



3rd Future Environmental Trends Conference
Energy, environment, and development
analysing opportunities for reducing poverty

14-16 December 2006
Bangalore, India

Conference summary



INSTITUT

Veolia Environnement





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The International Conference on “Energy, environment, and development – analysing opportunities for reducing poverty”, jointly organised by the Institut Veolia Environnement (IVE), The Energy and Resources Institute (TERI), and the Institute for Sustainable Development and International Relations (IDDRI), was held on 14-16 December 2006, in Bangalore, India. It brought together more than 200 researchers, practitioners, and policymakers from 24 countries. Through competitively selected technical papers, keynote speeches by renowned experts, and thought-provoking panel discussions, the conference focussed attention on the nexus between energy, environment, and poverty, and the challenges that it poses for sustainable development.

Inaugural session

Opening remarks Dr R K Pachauri, TERI

Welcome remarks Dr Georges Valentis, IVE
and Dr Laurence Tubiana, IDDRI

Special remarks Dr A Ramachandran, TERI

Keynote address Ms Rohini Nilekani,
Arghyam Foundation



Dr Pachauri opened the conference by acknowledging the guidance of IVE’s Foresight Committee in conceptualizing the conference. Introducing the theme of the conference, he said that it is critically important that a country like India makes wise choices and creates a model of sustainable development. Presenting highlights from TERI’s study “GREEN India 2047” on the state of use of India’s natural resources, he pointed out that water availability is fast reaching a state of crisis. There is a need for a mix of regulatory, fiscal, and economic measures to ensure optimal use of resources. We should remember Mahatma Gandhi’s words “Speed is irrelevant if you are going in the wrong direction”.

Dr Valentis welcomed the participants and appreciated the quality of papers submitted for the conference. Acknowledging the high calibre of the speakers, he wished the conference success, and expressed interest in the rich discussions ahead. On behalf of IDDRI, Dr Tubiana expressed pleasure at the organization of the conference, and looked forward to taking ideas back to France. Emphasizing the importance of the sustainable use of energy, she said that developing countries like India should not repeat the mistakes of the presently developed countries, but have the opportunity to adopt new technologies and new ways of thinking.

In his remarks, Dr Ramachandran pointed out that the prevailing forms of industrial and agricultural production in the last century have led to environmental degradation which we cannot afford to ignore due to its ecological, economic, and political consequences. The question is how we should develop in the future and meet the basic needs of the poor through sustainable livelihoods. The great challenge of increasing access to energy services can be met with an emphasis on decentralized systems and empowering local communities.

Ms Nilekani started her keynote address by recalling the Greek mythical hero Antaeus who derived his immense strength from the earth Gaia. She offered the opinion that the challenge of sustainable development needs to be discussed in the context of human motivation and behavioural change, rather than environmental considerations alone. Addressing this challenge requires a giant leap of faith, motivating the youth, and action by individuals at all levels.

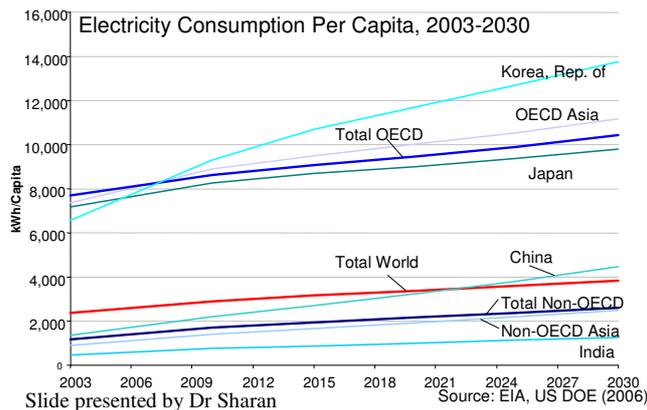


Energy – the ‘missing’ MDG

Chair Dr R K Pachauri, TERI

Keynote speech Dr Diwesh N Sharan, ADB

Asian electricity consumption will be only 25% of OECD averages in 2030



Access to modern energy services is a vital prerequisite for poverty reduction. Dr Sharan highlighted the urgent need for Asian countries to address both the supply of modern energy and the ability of individuals to purchase it. By 2030, developing Asia’s energy needs are projected to grow at more than twice the world average, but the number of poor depending on traditional biomass or without electricity is forecast to generally stay unchanged. Describing the vicious cycle between energy, poverty, and the environment, and the failure of the MDGs to include explicit energy targets, Dr Sharan outlined an alternate strategy to raise the per capita energy consumption levels of the rural poor. This would require energy supply targets supported by regulatory, fiscal, financial, and technological actions to enhance affordability.

Chair Dr Leena Srivastava, TERI

Papers • Dr Chandan Mahanta, IIT Guwahati • Dr Laura German, African Highlands Initiative • Ms Dawn Lippert, Yale and Dr VVN Kishore, TERI • Dr Ruth Nabinta, Adult Education and Sustainable Development Institute • Mr Kevo Luc Tussou, Department of Energy, Benin

Studies from North-east India, Uganda, Sudan, and Benin presented in this session showed that large rural populations in these regions face sharp energy deficits and poor quality of energy services. There is sharp inequity in energy access, exacerbated by depletion of natural resources, which acts as a barrier to social and economic development. Dr Mahanta’s paper gave emphasis to regional cooperation in energy security, increased accountability of different actors, and decentralization of decision making. Dr German’s study of Ethiopia pointed to agroforestry as an energy strategy compatible with existing land use and livelihood objectives. Ms Lippert’s analysis, presented by Dr Kishore, identified technical, financial, and market barriers to technology transfer and commercialization in India’s biomass briquetting industry, and proposed measures such as infrastructure adaptation, and use of non-agricultural biomass or pellet gasification. Presenting a parallel analysis of barriers to renewable energy implementation in rural areas of Benin, Mr Tussou called for greater capacity to design and monitor modern energy provision projects, with women being given greater control over such projects. Dr Nabinta suggested the formation of women’s cooperatives to create pools of capital to invest in energy solutions and boost domestic enterprises.



Photo presented by Dr German



Photo presented by Dr Kishore



Chair Dr Leena Srivastava, TERI

Panelists • Dr J Gururaja, retd. UNDESA • Mr Jean Jaujay, EDF • Dr Ananth Chikkatur, Harvard • Mr Emiel van Sambeek, ECN • Mr Khalid Semmaoui, TEMASOL • Mr Philippe Bosse, AFD/FFEM • Dr Moinul Sharif, GNESD



Though not explicitly stated in the Millennium Development Goals (MDGs), energy plays a vital role in their achievement. Countries should identify energy needs and set targets and timetables to meet them. The panellists discussed approaches for promotion of decentralised grid power with efficient use of renewable sources of energy. The development of reliable, clean and efficient energy should focus on improving energy services for economic growth, providing energy services for improving the quality of life, and strengthening energy security for macroeconomic stability. Recalling the experience of EDF on business models for renewable energy, Mr Jaujay said that there is no guarantee of sustainability with philanthropic projects, and that scaling up is possible only with replicable projects. Scaling up requires promotion of best adapted technologies, building local competence, and developing replicable financial and institutional frameworks. However, the challenges ahead are servicing peri-urban areas, and providing infrastructure to meet the increasing demand for decentralised energy. Mr Semmaoui presented a successful example of public private partnership in decentralised rural electrification in Morocco. The development of local competence must be combined with strengthened monitoring and evaluation of energy interventions.

Key messages

The provision of energy services should be linked with livelihood interventions and income generation. The focus should be on making energy services affordable, and on moving the rural and urban poor up the energy ladder. This needs innovative approaches such as developing markets for energy services rather than inputs. Further, the involvement of local stakeholders in energy sector planning is critically important.





Sustainable lifestyles

Chair Dr A Ramachandran, TERI

Keynote speech Prof. Emil Salim, Indonesian Biodiversity Foundation

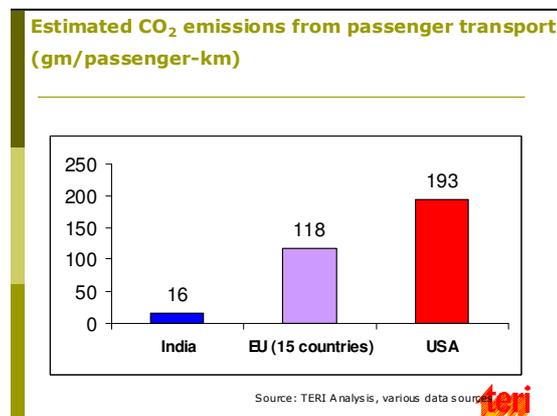


In an insightful address, Prof. Salim, Former Indonesian Minister for Population and Environment, talked about traditional Asian values which prioritised knowledge and spirituality over material consumption. He argued that the western model of economic development has led to unsustainable lifestyles due to the failure of the market to price natural resources and ecological services, and warned that we do not have more planets to exploit. The way forward is through price reform, for instance to make renewable energy made competitive relative to fossil fuels. Further there is need for fiscal policies that influence consumption behaviour, strengthening governance through civil society participation, promoting subsidies that directly help the poor, and provision of sustainable alternatives in transportation and settlements.

Chair Ambassador C Dasgupta, TERI

Papers • Dr Ritu Mathur, TERI • Mr Joshua Odeleye, Nigerian Institute of Transport Technology • Prof. Dilip Ahuja and Prof. D P Sen Gupta, NIAS • Dr Farhet Shaheen, Junagadh Agricultural University • Mr I Thanumoorthi, TERI

Papers presented in this session dealt with sustainable energy use and transportation patterns. Dr Mathur presented per capita carbon dioxide emissions from food production and processing, passenger transport, residential sector space heating and conditioning, and waste generation, all of which are very low in developing countries compared with developed countries. She posed a question to the larger audience on how individuals and governments can be made more willing to adopt sustainable living patterns. Mr Odeleye spoke about increasing transport demand in developing countries in the context of continued reliance on old technology. He proposed a mix of options including increased telecommuting, congestion pricing, work hour staggering, and infrastructure improvement.



Slide presented by Dr Mathur

Groundwater overexploitation for irrigation in western India was the subject of Dr Shaheen's presentation. According to him, when higher electricity tariff is levied for agriculture, groundwater usage becomes more sustainable. The vicious cycle of populist politics, energy subsidies, and unsustainable groundwater use can be broken by switching to pro-rata tariff, removal of energy subsidy, providing subsidy on energy saving technologies, and promotion of supply management. Prof Sengupta estimated that his proposal of daylight saving time for India could lead to annual electricity savings of 1.7 billion kWh or 0.35% of India's annual electricity consumption. Mr Thanumoorthi gave importance to the food processing sector, which is growing at a rapid pace in India, and is expected to contribute significantly to energy demand. Energy consumption in this sector can be reduced by introducing efficiency improvements in cold storage and use of solar driers.



Chair Ambassador C Dasgupta, TERI

Panelists • Mr Daniel Cukierman, Veolia Transport • Prof. Nicolas Gravel, CSH • Prof. Zhou Hongchun, DRC China • Ms Sylvia Lorek, SERI • Mr S Sundar, TERI • Dr Zhao Xingshu, CASS



The panel debated issues and options for changing to a more sustainable way of life. Radical shifts in sustainable consumption and production may lie closer to the heart of sustainable development than just efficiency improvements. Giving examples from Dhaka, Bangladesh and Bogota, Colombia, Mr Cukierman argued that metro rail is currently not an economically viable option, but bus rapid transport is a cheaper and faster means to improve public transport efficiency. In the Indian context, Mr Sundar expressed concerns about increasing private vehicle ownership and the lack of a coherent transport policy. Prof Gravel spoke in favour of freedom of choice, and suggested the use of ecolabelling, well-informed taxation, and legal regulation to influence people's decisions. Prof. Zhou described China's model of a circular economy, which aims at maximizing resource efficiency and minimizing waste, and is of great interest to all developing countries. The Chinese Government's priorities include energy conservation, water saving, arable land saving, material saving, and comprehensive resource utilization. The concept has been implemented in the sugar-making Eco-Industrial Park in Guigang, Multi-Gen model of coal-based power plants, comprehensive use in steel plants, and recycling of used products. The idea of circular economy can be taken forward by integrating it into rural, urban, and regional development, by transforming the mode of economic growth, and by developing new type of industries. Dr Zhao discussed rising energy prices and the widening gap between rich and poor due to globalization and presented biogas promotion as a way forward. Ms Lorek drew lessons from the reduction of specific energy consumption of households in Europe, and proposed measures such as ecological fiscal reform, corporate responsibility and accountability, clean and eco-effective production, education and public participation.



Photos presented by Mr Cukierman

Key messages

Lifestyles are changing as developing countries grow, economies develop, and consumption increases. But this process creates a potential for conflict as the gap between the rich and the poor increases in both developed and developing countries. We need to reduce our ecological footprint and learn to live with fewer resources. This requires the creation of sustainable alternatives, such as models for sustainable cities, and promotion of decentralised off-grid renewable energy for rural areas. A mix of approaches is required, including the use of economic instruments such as price reform or ecolabelling, and education to change attitudes among the youth.



Local dimensions of global environmental challenges

Chair Dr Georges Valentis, IVE

Papers • Dr Sarah Ahmed, University of Baroda • Ms Melba D'Souza, independent researcher, India • Ms Shova Thapa, University of Sussex • Dr R Uma and Mr Santhosh Raghavan, TERI • Mr Divaldo Rezende, Instituto Ecologica • Dr Harini Nagendra, Indian University and ATREE

Though climate change is a global problem, the burden is not the same for everyone and adaptation efforts are essentially local in nature. Dr Ahmed's presentation illustrated how countries in the South Asian region differ in terms of vulnerability to climate change, and would be negatively impacted in the pursuit of their MDGs. She recommended higher public expenditure on health and education to increase adaptive capacity of the vulnerable, and said that corporates could be incentivised to adopt villages and support achievement of specific MDGs. Ms D'Souza described the adverse impact of mining on water and food security, and on human health in Goa, India. Mr Raghavan presented data from a pilot assessment of household energy, indoor air pollution, and health in India. Space heating during winters and use of biomass cookstoves were primary causes for high levels of indoor air pollution. Mr Valentis stressed the importance of scientific research and case studies to influence policymakers and identify solutions. Corporates, the community and the government should undertake implementation projects in collaboration with one another. Conflicts are a threat not only at the global level but also at the local level and case studies such as these are necessary to enable us to work towards solutions.

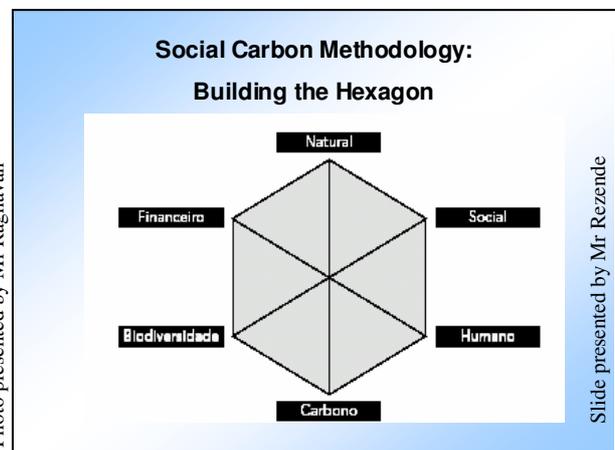


Photo presented by Dr Nagendra

Ms Thapa and Dr Nagendra presented case studies of interaction and conflict between biodiversity conservation and livelihoods in Nepal. Ms Thapa showed that relocation of dependent communities without providing alternative economic opportunities had a negative impact on biodiversity. She proposed biogas plants as an option to reconcile the conflict between conservation and biomass use for energy. Dr Nagendra showed that there is decreased conflict in community monitored parks, and that regular monitoring is a more important factor than tenure for sustainability of forests. Mr Rezende explained the concept of Social Carbon as a tool to strategically allocate project resources, and monitor sustainable development projects.



Photo presented by Mr Raghavan



Slide presented by Mr Rezende



Chair Prof. Akio Morishima, IGES

Panelists • Dr Q K Ahmad, BUP • Mr Jean-Marie Gugenheim, Veolia Water • Ms Rohini Nilekani, Arghyam Foundation • Dr Ambuj Sagar, Harvard • Ms Preety Bhandari, TERI



	World	China	India	USA	Japan
Energy/capita (toe)	1.642	0.962	0.513	7.938	4.087
Energy/GDP (ktoe/million PPP\$)	0.205	0.202	0.193	0.221	0.151
CO2 (fraction)		0.144	0.050	0.240	0.049
CO2/capita (kt)	3.920	2.739	1.162	20.233	9.432
CO2/GDP (kt/million PPP\$)	0.489	0.576	0.438	0.562	0.349
CO2/energy (kt/ktoe)	2.387	2.848	2.264	2.549	2.308

Source: World Development Indicators

Slide presented by Dr. Sagar

Several panelists remarked that Asia is especially vulnerable to climate change and there is an urgent need for adaptation and mitigation. While developing countries should start addressing the issue of mitigation, they also need to push developed countries towards undertaking mitigation measures. Some speakers felt that a cross dimensional approach is required, looking at economic, social, environmental and political aspects in an integrated manner when dealing with climate change policy and implementation at the local level. Public authorities, local community, NGOs, service providers, and the private sector should work together, and in particular, Mr Gugenheim gave examples to illustrate the benefits of involving the private sector to a greater extent. National policies need to be strengthened and should provide incentives for the use of clean technologies. Local policies should focus on promoting restraint in the use of natural resources. Pricing of technologies and services is important, while market-based instruments like the Clean Development Mechanism are also useful. In addition, Prof. Morishima and Dr Sagar said that national policies should also look beyond commercial gains and promote actions which will have large social and health benefits, irrespective of whether climate change benefits in such projects can be monitored or not. Dr Sagar spoke about the need to find acceptable technological solutions that will have minimal negative impacts, instead of trying to promote solutions that may be 'clean' but not accepted by the community at large.

Dr Ahmed and Ms Nilekani gave emphasis to better urban governance and political will, with massive capacity building required for government officials. With a view that public discourse needs to be deepened, Ms Nilekani also suggested that cities need to develop decentralized solutions like rain water harvesting, reduced use of plastics, and development of pricing mechanisms that promote restraint in the use of natural resources. Ms Bhandari offered the view that development is the best form of adaptation, and that institutional and non-institutional systems can help in the same. Several panelists and paper presenters highlighted the need for a reliable information base, and the need to integrate across case studies of climate change adaptation, to give a more useful comprehensive picture to policymakers.

Key messages

The achievement of the Millennium Development Goals is getting more difficult due to climate change, which can severely affect the reliability, accessibility, and affordability of water and other natural resources. There are significant interconnections between global environmental challenges and aspects of human well-being such as health, livelihoods, and migration. While this requires committed action at all levels, it should be noted that over-reliance of market solutions could exclude the poor. Instead, community management of natural resources has been seen to work better in the face of conflict, and hence, the need is to create suitable incentives for communities.



Globalization – forces of change

Chair Prof. Y K Alagh, Former Minister of Power, and Science and Technology, Government of India
Papers • Dr Ramesh Ramaswamy, ROI • Mr Jasjeet Singh Chaddah and Mr Kama Krishna, GSBF • Dr Surender Kumar, TERI University • Ms Kumudhini Ravindra and Dr Anjula Gurtoo, IISc

This session addressed issues of energy access in the changing global scenario, essential conditions to ensure that globalisation and economic growth translate into reduced inequities, and business and economic models necessary to enhance access of the rural poor to energy services. The session generated dialogue on how to combine technology innovation, local empowerment, and adaptation of existing knowledge and experience to suit local needs to provide goods and services that enhance their productivity. Dr Kumar's analysis revealed that rise in energy prices during 1974-80 induced rapid technological progress in high income countries, while technological progress in other countries was low. Dr Ramaswamy outlined the industrial ecology approach, which can help reduce the imprint of industry on the environment and ensure optimal use of available resources. This becomes especially relevant in developing countries with unequal resource distribution and resource scarcity. Ms Ravindra presented an economic value chain model to improve energy access by linking it with livelihoods and resource availability in rural areas. The model combines suitable energy carriers such as biogas, training of local people for operation and maintenance, participatory institutional set-up, and value enhancement activities such as cottage industries, thereby ensuring sustainable use as well as ownership of energy systems. Mr Krishna demonstrated the benefits of an innovative lighting technology that combines thin film solar technology and LED lighting in the backdrop of a sustainable value based business model providing the rural consumer efficient and higher quality lighting at a price comparable to their present source of energy supply.

Chair Prof. Y K Alagh, Former Minister of Power, and Science and Technology, Government of India
Panelists • Mr Raj Chengappa, India Today • Dr Hans Eerens, RIVM • Dr Laurence Tubiana, Director, IDDRI • Dr Vinod Vyasulu, CBPS

In the panel discussion, experts shared their views on globalization and the resulting inequities. Mr. Chengappa questioned the inequities present in energy pricing in India, stating that farmers do not require free electricity and at the same time, urban users can afford to pay more for energy. He emphasised that energy and environment crises are not adequately communicated, and stressed that these should be brought into the media in a way that young adults take active interest. Dr Eerens stated that the picture is not so dismal, and pointed out that the number of poor people has decreased. Economic growth has not resulted in proportional increase in energy use, but it is important to scale up local and national successes to the global level. Dr Tubiana expressed her concern for the global governance process, which is not functioning very well due to the fact that developed countries are slow to implement while developing countries have domestic concerns. If economic growth is given priority without giving consideration to the environment, then wrong investments may be undertaken. An international market should be set up to fund the development of technologies that both developing as well as developed countries can use for energy sustainability. A mix of carbon finance, overseas development assistance, and venture capital can promote technology development. Dr Vyasulu acknowledged that globalization has improved people's lives and poverty has declined. However, he felt that the definition of poverty needs to be changed in light of the globalization process and the increased disparity between rich and poor. There is a need to create empowered institutions and local governments should take an interest in technology development. Global collaboration is a must to develop cost-effective technologies.

Key messages

Globalization has the potential to provide access to cleaner and efficient technologies, develop human capital, and enhance employment opportunities. But there is a need for targeted international funding for the development of technologies for equitable development. In addition to ODA (overseas development assistance), important roles can be played by venture capital and carbon finance in this regard.



Technological leapfrogging

Chair Dr Diwesh Sharan, ADB

Keynote speech Prof. Ashok Jhunjhunwala,
IIT Madras

Prof. Jhunjhunwala shared some inspiring success stories of the innovative application of information and communication technologies (ICTs) for rural development. ICTs have been used to provide access to health care, skill-based education, agricultural expertise, weather data, and financial services. Local capacity building is a key element. Interestingly all these projects are presently financed by businesses and donations.



Chair Prof. Eric Godelier, Ecole Polytechnique

Papers • Dr Najem Al-Najem, Kuwait University • Mr Abhishek Nath, TERI • Ms Kamilya Cunha, University of Campinas • Mr Umesh Prasad Singh, Coal India

This session had several interesting presentations of new technologies and innovative applications of existing technologies to enhance energy access and reduce negative environmental impacts. Dr Al-Najem presented a feasibility study of the use of fuel cells for energy supply to reverse osmosis (RO) desalination plants. While the technology has large potential for reducing SO_x and NO_x emissions, the major challenges are cost and durability of the fuel cell technology. Mr Singh discussed methanogenesis for energy extraction from non-extractable coal deposits. Mr Nath described a decade-long initiative in India for energy efficient technology development and dissemination in small and micro enterprises like foundry, glass, thermal gasifier applications, brick, and puffed rice sectors. Energy savings to the tune of 15% to 50% have been achieved in various demonstration efforts in these sectors and a cumulative reduction of about 275,000 tonnes of carbon dioxide has been achieved in the past ten years. The priorities of this initiative are enhanced energy efficiency, high productivity, improved environmental performance, and innovative processing technologies for techno-social actions. The long-term goals are improved economic, environmental, and social conditions for entrepreneurs and workers of small and micro enterprises. In terms of funding for technology deployment and dissemination, Ms Cunha assessed the potential for Clean Development Mechanism (CDM) projects in Brazil, particularly finding good scope in renewable energy.

Chair Prof. Eric Godelier, Ecole Polytechnique

Panelists • Dr Ananth Chikkatur, Harvard University • Dr Pierre Jaboyedoff, SORANE SA • Prof. Ashok Jhunjhunwala, IIT Madras • Dr Ajay Mathur, BEE • Dr Saswinadi Sasmojo, Del Polytechnic

The panellists discussed whether current management tools or models are unilateral, how they can be adopted or modified for new technologies, whether technology transfer conflicts with local culture, and who are the agents to locally implement new technology.





For hundreds of villages in India grid electrification is not an option, and decentralised rural energisation is the solution. This can be based on conventional or renewable technology, but technological leapfrogging should be linked to livelihood opportunities. Dr Jaboyedoff drew lessons from his experience in India to stress the need to identify innovative ways of managing solid biomass, and to develop small-scale power gasifiers. Affordability is critical, and requires support from large donors. At the same time, the process should be flexible – design and technology should not be frozen. Dr Mathur traced the development of wind energy in India, and discussed the role of government policies and incentives in creating a market for wind power. On the other hand, energy efficiency in industries like cement was driven by private competition and willingness to take risks. Energy efficiency in the building sector has significant potential but currently there is a supply gap of trained architects – the government needs to provide the right signals in this case by specifying norms for the sector. Giving the example of TERI’s biomass thermal gasifiers for silk industries, Dr Mathur said that even if technology is not affordable, the product has to be made affordable. Prof Jhunhunwala made the additional point that technology has to be suitably modified to meet the needs of local people by understanding their fears and aspirations.

Dr Sasmojo was of the view that technology development is achieved by a continuous process of problem solving. Technology development should be socially constructive and based on cultural requirements. Prerequisites for technology leapfrogging are the existence of a group of actors to master the technology and persistently promote it, clear idea of resources and functioning of technologies, clearly defined goal and strategy for implementation. Dr Chikkatur related technology leapfrogging to technology transfer, but made the pertinent point that technology is more than products and hardware. The government has to provide institutional support as well as financial support and play a major role in coordinating the process of technology development or technology acquisition by having a well defined vision and by assessing challenges and constraints. Assessment of technology, monitoring and feasibility analysis has to be a continuous process. Important considerations include technology performance, physical investment, economics of technology, and subsidies. Unlike many speakers who concentrated on renewable energy, he said that improved technology is necessary for coal based power stations also.

Prof Godelier concluded the session by highlighting the importance of best practices closely linked to a specific situation, combining exploration of new technologies with exploitation of old technologies, and ensuring the suitability of technological solutions to cultural values.

Key messages

Technology transfer has to be made affordable through appropriate business models that are receptive to local needs and conditions. Technology should be thought of as products, not just research, and it is important to move from R&D to deployment. While local competence to provide energy services needs to be urgently developed, venture capital is needed to provide the requisite finance, while government can create the right enabling environment.





Revitalising R&D in Asia

Chair Mr S Sundar, TERI

Panelists • Prof. Shuichiro Asao, University of Tokyo • Dr R K Pachauri, TERI • Dr A K Vora, Tata BP Solar • Prof. Wei Zhihong, Tsinghua University • Mr Kentaro Toyama, Microsoft Research India

This session discussed measures to improve the status of research and development in Asian developing countries, with panellists drawing examples from India, China, Japan, United States, and other countries. Dr Vora described the roles of different players in R&D in India, and called for a new approach with a more collaborative framework. Prof Wei presented the Chinese strategy for promoting R&D. China's R&D expenditures have hit a historical high at USD 25 billion, or 1.23% of GDP. The country has a medium-term and long-term plan for science and technology development with targets for share of R&D expenditure in GDP, patent grants, and paper citations. Key roles are envisaged for universities and industrial research institutes, and are backed up by reforms in the process of science and technology project management.



Dr Pachauri called for a re-examination of the measurement of economic growth, greater involvement of industry for innovation, increased focus by multilateral organisations on areas that bring social benefit, development of a technology vision for the future by government, and a higher education system with more emphasis on R&D, with an agency like the United States National Science Foundation. Prof Asao stressed the importance of sustainability science and looked at sustainability research and education activities at institutions in United States, Europe, and Asia. He spoke about training experts with a global perspective, and equipping the younger generation with leadership skills, management capabilities, and far-sighted thinking to realise a sustainable society by 2050. Mr Toyama spoke about the fundamental mindsets and perceptions that prevent the most talented minds from joining the research profession. The opportunities and benefits of research must be widely communicated to attract the best students. At the same time researchers must connect to the real world by interacting more with grassroots communities so that they can understand, and hence attempt to solve their problems. To keep up quality, researchers should subject their work to peer review through publications and conferences, and maintain active engagement with the international research community.

The technical presentations in the conference highlighted the importance of inter-disciplinary research and the power of data to inform and change mindsets. In particular, community-level case studies and efforts are significant to better understand sustainable development challenges, but these need to be integrated and scaled up to improve policy responses.



Concluding session



“We have to move away from the limited – and limiting – idea that the environment is basically in conflict with development.”
– Prof. Amartya Sen

“Development is fundamentally an empowering process, and this power can be used to preserve and enrich the environment, and not just to decimate it.”
– Prof. Amartya Sen

Special remarks

Dr R K Pachauri, TERI

Valedictory address “Environment and Poverty: One World or Two?”

Prof. Amartya Sen, Nobel Laureate, and Lamont University Professor and Professor of Economics and Philosophy, Harvard University

Concluding remarks

Dr Georges Valentis, IVE

Dr Laurence Tubiana, IDDRI

In the concluding session, Dr Pachauri summarised the main points of the three days’ discussions. Drawing on assessments of the Intergovernmental Panel on Climate Change, and other studies, he also presented an overview of the implications of global climate change for the poor.

Prof. Sen delivered a scintillating valedictory address to a full house. He argued that if development is viewed as the expansion of human freedom, it becomes immediately clear that development cannot be divorced from ecological and environmental concerns. He emphasised that “environmental issues are inescapable parts of the battle against poverty”, and hoped that the conference would help highlight poverty removal and environmental enrichment as two parts of an integrated task.

Dr Valentis and Dr Tubiana concluded the event by thanking all the speakers and participants on behalf of the conference organisers.

The text of Prof. Sen’s speech and all presentations made at the conference are available at www.institut.veolia.org/en/activities/conferences-environmental-foresight/bangalore/home.aspx and at www.teriin.org/events/eedconference/programme.htm



Conference Advisory Committee

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Prof. Amartya Sen
Nobel Laureate, and Lamont University Professor and Professor of Economics and Philosophy,
Harvard University

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Agenda

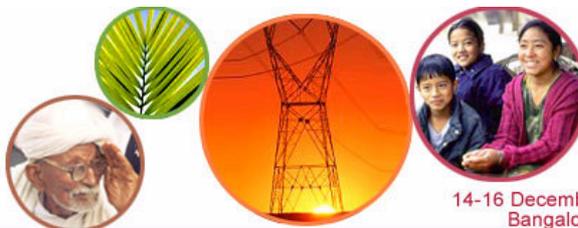
Video clips of the conference presentations are available in Windows Media Player format at www.institut.veolia.org/en/activities/conferences-environmental-foresight/bangalore/program.aspx

Thursday, 14 December 2006

0830-0930	Registration
0930 – 1015	<p>Inaugural session</p> <p><i>Opening remarks</i> Dr R K Pachauri, Director-General TERI</p> <p><i>Welcome remarks</i> Dr Georges Valentis, Managing Director, IVE Dr Laurence Tubiana, Director, IDDRI</p> <p><i>Special remarks</i> Dr A Ramachandran, Chairman, TERI Governing Council</p> <p><i>Keynote address</i> Mrs Rohini Nilekani, Chairperson, Arghyam Foundation</p> <p><i>Vote of thanks</i></p>
1015-1330	<p>Thematic session I: Energy – the “missing” MDG? <i>This session will discuss how energy policies can create opportunities for the poor, promote employment generation in rural areas, and reduce the negative environmental effects of current energy development.</i></p>
1015-1045	<p>Chair: Dr R K Pachauri, Director-General, TERI Keynote speech: Dr Diwesh N Sharan, Principal Economist (Infrastructure), Regional and Sustainable Development Department, Asian Development Bank</p>
1045-1115	Coffee break
1115-1215	<p>Thematic session I (continued)</p> <p>Paper presentations Chair: Dr J Gururaja, former Senior Technical Advisor, United Nations Department for Economic and Social Affairs (UNDESA)</p> <ol style="list-style-type: none"> 1. A critical appraisal of energy resource policies vis-à-vis development and growth in Northeast India (Dr Chandan Mahanta, Indian Institute of Technology, Guwahati, India) 2. Energy shortfalls and system nutrient decline: an integrated research approach for addressing problems on the environment-poverty interface (Dr Laura German, African Highlands Initiative, Uganda) 3. Ingredients for success in India’s biomass industry (Ms Dawn Lippert, Yale University, United States and Dr V V N Kishore,



1215-1330	<p>TERI, India)</p> <ol style="list-style-type: none"> 4. Women, economic development, and the environment (Dr Ruth Nabinta, Adult Education and Social Development Institute, Nigeria) 5. Utilization of sustainable energy systems for productive purposes in rural areas: the case of Benin Republic (Mr Kevo Luc Tussou, Department of Energy, Benin) <p>Panel discussion Chair: Dr Leena Srivastava, Executive Director, TERI Panelists:</p> <ul style="list-style-type: none"> ▪ Dr J Gururaja, former Senior Technical Advisor, UNDESA ▪ Mr Jean Jaujay, Senior Manager, Energy Access Programme, Electricite de France (EDF) ▪ Dr Ananth Chikkatur, Research Fellow, Science, Technology, and Public Policy Program, Kennedy School of Government, Harvard University ▪ Mr Emiel van Sambeek, ECN Policy Studies, The Netherlands ▪ Mr Khalid Semmaoui, General Manager, TEMASOL, and Mr Philippe Bosse, AFD/FFEM ▪ Dr Moinul Sharif, Programme Officer, Global Network on Energy for Sustainable Development (GNESD), Denmark
1330-1430	Lunch
1430-1745	<p>Thematic session II: Sustainable lifestyles <i>This session will focus on topics such as patterns of energy use in food production or waste generation, modification of consumption patterns, and sustainable urban mobility.</i></p>
1430-1500	<p>Chair: Dr A Ramachandran, Chairman, TERI Governing Council Keynote speech: Prof. Emil Salim, Former Minister for Population and Environment, Indonesian Biodiversity Foundation, Indonesia</p>
1500-1600	<p>Paper presentations Chair: Ambassador C Dasgupta, Distinguished Fellow, TERI</p> <ol style="list-style-type: none"> 1. Personal choices and associated emissions: Are “modern” lifestyles really sustainable? (Ritu Mathur, TERI, India) 2. Travel demand management: a sustainable policy option for transportation induced climate change in developing countries (Mr Joshua Odeleye, Nigerian Institute of Transport Technology, Nigeria) 3. A proposal to shift to using yearlong daylight saving time in India (Prof. Dilip Ahuja and Prof. D P Sen Gupta, National Institute of Advanced Studies, India) 4. Sustaining energy and resource use in groundwater: an optimal control model for scenario generation (Dr Farhet Shaheen, India) 5. Need for cost effective cold storage and solar energy penetration in the Indian food production and processing sector (Mr I Thanumoorthi, TERI, India)
1600-1630	Coffee break



1630-1745	<p>Thematic session II (continued)</p> <p>Panel discussion Chair: Ambassador C Dasgupta, Distinguished Fellow, TERI Panelists:</p> <ul style="list-style-type: none"> ▪ Mr Daniel Cukierman, CEO Asia, Veolia Transport ▪ Prof. Nicolas Gravel, Research Fellow, Centre de Science Humaines (Delhi) and IDEP-GREQAM ▪ Prof. Zhou Hongchun, Division Director, Department of Social Development, Development Research Centre of the State Council, China ▪ Ms Sylvia Lorek, Sustainable Europe Research Institute, Germany ▪ Mr S Sundar, Distinguished Fellow, TERI ▪ Dr Zhao Xingshu, Research Center for Sustainable Development, Institute of American Studies, Chinese Academy of Social Sciences
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Friday, 15 December 2006

0930-1300	<p>Thematic session III: Local dimensions of global environmental challenges <i>This session will focus on issues of equity, livelihoods, and access to common property resources, conflicts arising from water scarcity and threats to food security, and linkages between climate change adaptation and the Millennium Development Goals.</i></p>
0930-1100	<p>Paper presentations Chair: Dr Georges Valentis, Managing Director, VEI</p> <ol style="list-style-type: none"> 1. Climate change and the challenge to achievement of Millennium Development Goals in the developing countries (Dr Sarah Ahmed, Maharaja Sayajirao University of Baroda, India) 2. Impacts of water and food security on human health in the mining region (Ms Melba D'Souza, India) 3. Threats to biodiversity conservation: vulnerable livelihoods and illegal resource extraction in the Royal Bardia National Park, Nepal (Ms Shova Thapa, Science and Technology Policy Research, University of Sussex, United Kingdom) 4. Pilot study of household energy, indoor air pollution and health: assessment in households from four different regions in India (Dr R Uma and Mr Santhosh Raghavan, TERI, India)
1100-1130	Coffee break
1130-1200	<p>Paper presentations (continued) Chair: Dr Georges Valentis, Managing Director, VEI</p> <ol style="list-style-type: none"> 5. Social carbon – adding value to sustainable development and renewable energy projects (Mr Divaldo Rezende, Instituto Ecológica, Brazil) 6. The human dimensions of forest change: observations from the air and on the ground (Dr Harini Nagendra, Indiana University and ATREE, India)



1200-1330	<p>Thematic session III (continued)</p> <p>Panel discussion Chair: Prof. Akio Morishima, Chair of the Board of Directors, Institute for Global Environmental Strategies (IGES), Japan Panelists:</p> <ul style="list-style-type: none"> ▪ Dr Q K Ahmad, Chairman, Bangladesh Unnayan Parishad ▪ Ms Preety Bhandari, Director, Policy Analysis Division, TERI ▪ Mr Jean-Marie Gugenheim, Deputy General Manager, Veolia Water, Africa - Middle East - Indian Subcontinent ▪ Mrs Rohini Nilekani, Chairperson, Arghyam Foundation ▪ Dr Ambuj Sagar, Senior Research Associate, John F Kennedy School of Government, and Assistant Dean for Strategic Planning, Division of Engineering and Applied Sciences, Harvard University
1330-1430	Lunch
1430-1730	<p>Thematic session IV: Globalization – forces of change <i>This session will tackle issues of energy access in the changing global scenario. What conditions are essential to ensure that globalisation and economic growth translate into reduced inequities? What business models are needed to enhance access of the rural poor to energy and other services? How should we combine technology innovation, local empowerment, and adaptation of existing knowledge and experience to suit local needs to provide goods and services that enhance their productivity?</i></p> <p>Paper presentations Chair: Prof. Y K Alagh, Former Minister of Power, and Science and Technology, Government of India</p> <ol style="list-style-type: none"> 1. Industrial ecology and environmental priorities (Dr Ramesh Ramaswamy, Resource Optimization Initiative, India) 2. Dignity through electricity for rural under-privileged (Mr Jasjeet Singh Chaddah and Mr Kama Krishna, Grameen Surya Bijlee Foundation, India) 3. Measurement of energy price induced technological change: a directional distance function approach (Dr Surender Kumar, TERI University, India) 4. Developing an economic value chain model for energy and livelihood security of the rural poor in India (Ms Kumudhini Ravindra and Dr Anjula Gurtoo, Indian Institute of Science, India)
1530-1600	Coffee break
1600-1730	<p>Thematic session IV (continued)</p> <p>Panel discussion Chair: Prof. Y K Alagh, Former Minister of Power, and Science and Technology, Government of India Panelists:</p> <ul style="list-style-type: none"> ▪ Mr Raj Chengappa, Managing Editor, India Today ▪ Dr Hans Eerens, EEA - European Topic Centre on Air and Climate Change, MNP Office for Environmental Assessment associated



	with RIVM, National Institute for Public Health and the Environment, The Netherlands <ul style="list-style-type: none"> ▪ Dr Laurence Tubiana, Director, IDDRI ▪ Dr Vinod Vyasulu, Secretary, Centre for Budget and Policy Studies, Bangalore
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Saturday, 16 December 2006

0930-1300	<p>Thematic session V: Technological leapfrogging <i>This session will address issues of technology adaptation, building capability, ensuring financial and physical access, and policy frameworks that facilitate technology adoption.</i></p>
0930-1030	<p>Paper presentations Chair: Prof. Eric Godelier, Director of Research, Management Research Centre (CRG), Ecole Polytechnique, France</p> <ol style="list-style-type: none"> 1. Fuel cell operated reverse osmosis desalination system (Dr Najem Al-Najem, Kuwait University, Kuwait) 2. Knowledge sharing and development of linkages for technology development, dissemination, and concomitant social action in small and micro enterprises (Mr Abhishek Nath, TERI, India) 3. Status of implementation of the Clean Development Mechanism in Brazil (Ms Kamyla Cunha, University of Campinas, Brazil) 4. Methanogenesis of in-situ coal: a leapfrogging technology for sustainable energy extraction from non-extractable coal deposits (Mr Umesh Prasad Singh, Coal India Ltd, India)
1030-1100	Coffee break
1100-1130	<p>Chair: Dr Diwesh N Sharan, Principal Economist (Infrastructure), Regional and Sustainable Development Department, Asian Development Bank</p> <p>Keynote speech: Prof. Ashok Jhunjhunwala, Department of Electrical Engineering, Indian Institute of Technology Madras</p>
1130-1300	<p>Panel discussion Chair: Prof. Eric Godelier, Director of Research, Management Research Centre (CRG), Ecole Polytechnique, France</p> <p>Panelists:</p> <ul style="list-style-type: none"> ▪ Dr Ananth Chikkatur, Research Fellow, Science, Technology, and Public Policy Program, Kennedy School of Government, Harvard University ▪ Dr Pierre Jaboyedoff, SORANE SA and SDC consultant ▪ Prof. Ashok Jhunjhunwala, Indian Institute of Technology Madras ▪ Dr Ajay Mathur, Director-General, Bureau of Energy Efficiency, India ▪ Dr Saswinadi Sasmojo, Director, Del Polytechnic of Informatics, Indonesia



1300-1400	Lunch
1400-1530	<p>Thematic session VI: Revitalizing research and development <i>This session will discuss how developing countries can move towards higher levels of R&D capacity, innovation, and action for sustainable development.</i></p> <p>Chair: Mr S Sundar, Distinguished Fellow, TERI</p> <p>Panelists:</p> <ul style="list-style-type: none"> ▪ Prof. Shuichiro Asao, Project Professor, AGS Promotion Office, University of Tokyo ▪ Dr R K Pachauri, Director-General, TERI ▪ Dr A K Vora, former Managing Director, Tata BP Solar ▪ Prof. Wei Zhihong, Tsinghua University, Beijing ▪ Mr Kentaro Toyama, Group Leader, Technologies for Emerging Markets, Microsoft Research India
1530-1600	Coffee break
1600-1730	<p>Concluding session</p> <p>1600-1620 <i>Special remarks</i> Dr R K Pachauri, Director-General TERI</p> <p><i>Release of “GREEN India 2047 Renewed: Looking Back to Change Track”</i></p> <p>1620-1650 <i>“Environment and Poverty: One World or Two?”</i> Valedictory address by Prof. Amartya Sen, Nobel Laureate, and Lamont University Professor and Professor of Economics and Philosophy, Harvard University</p> <p>1650-1730 <i>Interactive session</i></p> <p>1730-1745 <i>Concluding remarks</i> Dr Georges Valentis, Managing Director, IVE Dr Laurence Tubiana, Director, IDDRI</p>



List of speakers

Dr Q K AHMAD

Chairman, Bangladesh Unnayan Parishad (BUP)

Prof Y K ALAGH

Former Minister of Power, and Science and Technology, Government of India

Prof Shuichiro ASAO

Project Professor, AGS Promotion Office, University of Tokyo

Ms Preety BHANDARI

Director, Policy Analysis Division, TERI

Mr Philippe BOSSE

AFD/ FFEM

Mr Raj CHENGAPPA

Managing Editor, India Today

Dr Ananth CHIKKATUR

Research Fellow, Science, Technology, and Public Policy Program, Kennedy School of Government, Harvard University

Mr Daniel CUKIERMAN

CEO Asia, Veolia Transport

Mr C DASGUPTA

Distinguished Fellow, TERI

Dr Hans EERENS

EEA - European Topic Centre on Air and Climate Change, MNP Office for Environmental Assessment associated with RIVM, National Institute for Public Health and the Environment, The Netherlands

Prof. Nicolas GRAVEL

Research Fellow, Centre de Science Humaines (CSH) – Delhi and IDEP-GREQAM

Prof. Eric GODELIER

Director of Research, Management Research Centre (CRG), Ecole Polytechnique, France

Mr Jean-Marie GUGENHEIM

Deputy General Manager, Veolia Water, Africa - Middle East - Indian Subcontinent

Dr J GURURAJA

Former Senior Technical Advisor, United Nations Department for Economic and Social Affairs (UNDESA)

Dr Pierre JABOYEDOFF

SORANE SA and SDC Consultant

Mr Jean JAUIJAY

Senior Manager, Energy Access Programme, Electricite de France (EDF)



Prof. Ashok JHUNJHUNWALA
Department of Electrical Engineering, Indian Institute of Technology (IIT) Madras

Ms Sylvia LOREK
Sustainable Europe Research Institute (SERI), Germany

Dr Ajay MATHUR
Director-General, Bureau of Energy Efficiency (BEE), India

Prof. Akio MORISHIMA
Chair of the Board of Directors, Institute for Global Environmental Strategies (IGES), Japan

Mrs Rohini NILEKANI
Chairperson, Arghyam Foundation

Dr R K PACHAURI
Director-General, TERI

Dr A RAMACHANDRAN
Chairman, TERI Governing Council

Dr Ambuj SAGAR
Senior Research Associate, John F Kennedy School of Government, and Assistant Dean for Strategic Planning, Division of Engineering and Applied Sciences, Harvard University

Prof. Emil SALIM
Former Minister for Population and Environment, Indonesian Biodiversity Foundation, Indonesia

Mr Emiel van SAMBEEK
ECN Policy Studies, The Netherlands

Dr Saswinadi SASMOJO
Director, Del Polytechnic of Informatics, Indonesia

Mr Khalid SEMMAOUI
General Manager, TEMASOL

Prof. Amartya SEN
Nobel Laureate, and Lamont University Professor and Professor of Economics and Philosophy, Harvard University

Dr Diwesh N SHARAN
Principal Economist (Infrastructure), Regional and Sustainable Development Department, Asian Development Bank (ADB)

Dr Moinul SHARIF
Programme Officer, Global Network on Energy for Sustainable Development (GNESD), Denmark

Dr Leena SRIVASTAVA
Executive Director, TERI

Mr S SUNDAR
Distinguished Fellow, TERI



Mr Kentaro TOYAMA
Group Leader, Technologies for Emerging Markets, Microsoft Research India

Dr Laurence TUBIANA
Director, Institut du Développement Durable et des Relations Internationales (IDDRI)

Dr Georges VALENTIS
Managing Director, Institut Veolia Environnement (IVE)

Dr A K VORA
Former Managing Director, Tata BP Solar

Dr Vinod VYASULU
Secretary, Centre for Budget and Policy Studies (CBPS), Bangalore

Prof WEI Zhihong
Tsinghua University, Beijing

Dr ZHAO Xingshu
Research Center for Sustainable Development, Institute of American Studies, Chinese Academy of Social Sciences (CASS)

Prof. ZHOU Hongchun
Division Director, Department of Social Development, Development Research Centre (DRC) of the State Council, China



List of paper presenters

Dr Sarah AHMED
Maharaja Sayajirao University of Baroda, India

Prof. Dilip AHUJA
National Institute of Advanced Studies (NIAS), India

Dr Najem AL-NAJEM
Kuwait University, Kuwait

Mr Jasjeet Singh CHADDAH
Grameen Surya Bijlee Foundation (GSBF), India

Ms Kamyla CUNHA
University of Campinas, Brazil

Ms Melba D'SOUZA
Independent researcher, India

Dr Laura GERMAN
African Highlands Initiative, Uganda

Prof. D P Sen GUPTA
National Institute of Advanced Studies (NIAS), India

Dr Anjula GURTOO
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Mr I THANUMOORTHY
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Department of Energy, Benin

Dr R UMA
TERI, Bangalore, India



About the organisers

INSTITUT

Veolia Environnement

Created in 2001, the Institut Veolia Environnement promotes foresight reflection on subjects related to the environment in partnership with universities or research organizations in order to shed light on the important issues for the upcoming decades.

www.institut.veolia.org/en/



A dynamic and flexible organization with a global vision and a local focus, TERI was established in 1974, and conducts research activities in the fields of energy, environment, and sustainable development.

www.teriin.org



Founded in 2001 as a research consortium, IDDRI became a non-profit, non-governmental think tank in 2003. It provides forums and networks creating common culture on sustainability issues among stakeholders.

<http://www.iddri.org>