plants	Permitted head of cattle per hectare
<b>Air</b>	Annual per capita distance travelled in km (1) (4)	Average annual values for NOx immission concentrations	Annual NOx emissions in tonnes (3)	NOx emissions/km journeys made (3)  Proportion of cars with catalytic converter	Level of supplementary petrol duty

Table 2: Examples of indicators for typology

- (1) An indicator may arise in several topics (in this example in the topics "mobility" and "air").
- (2) The same indicator may occur in various columns, depending on the topic: the indicator "school life expectancy" describes a level for the topic Education (meeting a training need) but capital for the topic Competitivity (training as an economic resource).
- (3) Indicators may occur as relative variables with different terms of reference: "GDP per capita" in the Level column, "Regional GDP" in the Defining criteria column. Or "NOx emissions in tonnes per year" (absolute value) in the column " $\Delta$ ", "NOx emissions per km journeys made" (efficiency) in the column "D".
- (4) This level indicator represents a need (mobility), the meeting of which has a considerable effect on the air (impairment of air quality). Another conceivable indicator could be "respiratory diseases" as a circumlocution for the need "health".

### 3.3 Advantages and possibilities of the model

Combining different indicator types allows complex statements to be made on particular topics and prevents arbitrary assessment of developments. This may be illustrated using the following (hypothetical) example relating to the topic "mobility" (Fig. 3):

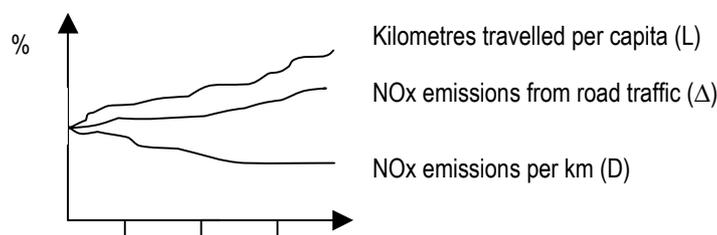


Fig. 3: Different types of indicator

An isolated examination of the indicator of the type "Defining criteria" (D) might lead to the following interpretation: an increase in efficiency (introduction of the catalytic converter) led to a reduction in NOx emissions per kilometre travelled, which represents a development towards sustainability.

The increasing NOx emissions from road traffic (input/output indicator), on the other hand, indicate a development away from sustainability. The reasons for this discrepancy lie in increasing mobility, which is expressed in an increase in kilometres travelled per person (level indicator). The increase in efficiency is therefore overcompensated for by growth, which, overall, must be judged as a negative development.

Without this typology, it would be inevitable that statements would either be unduly optimistic or overdramatic. By combining different indicator types, on the other hand, it becomes

possible to make a complex statement with respect to sustainability. Moreover, combining different indicator types highlights where there is room to manoeuvre and allows scenarios to be drawn up: how much mobility can we afford in the future while staying within with specific pollutant limit values? By how much more would efficiency have to be improved if emissions were to be reduced while mobility remained the same?

In practice, the indicators from one topic, unlike in the above (ideal) example, frequently do not display any clear causal associations. Nonetheless, an examination of several indicator types can throw light on various aspects of a problem, thus averting the danger of arbitrariness and biased (interest-led) assessment.

However, there are limits to the practical implementation of the model. Indicator typology should therefore be viewed as an orientation aid, not a "strait-jacket". This means:

- It is not necessary to apply all five indicator types in each topic area (indeed, in many cases it would not make any sense to do so; see Table 2). However, individual types of indicator should not crop up with undue frequency in the system as a whole.
- It is not possible to allocate every indicator unambiguously to one of the five types. However, this is not a good reason for omitting an indicator from the system.
- A causal relationship between the individual indicators of a topic area is desirable, but not essential.

## 4 Topics (rows of the grid)

### 4.1 Derivation

Sustainable development is an anthropocentric concept, thus it is obvious to choose individual and social issues and specify them as a list of topics. The political sphere, which after all addresses such issues, provides a useful starting point. However, it must be remembered that politics does not necessarily encompass all topics which are of relevance to sustainable development.

With regard to Switzerland's future sustainability strategy, IDC Rio<sup>7</sup> commissioned a study into the status of Federal policy in terms of the implementation of sustainable development<sup>8</sup>. For the purposes of analysis, Swiss policy was divided into 25 policy areas (summarised into five thematic policy sectors). For pragmatic reasons, we brought our list of topics as far as possible into line with this classification: firstly to ensure compatibility of MONET with efforts at the national level and, secondly, to simplify the selection and production of indicators as far as possible (the Government agencies which are to contribute data and expertise to the development of the indicator system are largely organised in accordance with these policy areas).

However, since MONET differs from the above-mentioned study in both its objectives and fundamental concepts, the policy areas cannot be adopted without making certain adjustments and additions<sup>9</sup>. The following considerations were central to this process:

- Objective: The purpose of the MONET project is not primarily to monitor current policies, but instead to provide a model of sustainable development that is as general and comprehensive as possible. The list of topics should thus not simply reflect current reality but also include topics which are not (yet) on the political agenda.
- Weighting of the dimensions: The definition and specification of sustainable development<sup>10</sup> carried out for the MONET project is based on a division into three target dimensions (social solidarity, economic efficiency and environmental responsibility), which are of equal importance. When selecting the topics, care was taken to ensure that coverage of the dimensions is as uniform as possible. However, no attempt was made to assign the topics to particular dimensions, as this is not appropriate for many topics (e.g. energy, mobility).

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<sup>7</sup> The Interdepartmental Committee Rio (IDC Rio) is an internal committee within the Swiss administration for implementing the decisions taken at the 1992 Rio Conference.

<sup>8</sup> Mauch Consulting, INFRAS, Ernst Basler&Partner AG (1992): Politik der nachhaltigen Entwicklung in der Schweiz: Standortbestimmung und Perspektiven. Hauptbericht. [Sustainable development policy in Switzerland: status and prospects. Main report.]

<sup>9</sup> See Appendix D

<sup>10</sup> See MONET (2001): consultation document "From the definition to the postulates of sustainability".

- Special features of the structure of the indicator system: the MONET system is structured so that certain aspects of sustainable development, such as "equality of opportunity" and "regional disparities", are integrated across all topics. These topics are modelled by the "defining criteria" (columns of the grid) and thus no longer need to appear in the list of topics.

## 4.2 The topics and their relationship with the sustainability postulates

Table 3 lists the 26 topics of the MONET indicator system and indicates how they relate to the sustainable development postulates<sup>11</sup>. The list of topics reflects the current approach and may be adjusted to new requirements. It is not possible to make a definitive judgement as to the topics which are or will become relevant to sustainable development.

The interrelationships between the topics and the postulates are diverse and multidimensional. In each case, the Table lists only the most important postulates which are deemed to be central evaluation criteria for a topic.

TOPICS	Specific examples	POSTULATES of sustainable development		
		Social solidarity	Economic efficiency	Environmental responsibility
1 Social security & material prosperity	Social insurance, assistance, income	2c	9a	
2 Health		2b		14a
3 Subjective living conditions	Contentment, happiness, well-being, social integration	3a,b, 6d	12	19
4 Housing	Living space, housing quality	2a		
5 Culture and leisure	Cultural diversity, freely disposable time, leisure and cultural activities on offer	1a, 2a		
6 Social cohesion & participation	Social and political participation	5a,b		
7 Education and science		6a,c,d	9a	
8 Information	incl. information about sustainable production	6b	11b, 9c	
9 Physical security	War, criminality, natural hazards, high-risk technologies, genetic engineering	2a,b, 3a,b	11a	17a,b
10 Competitiveness	Innovative ability, national budget, etc.		9a-d	
11 Free-market control mechanisms	Prices, market instruments, regulatory framework		8 a-d, 10a,b	
12 Work	Employment, working conditions	2a	12	
13 Research, development & technology			9a,c	
14 Production	In all sectors		11a,b	

<sup>11</sup> See Appendix C

15	Consumption	E.g. consumption behaviour		11c	
16	Mobility	incl. goods transport	2a	9a	14a
17	International trade & cooperation		5a	13	
18	Materials, waste, impact	Incl. radioactive waste, noise, non-ionising radiation (excluding atmospheric pollutants)	2b	11a	16a,b, 17a,b
19	Soil	Soil use, soil fertility	2a		15b, 16a,b, 17b
20	Water		2a		15a, 16a,b
21	Air	Atmospheric pollutants	2b		16a,b,11a,13b
22	Climate				17b, 18
23	Land use	settlements, natural landscapes			15b, 19
24	Biodiversity	Protection of biotopes and species			17c, 15b, 18
25	Energy and raw materials		2a	11a	15a,b
26	Forests				15a, 19

Table 3: List of topics

## 5 Indicator selection criteria and procedure

The aims of the MONET project are twofold: firstly to provide benchmarking on an international basis and secondly to permit monitoring of sustainable development in Switzerland itself. When filling the individual cells of the grid, it must thus be checked whether indicators may be available which are also used in other countries. It is thus vital to consult the relevant lists of indicators, with the CSD list<sup>12</sup> being assigned top priority, followed by lists from other organisations such as the OECD and Eurostat. If no internationally common indicators are available, Swiss sector-specific lists of indicators may be used. If necessary, it is also possible to propose two indicators for one issue, one for the purposes of international comparison, the other for monitoring sustainable development in Switzerland

The indicators also have to fulfil further requirements, for example with regard to data availability or relevance to Switzerland (see Table 4).

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<sup>12</sup> [http://www.un.org/esa/sustdev/csd9/csd9\\_indi\\_bp3.pdf](http://www.un.org/esa/sustdev/csd9/csd9_indi_bp3.pdf)

Criteria		Signifi- - cance
Frame of reference	1. <b>Of importance to Switzerland</b> The indicator is relevant in the Swiss context, giving an indication of the "state of the nation".	XX
	2. <b>Relevant with regard to MONET postulates</b> The indicator may be directly derived from at least one of the MONET postulates.	XX
	3. <b>Unambiguous with regard to evaluation</b> The indicator is clear - there is no uncertainty about which direction is good and which bad. * mandatory for capital and defining criteria.	X*
	4. <b>Responds rapidly to change</b> The indicator responds rapidly to changed conditions.	X
	5. <b>Temporal/spatial significance</b> The indicator has far-reaching spatial and temporal significance.	X
	6. <b>Urgency</b> Takes account of problems, including those over the long term, which are urgent in terms of sustainable development.	X
	7. <b>Scarcity</b> Preference for objects which, in the long term, constitute a limiting factor.	X
User friendliness	8. <b>Readily comprehensible</b> The indicator is easy to interpret and its origin is <i>transparent</i> (physical things are preferable to monetary values and prices: e.g. number of years of healthy life instead of health expenditure)	XX
	9. <b>Reasonable level of information content</b> The indicator does not contain too little information ( <i>no yes/no indicators</i> ).	XX
	10. <b>Relevant to the general public</b> The indicator is attractive and relates to the users' everyday life.	X
	11. <b>Politically relevant</b> The indicator relates to an international or national commitment or objective.	X
Validity	12. <b>Scientifically well-founded</b> There is broad scientific consensus regarding the validity and reliability of the indicator.	XX
	13. <b>Consensus regarding interpretation</b> There is broad agreement with regard to the interpretation of the indicator.	X
Data availability	14. <b>Available at low cost</b> The indicator is based on readily available data or data which may be provided with little financial expenditure.	XX
	15. <b>Regularly and homogeneously recorded data</b> The indicator is based on data which at present are and in the future will be recorded regularly and in a homogeneous manner.	XX
	16. <b>Quantifiable</b> The indicator is based on quantifiable data. (This does not exclude subjective, qualitative statements.)	XX
	17. <b>Representative of the whole of Switzerland</b> The indicator is based on data which are representative of the whole of Switzerland.	X

XX: mandatory requirement      X: desirable

Table 4: Indicator selection criteria

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## Appendix

### Appendix A: Mathematical modelling of indicator types

Variables:

- L Level or extent to which needs are met and space used
- C Capital
- $\Delta$  Inputs and outputs
- $\varepsilon$  Efficiency of capital utilisation (or  $\pi = \varepsilon^{-1}$  specific resource consumption)  
(one of the defining criteria, D)
- R institutional responses

Provision of environmental, economic and social capital (C) is subject to continuous change, specifically as a function of in- and outputs  $\Delta$ :

$$C_{t+1} = C_t + \partial C / \partial t \quad (1)$$

$$\text{where } \partial C / \partial t = f(\Delta_t) \quad (2)$$

The in- and outputs are here influenced – albeit often only over the relatively long term – by institutional responses (R):

$$\Delta_t = f(R_t, R_{t-1}, \dots, R_{t-n}) \quad (3)$$

Utilisation or improvement of capital, in other words in- and outputs ( $\Delta$ ), may proceed with a greater or lesser degree of efficiency. This has a direct impact upon the extent to which needs are met (L):

$$L_t = \varepsilon \cdot \Delta_t \quad (4)$$

Efficiency ( $\varepsilon$ ) may accordingly be calculated as:

$$\varepsilon = L_t / \Delta_t \quad (5)$$

or the efficiency of specific resource consumption ( $\pi$ ) as

$$\pi = \varepsilon^{-1} = \Delta_t / L_t \quad (6)$$

**Appendix B: Definition of sustainable development (summary)<sup>13</sup>**

The definition and interpretations of sustainable development of relevance to the MONET project are as follows:

1. Sustainable development is development which meets the needs of the present without compromising the ability of future generations to meet their own needs.
2. Sustainable development means ensuring decent living conditions with regard to human rights by creating and maintaining the widest possible range of options for freely defining life plans. The principle of fairness among and between present and future generations should be taken into account in the use of environmental, economic and social resources.
3. Putting these needs into practice entails comprehensive protection of biodiversity in terms of ecosystem, species and genetic diversity, all of which are the vital foundations of life.
4. The three overarching aims of social solidarity, economic efficiency and environmental responsibility are selected as the target dimensions. The three target dimensions are of equal importance: in the long term, environmental, economic and social objectives cannot be achieved at the expense of the other objectives.

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<sup>13</sup> The derivation of the definitions and associated explanations may be found in the MONET project - consultation document (2001) "From the definition to the postulates of sustainable development".

## Appendix C: Postulates of sustainable development<sup>14</sup>

### Postulates relating to social solidarity<sup>15</sup>

1 General principle	<p><b>a Each member of society has a right to the dignity of human life and to the free development of their personality. Democracy, legal stability and cultural diversity are guaranteed.</b></p> <p><b>b The limits of individual development are set where the human dignity of other contemporary individuals or of future generations is compromised.</b></p>
2 Objective living conditions	<p>a The basic needs of the population must be met over the long term. Individuals should be permitted reasonable latitude in meeting material and non-material needs which extend beyond the basic needs.</p> <p>b Human health should be protected and promoted.</p> <p>c The dignity of human life requires freedom from poverty. Needy members of society shall benefit from solidarity in accordance with their needs. (⊕a)</p>
3 Subjective living conditions	<p>d The contentment and happiness of present and future generations shall be respected and promoted.</p> <p>e Socioeconomic and environmental change must not be achieved at the cost of the physical and psychological well-being of the individual.</p>
1 Fairness of distribution, equality of opportunity	<p>a No-one shall be discriminated against on the basis of whatever external or internal characteristic.</p> <p>b Each member of society should have the same rights and opportunities. Society should strive to achieve a more just distribution of resources.</p> <p>c The integration of disadvantaged groups of the population and regions into economic, social, cultural and political life should be promoted.</p>
2 Strengthening of social cohesion	<p>d In recognition of the fact that the proper functioning and survival ability of society are substantially based upon the solidarity of its members, exchange and understanding between individuals and groups should be promoted.</p> <p>e Social and political participation should be promoted.</p>
3 Development and maintenance of human capital	<p>4 Collective knowledge and sociocultural heritage should be maintained and increased over the long term.</p> <p>5 There should be no restriction to the flow of information. Free formation and expression of opinion must be guaranteed.</p> <p>6 The ability to absorb and process information should be promoted.</p> <p>7 Children and young people in particular should be able to live in an open, motivating and future-oriented environment.</p>

<sup>14</sup> Derivation: see MONET project - consultation document (2001) "From the definition to the postulates of sustainable development.

<sup>15</sup> Basis for the postulates relating to social solidarity: Berger-Schmitt / Noll 2000: *Conceptual Framework and Structure of a European System of Social Indicators*. EuReporting Working Paper No. 9, Mannheim.

**Postulates relating to economic efficiency**

4 General principle	Economic activity should effectively and efficiently meet the needs of the individual and of society. The economic framework should be shaped in such a manner that it promotes personal initiative, thus putting self-interest to the service of the common good and ensuring the welfare of the present and future population. (Ⓢp)
5 Economic system	<p>a Goods allocation should primarily be by free market means. If the market fails or in the case of goods primarily in the public interest (exempt goods), intervention in the free market is justified. (new)</p> <p>b Prices should reflect the scarcity of natural resources and sinks and include external costs. The "polluter pays" principle should be applied consistently (with the exception of exempt goods). (①a, ②, ⑤a)</p> <p>c In the event of intervention in the market, market instruments should primarily be used. (Ⓢa)</p>
6 Efficiency and competitiveness	<p>a The economic efficiency of a society and its productive, social and human capital must be at least maintained over time. The aim should not merely be to bring about an increase in quantity, but instead to ensure a constant improvement in quality. (①a, ⑤a)</p> <p>b The framework of the market system should be shaped in such a manner that innovation is encouraged and functional markets are maintained or improved. (Ⓢa) Competitiveness and locational quality should be maintained and promoted. (Ⓢa)</p> <p>c Research and development activities which support sustainable development should be promoted. (④a)</p> <p>d Public-sector debt must be incurred only to the extent that it does not jeopardise the capability of future generations to meet individual and social needs. (new)</p>
7 Flexibility and stability	<p>a The framework of the market system should be shaped in such a manner that a long-term outlook is worthwhile and the social change necessary to adapt to future requirements is facilitated. (Ⓢa) New measures should be foreseeable. (Ⓢa)</p> <p>b The rapidity or slowness of changes in the framework of the economic system must not jeopardise social peace. (new)</p>
8 Production and consumption of goods and services	<p>a Environmental impact and risks emanating from production plants should be minimised, while energy and material flows should be optimised. (new)</p> <p>b Consumption of goods and services should be as environmentally compatible and socially just as possible.</p> <p>c Information should be provided both within and outside production plants (for example by means of environmental management systems) to ensure that production and consumption are as sustainable as possible. (④a).</p>
9 Employment	The economic system should ensure that anyone desiring gainful employment is able to find meaningful work to support themselves. (new)

10 International trade	<p>a The multilateral trading system should take account of the need for careful management of natural resources and promote technologies which ensure efficient use of environmental resources and social justice. (ⓐ)</p> <p>b The multilateral trading system should assist in ensuring that one nation's individual and social needs are met without consequently compromising the ability of other nations to meet their own needs. (new)</p>
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### Postulates relating to environmental responsibility

11 General principle	<p><b>a The natural foundations of life should be maintained in the long term and existing damage should be repaired. (ⓐ)</b></p> <p><b>b The dynamic diversity of nature must be preserved. (ⓐ)</b></p>
12 Consumption of resources	<p>a Consumption of renewable resources should be kept below the regeneration threshold (ⓐ)</p> <p>b Consumption of non-renewable resources should be kept below the development potential for renewable resources<sup>16</sup> (ⓐ)</p>
13 Materials and wastes	<p>a Pollution of the environment with degradable waste and emissions should be minimised. Contamination should on no account exceed the absorption capacity of the ecosystem. (ⓐ)</p> <p>b The emission of non-degradable pollutants into the environment should be prevented wherever possible. (ⓐ)</p>
14 Risks	<p>a Any impairment to nature should be offset such that biodiversity is maintained and the quality and continuity of the ecosystem are ensured. (ⓐ)</p> <p>b Accident risks with wide-ranging impact upon humans and the biosphere are permissible only insofar as, even in the worst case scenario, they do not cause any permanent damage for a subsequent generation. (ⓐ)</p> <p>c Severe or irreversible environmental damage should be prevented, even if the scientific community is not absolutely certain of the actual risk. (Rio Declaration, a)</p>
15 Rate of change	The rate of anthropogenic intervention in nature must be in balance with the tempo of the natural processes of relevance to the environment's capacity to respond and regenerate. (ⓐ)
16 Natural and agricultural landscape	Development of the natural habitat of humans must be guided by the concept of human rights. Human dignity requires a decent natural and agricultural landscape. (ⓐ)

### Keyⓐ-ⓐ: Source; a: amended, p: partially amended

#### Sources:

- ⓐ UVEK 1999: *UVEK departmental strategy*. Berne. (ⓐU: Chapter entitled "Sachziele Umwelt" ["Environmental goals"])
- ⓐ IDC Rio 1997: *Nachhaltige Entwicklung in der Schweiz - Stand der Realisierung [Sustainable development in Switzerland - Implementation status]*. Berne.
- ⓐ IDC Rio 2001: *Politik der nachhaltigen Entwicklung in der Schweiz: Standortbestimmung und Perspektiven. [Sustainable development policy in Switzerland: status and prospects. Main report]*. Zurich.
- ⓐ Öko-Institut 1999: *Soziale und ökonomische Nachhaltigkeitsindikatoren [Social and economic sustainability indicators]*. Freiburg.
- ⓐ Council for sustainable development/Indicators working group/Criteria 1999: *Comments on SFSO and SAEFL report "Indikatoren der Nachhaltigkeit" ["Sustainability indicators"]*. Berne, unpublished.

<sup>16</sup> Utilisation rates for non-renewable resources should be lower than the simultaneously existing potential for the creation of renewable substitutes. (Cf. El Serafy, cited in Minsch 1993, p. 40)

## Appendix D: Topics and Federal policy areas

MONET's 26 topics in relation to Federal policy areas in the Mauch Consulting, INFRAS, Ernst Basler&Partner AG report (2001)<sup>17</sup>

TOPICS (MONET project)		FEDERAL POLICY AREAS Mauch Consulting, INFRAS, Ernst Basler&Partner AG (2001)		
1	Social security & material prosperity	1	Social security policy	
2	Health	2	Health policy	<i>a</i>
3	Subjective living conditions			
4	Housing			<i>b</i>
5	Culture & leisure	3	Cultural policy	<i>c</i>
6	Social cohesion & participation			
7	Education & science	4	Education & science policy	
8	Information	6	Information society policy	
9	Physical security	20	Security & peace policy	<i>d</i>
10	Competitiveness	7	Economic & regional support policy	<i>e</i>
11	Free-market control mechanisms	8	Financial & control policy	
12	Work	9	Labour market policy	
13	Research, development & technology	10	Research, development & technology policy	
14	Production	11	Agricultural policy (among others)	<i>f</i>
15	Consumption			
16	Mobility	14	Transport policy	<i>g</i>
17	International trade & cooperation	17	Foreign trade policy	<i>h</i>
		18	Development policy	
		19	European integration policy	
		21	Migration policy	
		22	Environmental foreign policy	
18	Materials, waste, impact	13	Environmental policy	<i>i</i>
19	Soil			
20	Water			
21	Air			
22	Climate			
23	Land use			
24	Biodiversity			
25	Energy & raw materials			
26	Forests	16	Forest policy	

<sup>17</sup> Interdepartmental Committee Rio (IDC Rio): Politik der nachhaltigen Entwicklung in der Schweiz: Standortbestimmung und Perspektiven. Hauptbericht. [Sustainable development policy in Switzerland: status and prospects. Main report.]

## Table notes:

- a* Subjective living conditions are not actually covered by health policy (according to Mauch Consulting, INFRAS, Ernst Basler&Partner AG report). However, in the widest meaning, they do encompass basic needs which are of relevance to health, such as contentment and social integration, and which should be met in the context of sustainable development.
- b* Housing is not covered by its own Federal policy area (the cantons and local authorities tend to bear this responsibility) but is also a basic need. Various policy areas (e.g. regional planning and environmental policy) are of relevance to housing.
- c* Federal cultural policy essentially comprises public support for the creative arts. However, the report by Mauch Consulting, INFRAS, Ernst Basler&Partner AG understands culture in connection with sustainable development "in a further sense as the basis for coexistence in this country and not limited to art (requiring support)" and identifies community spirit, solidarity, openness, respect and participation as key cultural themes. This understanding of the term "culture" has been adopted by MONET.
- d* In the MONET project, security also covers aspects such as natural hazards and crime, i.e. it is broader than the policy area "Security & peace policy", which deals mainly with military threats.
- e* MONET's different classification: a classification has been selected which allows a better definition of the postulates.
- f* The overarching topics Production and Consumption were selected for MONET. In addition to agricultural policy, these topics naturally touch on other policy areas (economic and regional development policy, environmental policy etc.). No individual area (agriculture) should be singled out while other areas (industry, services) are ignored.
- g* The general term is used so as to include structural issues (e.g. spatial segregation).
- h,i* In order to give equal weight to the three dimensions, a different classification was selected for the MONET topics.

The following areas of Federal policy do not have their own MONET topics:

5	Equality policy	Covered in the indicator system by the column "defining criteria".
12	<b>Regional planning policy</b>	Covered by various topics (16 Mobility, 23 Land use etc.) and by the "defining criteria" column (regional disparities).
23	Federalism	Covered by topic 6 (Participation) and by the columns "defining criteria" (regional disparities) and "responses" (legislative measures etc.).
24	Direct democracy	
25	Government	