Sustainable Development
Sust. Dev. **10**, 103–115 (2002)
Published online in Wiley InterScience (www.interscience.wiley.com). **DOI**: 10.1002/sd.184

INSTITUTIONAL SUSTAINABILITY INDICATORS: AN ANALYSIS OF THE INSTITUTIONS IN AGENDA 21 AND A DRAFT SET OF INDICATORS FOR MONITORING THEIR EFFECTIVITY

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Objectives of sustainable development are defined for the economic, social and environmental dimension, but for effective compliance as well as for sustainability characteristics such as justice or participation they must be complemented by core institutional objectives. The CSD's set of sustainability indicators was the first one to explicitly take into account the institutional dimension of sustainability, and other organizations such as the World Bank and the OECD have followed. Like most pioneers, the indicators suggested offer significant room for improvement.

In order to measure the effectiveness of the relevant institutions, Agenda 21 has been analysed regarding its institutional content (organizations, mechanisms, orientations). From this basis, the purposes of the institutions have been determined in a stepwise approach and indicators developed that permit us to measure the progress achieved against the purposes of the respective institution.

The methodology developed can be applied to other international agreements, providing the basis for an integrated reporting system. Copyright © 2002 John Wiley & Sons, Ltd and ERP Environment.

Received 13 March 2001
Revised 17 May 2001
Accepted 4 February 2001

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Contract/grant sponsor: German Federal Environment Agency; Contract/grant number: 298 121 40.

INTRODUCTION

As recommended in Agenda 21, Chapter 40, the Commission on Sustainable Development (CSD) in 1995 undertook

to develop a set of sustainability indicators as a tool for assessing the progress towards sustainability and to communicate the achievements (UNDPCSD, 1995). As a preliminary result, a working list of 134 indicators and their respective methodologies was selected (UNDPCSD, 1996), which have been tested for their usefulness and practical applicability by a group of pilot countries from North and South.

Although not separately dealt with as an additional fourth dimension of sustainability in Agenda 21, it turned out that the institutional dimension and respective indicators needed to be introduced as another pillar of sustainability. Only this way it was possible to accommodate a significant number of crucial societal and cultural elements of Agenda 21. The CSD referred the institutional indicators to seven themes of Agenda 21 (Chapters 8, 23–32, 35, 37, 38, 39, 40), proposing a total of 15 indicators. However, although the introduction of the institutional dimension is a major achievement in itself, the set of institutional indicators proposed has given rise to concerns whether it adequately reflects the institutional dimension of sustainability.

The results of the test phase (UNDSD, 1999) pointed to structural problems in the original CSD set of indicators, leading to the suggestion of a revised draft set. Unfortunately, although the number of indicators was reduced from 134 to 58 and a new structure based on key themes made them more palatable, some problems remained: the selection has been focused on well founded, consensus based indicators for which data are already available and which can be realized within the currently given constraints in national administrations (UNDPCSD, 1995). This results in a focus on historically experienced problems, which at a particular time in the past have been of political relevance, triggering the collection of data to monitor the issue. Such a procedure is however unable to react proactively on potential threats of the future, or at least in due time when first symptoms become visible (Spangenberg and Bonniot, 1998).

The following section briefly clarifies the concepts of sustainability, indicators and institutions as used in this paper. They are used in the next section to develop an innovative methodology to derive institutional sustainability indicators. Selected results are then discussed, while the full list of indicators is documented in the appendix.

CLARIFYING THE CONCEPTS

As no unanimous international consent has emerged yet regarding the definition of institutions, indicators and sustainability, some definitions are necessary; for a more detailed explanation see an article by Spangenberg *et al*. (2002).

Sustainability

For the purpose of this paper, sustainability is understood to comprise four dimensions: the social, economic, environmental and institutional ones. Whereas the environmental dimension can be defined to be the sum of all bio-geological processes and the elements involved in them (referred to as 'environmental capital' by economists), the social dimension ('human capital') consists of the intra-personal qualities of human beings: their skills, dedication and experiences. Institutions (confusingly called 'social capital') are the result of interpersonal processes, such as communication and co-operation, resulting in information and systems of rules governing the interaction of members of a society. The economic dimension ('man-made capital') includes not only the formal economy, but as well all kinds of informal activity that provide services to individuals and groups and thus increase the standard of living beyond the monetary income (Spangenberg and Lorek, 2002).

The fact that the structure of analysis chosen separates societies into four discrete subsystems should not be understood as denoting the permanent interaction of the

economic, social, institutional and environmental subsystems. These interactions constitute the linkages of the four dimensions. They can be characterized by interlinkage indicators that do not refer to one single dimension of sustainable development, but are socio-environmental, institutional-economic and so forth. The emerging picture is complex (reflecting the complexity of reality) and not easy to communicate as such; for this purpose, the *prism of sustainability* (Figure 1) has proven to be an essential tool by clearly and comprehensively structuring the dimensions and providing obvious insights into their interaction.

In terms of system analysis, each of these subsystems is complex, non-linear, self-organizing and thus cannot be steered exogenously towards some externally defined targets by hands-on management. For sustainability, the self-reproducing capabilities not only of the economic subsystem, but also of the social, environmental and institutional subsystems are to be enhanced in a way that the maintenance of the systems is guaranteed (Daly, 1996). However, maintenance of self-reproducing systems does not come at zero cost: to maintain the four types of capital, investments *into each of them* are needed to maintain their value as production factors. These (mainly non-monetary) investments are the core of sustainability policies (Spangenberg, 2001a).

Indicators

The purpose of sustainability indicators in general is to serve as simplifying communication tools helping to guide political decision-making towards sustainable development. To serve for communication purposes, they should reduce complexity, be easily understandable and limited in number. To provide a sound basis for decision making they have to be

(i) general, i.e. not dependent on a specific situation, culture or society;
(ii) indicative, i.e. truly representative of the phenomenon they are intended to characterize;
(iii) sensitive, i.e. they have to react early and sensibly to changes in what they are monitoring, in order to permit monitoring of trends or the successes of policies, and

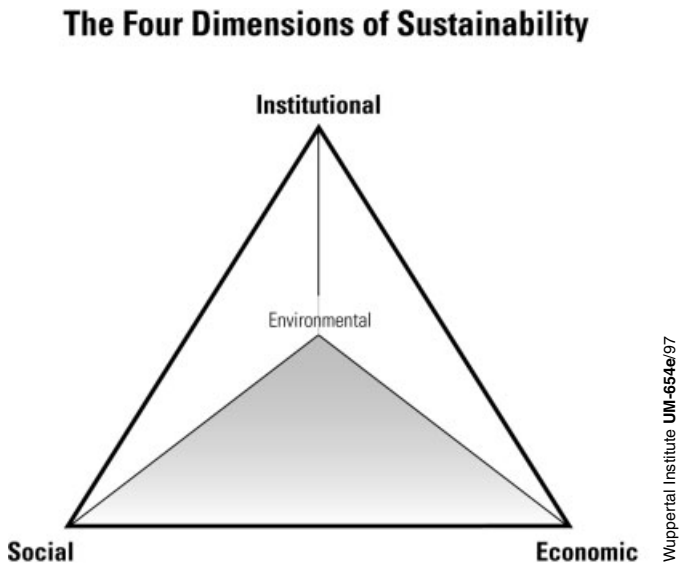

Figure 1. The prism of sustainability. Source: Joachim H. Spangenberg

(iv) robust, i.e. directionally safe with no significant changes in case of minor changes in the methodology or improvements in the data base.

In order to permit policy assessments, it must be clear which value of the indicator is more or less desirable than another one, thus avoiding ambiguous indications. This requires a gradient from good to bad results, which can have different forms.

Nominal scales consist of only two values: a certain characteristic is either given or not. As they provide no information about the quality of their respective object, they are the least meaningful ones concerning policy relevant information. However, for exactly this reason they are the easiest to agree upon in case of politically controversial themes. For example, whereas the effectiveness of a national sustainability council (i.e. its quality) may be questionable, its very existence is easy to report.

Ordinal scales are based on a hierarchy of qualitative states, e.g. qualities of public participation. To apply them properly, the hierarchy (e.g. elections, right to know, right to be consulted, right to appeal to courts, co-decision procedures) would have to be made explicit and the relative distances between the different classes defined. These distances, however, are often based on value judgements (is the step from right to appeal to co-decision as big as that from elections to right to know?) and are often not easily agreeable in particular in international negotiations.

Cardinal scales give quantitative information. If linked to a quantitative target, they can measure the distance towards it. Such indicators are called 'performance indicators' (Opschoor and Reinders, 1991). To derive them, quantified targets have to be agreed upon politically – the most meaningful process for indicator development, but also the most difficult one in international politics. The foot-dragged climate negotiations (Kyoto follow-up) illustrate this point.

Consequently, cardinal performance indicators are the preferable kind of indicator, with ordinal indicators providing an alternative as long as the reference list of qualitative states is clearly defined.

Indicators used on different levels of decision making obviously need different levels of detail. Therefore a hierarchy of indicators seems most appropriate, with the highest level of 'headline indicators' particularly useful for communication purposes, while more details would be provided on the lower levels, to be used e.g. for policy assessment and reporting within administration or expert groups. The initial CSD system of sustainability indicators can be understood as an expert system in this sense, and the new one as a reporting system, with the corresponding set of headline indicators not yet identified. The indicators

Table 1. The relationship of ideas and institutions

Domain	Elements	in Agenda 21
Ideas	behaviour guiding general expectations of a society, values, ideas, principles	explicitly and implicitly
Institutions III: institutional orientations	norms, leitbilder	explicitly, but not referred to as institutions
Institutions II: institutional mechanisms	administrative, political, social procedures, legal norms	explicitly in Agenda 21
Institutions I: organizations	structured and permanent organizations with implicit and explicit internal rules	explicitly in Agenda 21

developed in this paper follow the same stepwise approach, i.e. a condensed set of reporting and headline indicators is not included so far. However, it could be selected from the indicators suggested, since these are designed to take stock of the full institutional content of Agenda 21.

Institutions

Very broadly defined, political institutions as analysed by political sciences are the rules by which political decision-making and implementation is structured. They can refer to social entities as actors as well as to systems of rules shaping their behaviour, including the mechanisms for rule enforcement (Czada, 1995, p. 205; Göhler, 1997, p. 29). Political organizations encompass both: they are social entities, appearing as actors in political processes, as well as systems of rules, structuring political behaviour and facilitating societal orientations.

Due to the difficulty of quantitatively assessing the influence of institutions, capturing their effects with the help of indicators seems to be of utmost importance. However, the diffuse impacts of institutions as well as the rebound effects of political decisions on institutions make it difficult to structure them beyond an allocation to key themes. Therefore the new CSD system of indicators, listing them according to priority concerns, is well suited to accommodate institutional indicators as presented in this paper.

THE METHODOLOGY OF DEVELOPING INSTITUTIONAL INDICATORS

The task to develop proposals for improving CSD's institutional indicators was operationalized in a stepwise manner. The following brief overview of the procedure demonstrates the logic behind and the results of the individual steps; more detail is provided by the full report published separately (Spangenberg *et al*., 2000).

First, all institutions mentioned in Agenda 21 have been identified chapter by chapter, based on the triple definition including organizations, mechanisms and orientations (see Table 1). Together with the institutions, the purposes they are referred to were documented. The result is a systematic list of all institutional aspects in Agenda 21 as the basis for the further analysis.

Second, the institutions have been classified according to their objectives and allocated to social, economic, environmental and essentially institutional objectives (an illustration of the allocation of objectives to the dimensions and the interlinkages is given in Figure 2). Thus a list of institutions was derived, which refer either to one of the three linkages or are core institutional ones, i.e. institutions serving institutional purposes.

As a *third* step, the purposes were cross-checked with the CSD's initial set of sustainability indicators to find out whether or not they had already been covered. As the new set – by and large – is a selection from the initial one, the result of the analysis applies to both. This way a limited number of non-institutional indicators was identified, which are *measuring the effectiveness of institutions through assessing the implementation of their purposes*. However, according to the basic principle in the CSD's indicators to mention each indicator only once, they had been listed not as interlinkage indicators, but under the dimensional headings. In all further steps a similar cross-checking was included.

Based on this analysis, in a *fourth* step it was examined which institutions are allocated to clearly defined purposes in Agenda 21, without these purposes being represented in the CSD's set of indicators. For these purposes indicators are suggested, again based on *measuring the effectiveness of institutions through assessing the implementation of their purposes*.

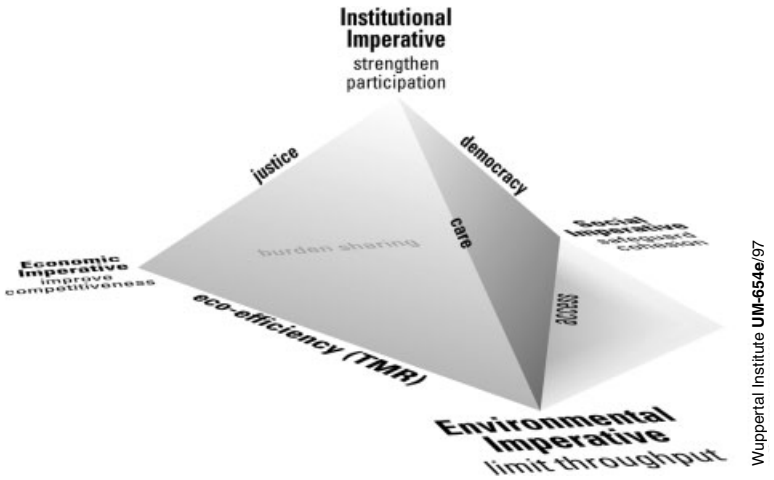

Figure 2. Sustainability core and interlinkage objectives. Source: Joachim H. Spangenberg

Having exhausted the explicitly mentioned purposes of institutions in Agenda 21, from step *five* on the indicator development had to be based the implicit ones. This refers to institutions mentioned in Agenda 21 that have not been explicitly given clearly defined purposes, or for which the scope of purposes mentioned is clearly only a fraction of the functions the respective institution has in reality. The purposes were derived by plausible conclusion from the objectives, actors and institutions mentioned and made explicit. Then the corresponding indicators were developed as described above.

In step *six* the purposes of institutions referred to in Agenda 21 were tested against the sustainability objectives mentioned in the same context. As long as the objectives were not covered by the purposes mentioned or developed so far, further amendments to the purpose list were derived based on the objectives, together with the corresponding indicators. With this step, the total of implicit and explicit purposes of institutions in Agenda 21 has been covered and indicators developed.

Step *seven* finally asks for objectives and institutions not mentioned in Agenda 21 but important for sustainable development. Sources for the identifications of additional objectives and institutions are the Rio declaration, UN decisions, international conventions and conference results, the work of other international organizations etc. This is obviously disputable, since 'important for sustainable development' is a criterion that – beyond the official documents mentioned – will always be dependent on subjective assessments. However, without at least an attempt at integrating objectives from other UN meetings into the list of institutions and purposes, a significant lack of coherence would remain when trying to make sustainable development operational.

SELECTED RESULTS

A frequently repeated issue of institutional sustainability in Agenda 21 is the decentralization and accountability of decision making. However, this orientation is rarely linked to specific mechanisms and purposes, making it less easy to develop an indicator fitting to the orientation. As a stand-in for a direct measure, the number of elected representatives in parliaments, councils etc per 100 000 inhabitants is suggested. With more levels of decision making closer to the citizens the number of representatives and the relative influence of individuals on them will tend to increase,

whereas with a very low number of representatives for a large constituency the individual influence will tend to be jeopardized. The indicator is rough, but meaningful for the level of decentralization. As regards the relative importance of local decision making, no 'power indicator' could be derived. Instead the share of local expenditures as a share of the total public budget can be used as a proxy measure. The relation of national and local spending indicates to some degree the strength of communities.

Similarly rough but meaningful is the suggested assessment of the total support NGOs really receive, beyond political declarations. Political priorities can be measured by expressing the funding for NGOs as a share of the total subsidies paid by government.

Strongly emphasized in Agenda 21, but missing from the set of indicators, are gender issues. Whereas the share of women in the top two levels of the most important organizations indicates the level of equity in the existing economy and administration, the relation of wages for production and reproduction work indicates the relative importance of the sector that is traditionally dominated by women. It indicates as well the value a society gives to reproduction work, which is also informative for the value attributed to reproductive and caring work outside the formal economy. For example, if the salary for repairing cars (mechanics) is twice as high as that paid for 'repairing' people (nurses), then probably informal caring work will be valued quite low. Nonetheless reproduction work is one of the key forces for the social cohesion of any society, and as such of an important element of the *caring capacity* of societies. For sustainability, safeguarding this caring capacity is as essential as respecting the *carrying capacity* of the ecosystems sustaining the economy.

For the social–institutional interlinkage, some labour indicators were developed, based on recommendations in Agenda 21 and from publications of the International Labour Organisation (ILO, 1993). The level of representation at the workplace indicates individual vulnerability. A more detailed assessment as e.g. in the corporate human development index (CHDI) (Spangenberg and Bonniot, 1998) would be more informative, but is not covered by the content of Agenda 21. Based on political will, however, any such extension would be possible. Besides employment, income distribution is a crucial social–institutional issue. Poverty indices are already included in the CSD's set of indicators, and the ratio of the top 1, 3 and 20% of private income to the bottom 20% is a kind of standard complementary information. More important for the distributional dynamics, however, is the average real tax paid by the top 20% of private income earners as compared with the national average. This provides information whether or not a taxation system is oriented towards redistribution of wealth on the national level, a clear institutional orientation (for more background on the social indicators see e.g. Lengyel, 1994).

The environmental–institutional linkage adds indicators such as ecosystem fragmentation as a measure for the quality of national planning regarding the protection of biodiversity and the total material requirement as a measure of the resource intensity of the economy (already included in the sustainable consumption indicators, see UNDESA, 1998; Lass and Reusswig, 1999). This measure – together with some socially relevant information such as unemployment levels or income distribution – can be used to assess the sustainability of a given level of economic growth (Spangenberg, 2001b).

Economic–institutional indicators comprise debt servicing as share of total government revenue (an indicator for the spending capacity influencing the strength of government), or the national trade balance, not only in monetary units, but also in embodied materials and energy. This provides information about the development of a country's resource base

under a given development path. Technology transfer, a key issue of Agenda 21, results in most modern equipment, i.e. in best available technologies (BAT). Consequently, one indicator asks for the share of BAT current foreign, domestic and public investment in order to identify actors who could improve their contribution.

Following recommendations from the CSD expert group on sustainability indicators in early 1999, risk indicators were adapted from several studies (Lass *et al*., 1998; Crowards, 1999) and integrated in the list of suggestions. Similarly not covered by Agenda 21, but important for sustainability is the issue of peace, as highlighted by the UN when choosing peace and sustainable development as themes for its Millennium Assembly in autumn 2000. Therefore some indicators from peace research studies were added, e.g. the relative importance of conflict management and de-escalation training in the education and training of armed forces. A sufficient share is an almost undeniable condition of success, e.g. for UN peace keeping missions.

While the individual indicators are up to debate, the same methodology can be used to develop alternative proposals. It might as well be applied to other UN conventions' results dealing with different aspects of sustainable development, thus permitting us to proceed towards an integrated sustainability reporting system of core and interlinkage indicators. Any such system should and could also include the indicators used by OECD, World Bank and others as illustrated by the list of indicators in the appendix.

OUTLOOK

The result of this study can serve as a starting point for the development of a comprehensive set of sustainability indicators beyond Agenda 21. Hence the selection of reporting and headline indicators is a necessary next step; the *prism of sustainability* and the differentiation between core institutional and interlinkage indicators may prove helpful.

ACKNOWLEDGEMENTS

Kerstin Deller (classification of institutions) and Stefanie Pfahl (screening of Agenda 21) were team members. Barabara Schäfer and Frank Hönerbach (Federal Environment Agency) and Tom Crowards (CSD's expert group member on sustainability indicators) supported us.

The project was commissioned by the German Federal Environment Agency (UBA) and sponsored as UBA research project No. 298 121 40. The full report is available from the author.

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APPENDIX

Table A1. Core institutional indicators

Suggested indicators by themes	Source
Decentralization and accountability	
– Share of local authorities in total public expenditure.	New
– Number of elected members of parliament/council per 100 000 citizens.	New
– Percentage of population involved in locally managed credit systems.	Established
– Locally managed credit systems as share of national volume of commercial loans.	New
– Share of municipalities that implement local Agenda 21.	Established
– Share of population that takes part in local Agenda 21 processes.	New

(*continued overleaf*)

Table A1. (*Continued*)

Suggested indicators by themes	Source
Public policies and civil society empowerment	
– Percentage of GDP spent on environment and development policies.	New
– Share of development plans including EIA, social and economic acceptability assessments.	Established
– Percentage of environment and development expertise in government consultancy, plus gender shares thereof.	New
– Ratio of full time paid/voluntary sustainability and development experts in (i) government, (ii) business, (iii) academia, (iv) NGOs to total staff by gender.	New
– Financial support for NGOs as percentage of total subsidies.	New
– Number of people involved in work of NGOs.	Germany, 1999
– Number of court cases on claims of violating sustainability legislation per billion dollars GDP.	New
– Share of NGO initiated cases.	New
– Share of national/regional development plans under legal scrutiny due to NGO initiatives.	New
– Share of NGOs entitled to file suit.	New
Education and research	
– Percentage of research expenditure for sustainability incl. share of gender sensitive R+D.	New
– Percentage of interdisciplinary policy relevant research in total R+D budget.	New
– Percentage of public/private partnership of expenditure of sustainability related R+D.	New
– Share of private funding in research for sustainability.	New
– Percentage of sustainability related education in schools and adult education; or time budget spent in grades 5–8 on environmental 'syndromes'.	Germany, 1999
– Percentage of teachers taking part in training for sustainability education p.a.	New
– Share of adult population taking part in adult education programmes (full and part-time).	Established
– Share of university professors researching in the field of traditional methods of knowledge as related to share of indigenous people in the total population.	New
– Average number of languages spoken per person.	New
Gender related	
– Similar constitutional and legal rights as men in the area of electoral rights, inheritance, contractual relations, divorce and choice of profession as percentage of limitations referring to these rights.	Established (ordinal indicators)
– Share of measures to secure baby food quality in drinking water investments.	New
– Share of water infrastructure plans based on women's day-to-day water use analysis.	New
– Share of data collection work based on problem definitions developed from the everyday life experience of women, in particular in agricultural, water management and health care research and planning.	New
– Relation of average incomes in production and reproduction work.	New
– Share of women earning more than their partners by the share of men doing so.	New
– Gender sensitive control mechanisms in legislation and implementation.	New
– Share of gender specific data collection and interpretation as a share of total data collection with reference to population groups.	New
– Share of gender sensitive research in the research budget per discipline.	New
– Percentage of female experts in expert data bases.	New

Table A1. (*Continued*)

Suggested indicators by themes	Source
– Share of women in the two top levels of the ten biggest companies, in public administration, national NGOs and interest groups, in parliament and government, amongst professors.	Established UNDP-GEM
– Share of these institutions which have 50% or more women in their two top level positions.	New
– Participants and budget share of top level training courses specifically dedicated to women.	New
– Average frequency and expenditure for effectivity assessment of plans to reduce gender hierarchies in main organizations.	New
– Share of staff in charge of analysing conditions of and progress in reducing gender hierarchies.	New
– Share of men in top positions (see above) with demonstrated qualifications in reproductive and care work (e.g. having taken educational time off).	New
– Share of official information publications specifically dedicated to gender issues.	Established
– Share of research expenditure for these linkages in economics, political sciences, environmental sciences and sociology, and in the national research budget.	New
– Frequency of budget lines including these linkages as a purpose or criterion for eligibility in total institutions support funding of the ministries for research, economics, environment, development.	New

Table A2. Interlinkage indicators

The social interlinkage	
Health issues	
– Percentage of persons with basic health training/1000 inhabitants.	Established
– Percentage of SDP at the primary health care level offering three or more integrated reproductive health services or more integrated reproductive health services either directly or through referrals.	UNFPA, 1998
– Contraceptive prevalence rate.	UNFPA, 1998
– Percentage of births assisted by health personnel trained in midwifery.	UNFPA, 1998
– Percentage of population with access to primary health care services.	UNFPA, 1998
– Maternal mortality ratio.	UNFPA, 1998
– Number of nurses and doctors/1000 inhabitants.	UNDP, 1994
– Body mass index.	Germany, 1999
– Share of smokers in population.	Germany, 1999
– Share of GDP spend on preventive health care.	Established
– Water expenditure as percentage of disposable income of households.	UNDESA, 1998 (discussed)
Employment and income issues	
– Percentage of population employed.	Established
– Ratio of average female wage to male wage.	Established
– (Share of women in senior positions: see gender related indicators.)	
– Ratio of top 1, 3, 20% of private income to bottom 20% of private income.	Established
– Average real paid tax paid by top 20% of private income earners in comparison to national average tax paid.	New

(*continued overleaf*)

Table A2. (*Continued*)

The social interlinkage	
– Spending on recreation as share of disposable income per gender.	UNDESA, 1998
– Time spent on leisure, paid and unpaid work, and travelling per gender.	UNDESA, 1998
– Employees represented by elected councils or comparable institutions of the workplace.	ILO, 1993, rev.
– Share of elected representative bodies with competencies for environment and development.	German TUs
– Share of elected representative bodies with co-decision rights for employment policies.	ILO, 1993, rev.
– Share of elected representative bodies with co-decision rights for industrial strategies	ILO, 1993, rev.
– Share of workers covered by collective framework contracts (employers and trade unions).	ILO, 1993, rev.
The environmental interlinkage	
– Eco-system fragmentation by infrastructure development.	New
– Total ground water abstraction as share of ground water generation.	Established
– Share of rivers and streams with drinking water quality.	Established
– Share of households, agriculture and industry in water consumption.	Established
– Distance travelled *per capita* by mode of transport per gender.	UNDESA, 1998
– Number of road vehicles.	UNDESA, 1998
– Share of waste and hazardous waste in (i) non-organized disposal, (ii) organized disposal, (iii) recovered and recycled, (iv) traded internationally.	Established
– Percentage of territory covered by public/private waste management systems.	New
– Total material requirement.	UNDESA, 1998
– Agriculture and rural development	
– Share of organically produced farming products.	IFOAM, 1998
– Tons of yield per tons of fertilizer for wheat, rice, sorghum.	Established
– Tons of yield from irrigation versus dryland agriculture for wheat, rice and sorghum.	Established
– Level of implementation of code of conduct on the distribution and use of pesticides.	Oberthür and Buck, 1999
– Percent of post-harvest losses of plant and animal products.	New
– Disease resistance of animals: annual veterinary cost.	New
– Number of people working in agriculture per farm owner.	New
– Percent fertile soil not used for agriculture.	New
– Share of marginal land in total land cropped for national food supply.	New
– Area affected by degradation, i.e. water logging, salinization, erosion.	UN, 1993, Ch 14
– Share of rural area (as compared with urbanized area) in population, total income and public revenues.	Established
– Number of teachers, doctors and nurses per 10 000 inhabitants in rural and urban areas.	Established
– Percentage of national budget for development plans of (i) industrial, (ii) rural sites.	Established
Economy and trade	
– Debt servicing as percentage of total governmental revenue.	World Bank, 1995
– Private debt as share of annual household income.	New
– Business debt as share of annual revenues.	Established
– Estimated share of national income not covered by taxation.	New
– Total value of custom related payments as share of the trade volume (openness).	OECD, 1998

Table A2. (*Continued*)

The economic interlinkage	
– National trade balance in terms of embodied energy and materials.	New
– Maximum annual variation of national currency against US dollar and Euro.	New
– Environmental and social impact assessment of trade agreements.	New
– Relation of net national interest rate to average annual GDP growth in the last three years.	New
– Percentage of emission reductions covered by voluntary commitments by polluters.	Established
– Share of CO_2 reductions (planned) by emission trading.	New
– Percentage of national business subscribing to environmental principles drafted by (i) WBCSD, (ii) ICC Environment Charter, (iii) INEM Charta.	New
– Share of companies and production sites by number and share of domestic production that have undergone ISO 14 000 or EU EMAS evaluations.	Established
– Number of substances covered by PPP rules.	New
– Share of timber in forest resources revenues.	New
– Share of forest resource revenue going to local communities.	New
– Share of revenues from the use of indigenous knowledge paid to indigenous people.	Disputed
– Share of jobs created locally.	Established
– Percentage of BAT in (i) foreign private, (ii) domestic private, (iii) public investment.	New
– Intensity of energy use: energy consumed/$ GDP (energy intensity of GDP).	UNDESA, 1998; WBCSD, 1999
– Total material requirement (TMR) per unit of GNP (material intensity of GDP).	UNDESA, 1998
– Intensity of water use: water abstracted/$ GDP (water intensity of GDP).	UNDESA, 1998;
– Water consumption per $ output in (i) agriculture and (ii) industry.	WBCSD, 1999

Table A3. Sustainability beyond Agenda 21

	Source
Vulnerability indicators	
– Peripherality/accessibility: distance to main trading partners.	Crowards, 1999
– Export concentration: share of main products.	Crowards, 1999
– Convergence of export destination: share of recipients.	Crowards, 1999
– Dependence upon import energy: share of total consumption.	Crowards, 1999
– External finance/capital: share of total investment.	Crowards, 1999
– Share of imported food in national food consumption.	Established
Indicator on disaster preparedness	
– share of population trained in First Aid,	Lass *et al*. 1998
– trained helpers in disaster protection (above 1% of the population),	Lass *et al*. 1998
– expenditures for disaster prevention (share of GDP).	Lass *et al*. 1998
– Frequency of risk assessments and contingency plans in business.	New
Peace	
– Share of defence spending in national budget.	Established
– Share of armament in total industrial exports.	Established
– Share of armament in total industrial production.	Established
– Peace research expenditure.	Established
– Time share of conflict management and de-escalation training in the total education of police and armed forces.	New