



Sustainable Development

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Sustainable development for quality of life

Sustainable development is perceived as a compromise between environmental, economic and social goals. This allows society to ensure well-being for present and future generations without damaging the environment and jeopardising the ability of future generations to meet their own needs.

This thematic issue outlines recent research which helps us understand the benefits of sustainable living and how it can be achieved through implementing sustainable development strategies. It provides an analytical overview of the central issues and explores different perspectives.

The current economic crisis is top of the policy agenda and understandably the cause of great concern. A recent report outlined in "Prosperity without growth: lessons from the economic crisis" suggests that we need to redefine 'prosperity' in order to avoid similar catastrophes in future and protect precious environmental resources.

Business and industry could go far, both economically and environmentally, through careful sustainable development strategies with cooperation at their heart. See "Can SMEs improve sustainability?" and "Cooperation is the key to sustainable industry" for more details.

Sustainable development can also play a central role in community development. "Sustainable development can break the vicious cycle of poverty" takes a look at how a careful strategy could transform a community in Ethiopia suffering from the repercussions of deforestation. Closer to home, "Roadmap builds consensus for sustainable rural development" explores a new way of developing rural planning strategy which has brought together a Dutch community to create a desirable vision of the future for all.

Another method of identifying the best options for sustainability is described in "Worldviews' provide basis for sustainable development", which seeks to incorporate the values of all in society to produce robust policies.

Two policy areas for which sustainable practices are essential to environmental improvement are energy and transport. A recent study provides policy makers with a useful framework for understanding a range of different policy measures on sustainable energy targets. See: "Making links between sustainable energy policies". "Local decision making tools for sustainable urban transport" provides information on helpful resources for planners implementing sustainable transport policies.

Ecosystems are clear victims of unsustainable practices, with biodiversity suffering some severe blows. "New impact assessment method monetarises ecosystem damage" provides a new tool for sustainable development by using measures for ecosystem damage which can be made directly comparable to measures of damage to human health.

Finally, we need to be able to measure how well we are doing in the journey towards sustainable living. "Indicators to keep track of sustainable development" provides an overview approaches to measuring progress.

Sustainability is much more than a handful of influential policies. It should be a guiding principle in all that we do – for government, for business and for everyone as citizens making everyday choices. While profound, and perhaps difficult, these changes will ensure we can maintain and improve quality of life for all.

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Prosperity without growth: lessons from the economic crisis

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Theme(s): Sustainable development and policy analysis, Sustainable consumption and production

“Business cannot continue as usual and although the current crisis is uncomfortable, it could provide a unique opportunity to jointly address financial and ecological sustainability.”

Is it possible to achieve prosperity without economic growth? This is the question asked by a recent report, which suggests that the current economic crisis provides a key opportunity to reform economic systems with added benefits for the environment.

The global economy is nearly five times the size it was fifty years ago. This unprecedented level of growth places huge demands on limited resources and has degraded an estimated 60 per cent of global ecosystems. Business cannot continue as usual and although the current crisis is uncomfortable, it could provide a unique opportunity to jointly address financial and ecological sustainability.

The report asks how ‘prosperity’ should be redefined. The current economic crisis has been caused by systemic problems rather than solely by banking malpractice, it claims. While prosperity requires some economic growth, there is a limit. The report demonstrates this by comparing GDP with life expectancy, infant mortality and an index of education.

The statistics indicate that the advantages of a richer nation have diminishing returns and some countries are flourishing in terms of health and education, despite lower income, for example, Cuba and Chile. Alternatives to consumption-based measures of GDP are needed, preferably with a social and psychological dimension.

The report also investigates ‘decoupling’ – the delinking of economic growth and environmental impact. It stresses that we must clearly differentiate between ‘relative decoupling’ and ‘absolute decoupling’. Relative decoupling slows the rate of environmental impact in relation to economic growth by promoting efficiency, whereas absolute decoupling breaks the link entirely by actually reducing impact.

There is evidence of some relative decoupling. For example, the global carbon intensity (measured here as the amount of carbon emitted per US dollar) has dropped by almost a quarter over the past 25 years. However, total carbon emissions have actually increased by 80 per cent. Absolute decoupling has thus not occurred, but is essential to remaining within ecological limits. How exactly this can be achieved remains unclear.

The standard response to the economic crisis is public spending and tax cuts. However, targeting investment towards energy security, low carbon infrastructures and ecological protection would provide employment, recovery and technological innovation. A ‘New Green Deal’ could incorporate policy measures such as fiscal support for green industries and technologies and limits on per capita emissions.

For these policies to succeed, a new ‘macro-economic’ model is needed, which looks at the bigger picture – the behaviour of an economy as a whole. First and foremost, the new macro-economics must abandon the notion of growth in material consumption as a basis for economic stability. In addition, new structures are needed to reduce materialism, for example, improving the work-life balance and better equality measures. Social inequality drives consumption to achieve status, the report writes. Taxes designed to redistribute wealth, better access to education and anti-discrimination measures are examples of policies which could address inequality.

Source: Jackson, T.J. (2009) Prosperity without growth? The transition to a sustainable economy. Sustainable Development Commission report. Downloadable from http://www.sd-commission.org.uk/publications/downloads/prosperity_without_growth_report.pdf.



Can SMEs improve sustainability?

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Theme(s): Sustainable consumption and production, Sustainable development and policy analysis

“SMEs have more flexibility than multinational enterprises (MNEs) and can easily change to meet important environmental and social targets.”

A recent study has investigated the role of small and medium sized enterprises (SMEs) in modern business and concludes that, with the right strategy, they can offer economic prosperity alongside environmental protection.

At least 99 per cent of all EU enterprises are considered SMEs, having less than 250 employees. While their environmental impact is significant (contributing 70 per cent of industrial pollution in the UK, for example), the study suggests that they are well positioned to benefit from new sustainable development opportunities. SMEs have more flexibility than multinational enterprises (MNEs) and can easily change to meet important environmental and social targets.

Although MNEs have larger assets and resources, their strictly defined cultures and processes can make them more resistant to change. MNEs may also be more able to protect themselves from external competitive forces. SMEs, on the other hand, have developed coping mechanisms to face these challenges and embrace innovation and change. As such, SMEs can work to both the limits and opportunities presented by the current social, economic and environmental circumstances.

The study discusses several different ways for SMEs to increase their sustainability. For example, SMEs could become investment targets for larger firms. This can “free up” the founding entrepreneurs and their capital so they continue to strive for sustainable innovations whilst also helping MNEs increase their level of sustainability. However, care needs to be taken that the SMEs are not in conflict with the bigger brand.

SMEs could also form a network and behave like a single, larger firm in the marketplace, aided by the globalisation of communication technology. An SME network would allow efficiency, creativity and flexibility with the equivalent force of a larger organisation when necessary. In addition, networking could mitigate against any negative influences caused by individual SMEs.

Lastly, SMEs could form global supply chains. Larger companies often demonstrate a commitment to environmental responsibility by carefully managing and monitoring their supply chain, a practice which is often too expensive for SMEs. However, as SMEs are suppliers as well as buyers they can still exert their influence on the supply chain by adopting sustainability practices, especially if they are networked to behave like a larger organisation. This moves their customers in the chain towards sustainability as well as placing pressure on upstream suppliers to provide more environmentally-friendly goods or services. This could ensure that the sustainability of products is based on a life cycle analysis through every stage of production.

Currently, there are several successful models of sustainable SMEs evolving in the business environment. The authors suggest that collaboration between SMEs and MNEs could be essential to attain global sustainable goals.

Source: Moore, S.B and Manring, S.L. (2009). Strategy development in small and medium sized enterprises for sustainability and increased value creation. *Journal of Cleaner Production*. 17:276-282.



Cooperation is the key to sustainable industry

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Theme(s): Sustainable consumption and production, Sustainable development and policy analysis

“Industries should be encouraged to interact with each other; the waste stream of one industry provides a potential raw material for another.”

A recent analysis discusses how detailed study of industrial processes and policy can make the usage, recovery and recycling of natural resources more sustainable. It summarises a range of studies on sustainable industrial practice, highlighting where policy makers can support sustainable procedures.

The goals of legislative and non-governmental bodies should be complementary and avoid duplication. Measures are needed to ensure that:

- (i) research findings from related programmes are available for all relevant parties, and
- (ii) industry continues to develop new technologies essential to improving sustainability.

Tools are also required to measure the effectiveness and importance of policies and technological advances

Sustainable management begins with individual industries, minimising the use and waste of raw materials and maximising reuse and recycling. Industries should be encouraged to interact with each other; the waste stream of one industry provides a potential raw material for another. For example, composted sewage sludge can be used as fertiliser, and metals and salt can be extracted from the concentrated brine discharged by desalination plants.

The authors discuss scenario analysis - using software tools to compare how different business plans might respond under different management methods to predict the environmental impact of proposed sustainability measures. Group scenario analyses can identify where co-location of several industries may substantially reduce resource use and waste, guiding the design of Eco-Industrial Parks.

Similarly, industries and regulators alike must recognise where unified efforts are required to establish coherent policy and standards. An example might be agreeing on a technical specification for the properties and reuse of recycled concrete across the construction industry. Multiple industries may have to negotiate a convergence of their interests in order to maximise their financial and material sustainability, while policies recognising technological or practical limits could accommodate and maximise sustainable behaviour.

Source: Jegatheesan, V, Liow, J.L., Shu, L., Kim, S.H. and Visvanathan, C. (2009). The need for global coordination in sustainable development. *Journal of Cleaner Production*. 17:637-643.



Sustainable development can break the vicious cycle of poverty

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Theme(s): Forests, Sustainable development and policy analysis

Sustainable development plays a key role in enhancing human welfare. A recent study investigates investment in social and environmental resources in Ethiopia as a means of both encouraging sustainable development and combating poverty.

“Local input and involvement are needed at all stages and financial incentives are required to prevent sacrificing natural capital stocks for short-term gains, particularly in forestry.”

Ethiopia is one of the least developed countries in the world, ranking 169 out of 179 countries on the United Nations Human Development Index (2008). Almost 60 per cent of the population lack access to portable drinking water. The main source of energy is wood but forest resources are rapidly dwindling. Current development focuses on investing in buildings and industry. Although this development is necessary, it overlooks the importance of human and natural capital, which could lift the country out of its cycles of underdevelopment and poverty.

The research investigated the outcomes of a workshop to discuss the potential for investment in human and natural capital in the city of Awassa in Ethiopia. The workshop included 40 participants from local NGOs, businesses, academia and government.

Participants identified a list of serious needs for the community of Awassa and a number of vicious cycles. For example, deforestation leads to soil erosion which leads to reduced agricultural productivity. This promotes agricultural expansion on marginal land which in turn leads to further deforestation.

Participants discussed possible solutions to these problems and the creation of so-called ‘virtuous cycles’ to replace the vicious ones. They suggested four complementary projects. Firstly, a forestry programme to plant 1 million seedlings and reforest 15,000 hectares of watershed surrounding Lake Awassa. Complementing this would be an ‘Alternative to Woods’ strategy to promote efficient wood stoves in Southern Ethiopia. The stoves would be built and sold by local women and young people to encourage entrepreneurial activity.

Thirdly, the workshop participants suggested a public environmental awareness campaign run by an educational circus company who have previously undertaken campaigns about AIDS. Lastly, they identified the need for a coordination/steering committee to ensure the projects work together.

Participants also identified possible barriers to implementation. Local input and involvement are needed at all stages and financial incentives are required to prevent sacrificing natural capital stocks for short-term gains, particularly in forestry. International Payment for Ecosystems Services (PES) could provide the necessary funding. For example, funds for carbon sequestration from developed countries via the UN’s Clean Development Mechanism¹.

Source: Reynolds, T.W., Farley, J. and Huber, C. (2009). Investing in human and natural capital: An alternative paradigm for sustainable development in Awassa, Ethiopia. *Ecological Economics*. Doi: 10.1016/j.ecolecon.2009.03.007.

¹ See: <http://cdm.unfccc.int/about/index.html>



Roadmap builds consensus for sustainable rural development

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Themes: Agriculture, Sustainable development and policy assessment

“Throughout the process, stakeholders are made aware of not only what they can achieve for themselves, but also what they can contribute to others.”

Where agricultural policies are in conflict with environmental and social issues, a ‘roadmap’ can provide a way forward as part of a sustainable rural development planning process. New research describes an approach used in the Netherlands, which brings together stakeholders to create a mutually desirable vision of the future.

Agricultural policies have conflicted with environmental and social development for many decades. The Netherlands, for example, has seen much conflict between conservationists and farmers in the past, with neither party satisfied with results of top-down planning procedures. Reforms to the EU’s Common Agricultural Policy have sought to improve the competitiveness of agriculture and forestry, as well as improve environmental quality. However, the researchers believe that implementing these new policies has been hampered by difficulties in involving all parties concerned with rural development.

According to the authors, sustainable rural development could be much improved by developing a ‘roadmap’. This explores all potential social, economic and ecological benefits of developing rural land and aims to reduce stakeholder doubts about co-operating with other parties.

The roadmap identifies all stakeholders involved in developing a certain area, the goods and services it might deliver. It begins with a goal-setting exercise in which participants create a desirable vision of the future. For example, a rural community where employment levels, recreational opportunities and environmental quality are strong. From this vision of the future, participants ‘back-cast’ to decide on how to achieve these mutually desirable goals.

The researchers emphasise that all stakeholders must be properly represented. Throughout the process, they are made aware of not only what they can achieve for themselves, but also what they can contribute to others.

The roadmap was developed by the Dutch government in the rural Winterswijk district to address conflicts of interest, such as competition over water for drinking and agricultural purposes.

In the Winterswijk case study, participants used the roadmap to create two future scenarios for the region. One was a conservative vision where little changed, and the other saw the scenic appeal of the area strengthened. The stakeholders could explore the two scenarios and compare changes to production, employment and recreation.

The roadmap process proved to be a practicable and useful way of removing doubts about cooperation over new land uses. Other strengths included being able to involve policy makers from the beginning. The focus is on mapping goals for the future rather than emphasising environmental problems of the past.

There were some areas identified for improvement, including insufficient coverage of energy related issues during the process, the need for an independent process manager and the risk of one small but strong group overpowering others.

Source: de Graaf, H.J., Noordervliet, M.A.W., Musters, C.J.M. and de Snoo, G.R. (2009). Roadmap for interactive exploration of sustainable development opportunities: The use of simple instruments in the complex setting of bottom-up processes in rural areas. *Land Use Policy*. 26 (2): 295-307.



'Worldviews' provide basis for sustainable development

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Themes: Sustainable development and policy analysis

"Social sciences and natural sciences need to be brought together in a meaningful way to understand the relationship between natural, physical resources and people's behaviour and experience of well-being."

A recent study describes a multi-disciplinary approach to identify the best policy options for sustainable development, based on individual and collective 'worldviews'. The method can produce sustainability assessments of any social or ecological system or country.

Hundreds of definitions of 'sustainable development' have been given; this study focuses on the concept of 'quality of life' for humans both here and elsewhere, now and in the future. Originally, sustainable development was conceived of in physical terms, by setting an ecological or environmental target. However, economic and social dimensions have now also been brought to the forefront.

Sustainability science thus brings great challenges in linking social sciences with natural sciences (such as biology or chemistry), which need to be brought together in a meaningful way to understand the relationship between natural, physical resources and people's behaviour and experience of well-being. The study describes a methodology for this developed by the Netherlands Environmental Assessment Agency (PBL).

Since groups of people hold different values and beliefs about the best way society can sustain quality of life, the first step is to analyse their value orientations and their interpretation of sustainability problems, i.e. their beliefs. This study finds different tendencies, for example, preferences for progress over conservatism, freedom versus order, individual versus collective behaviour or market forces over government legislation. The idea of quality of life is strongly linked to such values and interpretations.

These worldviews are then used to create sustainable development scenarios which can be investigated in terms of risks and opportunities and positive and negative impacts. This allows policy options to be identified which are robust under several worldviews.

However, the relationship between individual worldviews and behaviour is complex. Although values are not a predictor of behaviour, they do offer insights into motivations for choices, such as mode of transport.

In the Netherlands, the method was used as part of the 'First Sustainability Outlook' to explore policy options for transport, energy and food. In the case of transport, it led to the conclusion that a mix of market-based and regulatory instruments are needed to reduce congestion and environmental problems. In the case of food, the method highlighted large tensions, for example, between global concerns surrounding poverty and biodiversity, and more local concerns about water and soil pollution.

The researchers believe that identifying worldviews provides a more cohesive approach to sustainable development and increases the effectiveness and legitimacy of policies in three ways: by supporting strategic decision making or identifying tensions; by enabling the pros and cons of a chosen scenario to be worked out; and by assessing the ease of implementation of agreed goals such as the EU's targets for climate change.

Source: de Vries, B.J.M. and Petersen, A.C. (2009). Conceptualizing sustainable development: An assessment methodology connecting values, knowledge, worldviews and scenarios. *Ecological Economics*. 68 (4): 1006-1019.



Making links between sustainable energy policies

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Themes: Climate change and energy, Sustainable development and policy analysis

“The study develops a framework for analysing the main EU directives designed to target sustainable energy development.”

Lithuanian researchers have produced a framework for analysing the interactions between different EU sustainable energy policies. In a new study, they show how this might be applied by evaluating the impacts of a range of different policy measures on sustainable energy targets.

Many different EU policy documents and directives have an impact on sustainable energy development. The interactions between the various recommendations and targets they set out are complex and require detailed knowledge of their contents, as well as complicated analyses. Therefore, it is essential that policy makers tasked with assessing the impacts of different energy policies, and making the necessary adjustments, are equipped with the right analytical tools.

The study addresses this issue and attempts to develop a framework for analysing the main EU directives designed to target sustainable energy development. The researchers present a list of key indicators for monitoring the progress of countries in achieving the goals set by different directives. These are taken from the Energy Indicators for Sustainable Development (EISD) created by the International Atomic Energy Agency (IAEA) and cover four priority areas: increases in energy efficiency, use of renewable energies, increases in energy security and reductions in greenhouse gases and other emissions.

A key aim of the work is to help policy makers identify the links between different indicators and, in this way, understand how one policy change can have impacts on sustainable energy development. The researchers used the Baltic States as a case study, laying out the main policy measures designed to achieve sustainable energy targets in this region. They demonstrate that several policies and measures are aimed at achieving the same targets. For example, energy taxes and subsidies for energy efficiency measures are both aimed at reducing energy usage in buildings. These policies also have an impact on energy security and greenhouse gas emissions targets.

The researchers present a quantitative evaluation method for each of the policy measures relevant to sustainable energy development. This takes the form of a simple scoring system in which positive impacts are scored three, neutral impacts are scored two and negative impacts are scored one. They use this scoring system to assess the overall impact (considering impacts for each of the four priority areas) in respect of EU sustainable energy policy targets. Using this system, one of the “best” policies is shown to be financial support for energy efficiency and renewables provided as subsidies or soft loans.

The researchers suggest such a framework could be applied to achieve sustainable energy targets by establishing the relevant trade-offs and conflicts.

Source: Štreimikienė, D. and Šivickas, G. (2009). The EU sustainable energy policy indicators framework. *Environment International*. 34: 1227-1240.



Local decision making tools for sustainable urban transport

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Themes: Sustainable development and policy analysis, Sustainable mobility, Urban environment

Recent research has investigated obstacles experienced by local government during the development of Local Transport Plans (LTP) in the UK. A new toolkit will help overcome these hurdles.

“Many people are reluctant to use transport models and their use may depend on greater government guidance and institutional support.”

The European Commission is increasing its involvement in urban transport. A green paper¹ has been issued and larger cities are recommended to produce sustainable transport plans². LTPs have had a long history in the UK, but when they were first introduced in 2001, they faced a lack of both financial subsidy and public acceptance. Furthermore, there were inconsistencies between local and national policies.

These problems persisted into the second round of LTPs in 2006, which also highlighted conflicts between transport and other public sector interests. Barriers to sustainable transport identified at the national level include poor integration of policy, regulation and institutions, limited public support and lack of political decision.

Previous research has found that improvements to public transport (such as increased frequency and lower fares), urban road-use charging and concentrated land use planning are the most effective measures for improving the sustainability of transport. This study found that local authorities in the UK also believed these to be the most important measures, but also the least effectively dealt with by policy.

The researchers produced several toolkits to assist local governments in generating, modelling and financing alternative transport strategies. Transport planning is more often solution led (e.g. aiming to build a light railway) than problem led (e.g. aiming to reduce urban traffic). As such, modelling was seen by many as unnecessary other than for large infrastructure projects. Many people are reluctant to use models at all and their use may depend on greater government guidance and institutional support.

Guidance was also produced for project appraisal. Government departments use many different indicators and appraisal methods, and national targets may not match local authority aims. For example, methods often emphasise travel time savings ahead of health and economic benefits. Important indicators which can be used to measure the success of LTPs include amount of public transport use and levels of walking and cycling. New indicators may also emerge to monitor developing aspects of sustainability.

The authors suggests that innovative methods will only be taken up if benefits are proven, or with encouragement from policy guidance. The UK government is expected to promote the toolkits to local authorities developing new LTPs for 2011.

Source: May, A.D., Page, M. & Hull, A. (2008) Developing a set of decision-support tools for sustainable urban transport in the UK. *Transport Policy*. 15:328-340.

¹ See: http://europa.eu/legislation_summaries/transport/bodies_objectives/124484_en.htm

² See: http://ec.europa.eu/environment/urban/pdf/final_report050128.pdf



New impact assessment method monetarises ecosystem damage

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Themes: Biodiversity, Sustainable development and policy analysis

A Danish study outlines a new way of placing a monetary value on damage to ecosystems which uses a 'budgetary constraint' – which equates to the maximum that an average person can pay for an additional life year. The method provides a tool for sustainable development by using measures usually applied to health economics.

“All impacts, whether on humans, ecosystems or resources, can be measured in the same terms.”

Life cycle impact assessment (LCIA) is part of a process that analyses the damage caused by different events or processes to humans, ecosystems and resources. Using the Eco-indicator 99¹ method, damage to each of these three “subjects” can be scored in order to help rank events or processes, such as climate change or road accidents, in terms of their overall impact and acceptability. In general, impacts on humans are ranked higher than impacts on ecosystems or resources.

This new research suggests it would be useful to replace the scores in LCIA analyses with monetary values – an estimate of what we would be willing to pay to avoid a specific type of damage. This would indicate the importance of the impact. The approach has been attempted previously, but inconsistencies arise because different approaches are used to cost different types of damage.

The new method uses just one system of costing based on Quality Adjusted Life Years (QALYs). This is the same system used in health economics to determine whether a particular medical intervention, such as a drug, is worthwhile. In other words, all impacts, whether on humans, ecosystems or resources, can be measured in the same terms.

The study gives QALYs a monetary value by estimating the annual economic productivity per capita at full well being. The authors argue that the value of the QALY is therefore equivalent to the average annual income at full well-being, which they calculate as €74,000 (but potentially between €62,000 to 84,000, due to uncertainties).

In this study, ‘ecosystem impacts’ are understood in terms of potential loss of biodiversity. The accepted measure of biodiversity loss is known as Biodiversity Adjusted Hectare Years (BAHYs). The study arrived at a cost/BAHY by considering different possible BAHY/QALY “exchange rates”. The average value of these exchange rates is in the range of the current spending on environmental protection in developed countries (estimated at 2 per cent of GDP). This equates to €1500 per person per year or €1400/BAHY (with an uncertainty range of €350 to 3500/BAHY). For the category ‘resources’, the study considers resource productivity. This is measured in terms of future economic output.

Source: Weidema, B.P. (2009). Using the budget constraint to monetarise impact assessment results. *Ecological Economics*. (68): 1591-1598.

¹ See: www.pre.nl/eco-indicator99/default.htm



Indicators to keep track of sustainable development

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Themes: Sustainable development and policy assessment

“As sustainability is a long-term concept, indicators are useful in gauging whether progress is being made towards sustainable living.”

A recent paper presents an overview of a selection of indicators that measure sustainable development. Sustainability indicators are easy-to-understand tools that can summarise or quantify complicated information in a meaningful way. They are useful substitutes when dealing with complex systems and can

Policy makers and wider society need to be able to assess whether activities are sustainable. As sustainability is a long-term concept, sustainability indicators are useful in gauging whether progress is being made towards sustainable living by assessing current conditions and anticipating long-term trends. In addition, sustainability indicators can provide an early warning of problems, help formulate strategies, communicate ideas and support decision-making.

Indicators can be developed for all levels of activities: for example, corporate performance, regional development programmes, national initiatives, ‘green’ GDP and international efforts to negotiate environmental protection.

Many indicators have been developed to measure progress in environmental, economic and social areas. Composite indices, however, combine a number of individual indicators to capture the essential components and complex relationships between the environment, the economy and society. For example, composite indices can be used to compare the performance of various sustainability measures of different countries.

It is necessary to work within a well-designed, suitable framework when developing composite indices and choosing suitable indicators. Two main approaches can be distinguished: a ‘top-down’ approach where experts and researchers define the framework and select the indicators and a ‘bottom-up’ approach where input is received from a wide variety of stakeholders.

Guidelines are given in the study for the development of composite indices. Policy goals should be clearly defined before constructing a framework and choosing the type and number of indicators that make up the parts of the composite index. This involves making choices which can be subjective at this stage. However, when the selected indices are combined into the composite index there are rules to guarantee consistency and meaningfulness of the composite indices. In addition, composite indices must be reliable and tested for robustness to ensure the messages they communicate are not misleading.

An example of a composite index is the Well-Being Index (WI), which is based on the idea that a healthy environment is necessary for healthy humans. The WI is the average of a Human Well-being Index (HWI) and an Ecosystem Well-Being Index (EWI). The indices HWI and EWI each consist of five sub-indices. The HWI comprises indices for Health and Population, Welfare, Knowledge, Culture and Society and Equity. The EWI comprises indices for land, water, air, species and genes and resources deployment. The five dimensions of the HWI are based on 36 indicators, those of the EWI on 51 indicators.

Source: Singh, R.K., Murty, H.R., Gupta, S.K., Dikshit, A.K. (2009) An overview of sustainability assessment methodologies. *Ecological Indicators*. 9:189-212.



A selection of articles on sustainable development from the *Science for Environment Policy News Alert*

Economic crisis hits investment in sustainable energy (23/7/09)

A new report demonstrates that investment in sustainable energy continues to rise globally and that in 2008 total investment surpassed fossil-fuelled energy for the first time. However, the rate of investment growth was much lower than in previous years.

The future of subsidy payments for organic farming (23/7/09)

Despite the current economic situation, organic farming is a growth sector in the EU. A recent EU-funded study suggests support payments from the amended 2003 Common Agricultural Policy (CAP) for organic farming will continue to play an important role in Western European countries and will become increasingly significant in new Member States.

Renewable energy boosts economy and brings new jobs (16/7/09)

Renewable energy policy aims to decrease greenhouse gas (GHG) emissions whilst stimulating the economy and employment. The first study to assess the economic effects of supporting renewable energy indicates that meeting the EU renewable targets could provide about 410,000 new jobs and 0.24 per cent additional GDP for the EU.

Overcoming cultural barriers to sustainable development (2/4/09)

Moving towards a sustainable society means overcoming perceived barriers such as high consumption. A new report argues that policy makers can and must play a central role in this cultural evolution.

White certificate schemes: interactions with the EU ETS (19/2/09)

Tradeable white certificate (TWC) schemes are attracting interest within the EU as a cost-effective way to encourage investment in energy efficiency. A recent analysis has investigated the impact of these schemes on the market for electricity. It suggests that such schemes will not reduce European or global carbon emissions unless they lead to a subsequent tightening of the EU ETS cap.

Environmental progress hindered by lack of qualified employees (30/10/08)

A landmark report has reviewed the emergence of a 'green economy'. It predicts that adaptation to climate change and emissions reduction schemes are creating new employment opportunities across the globe. One aspect of the report highlights the need for new training schemes to meet the growing needs of green industries.

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