CHANGING COURSE

A contribution to a Global Energy Strategy (GES)

An Öko-Institut Policy Paper by

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Foreword

Building emission-poor economies in the South and North is actually implementing cosmopolitan politics (The Jo'burg Memo, p. 39)

More and more scientists agree, that the increasing frequency of flooding that we witness in many parts of the world is already a first sign of climate change. But these floods give but a faint taste of the things to come if the estimates of the Intergovernmental Panel on Climate Change of a rise in mean surface temperatures of between 1.8°C and 5.8°C come true by the end of this century.

Southern countries and their poor populations are by all predictions most affected when the world's climate changes. As our Jo'burg Memo[1] puts it most eloquently: "As it happens, not every citizen of the world is equally exposed to climate turbulence; it is the rice farmers in the Mekong Delta and the fisher folk along the coast of Senegal, the shepherds in the highlands of Ethiopia or the slum dwellers on the hillsides in La Paz, whose livelihoods are threatened by climate change. People will be forced to leave their homes and homesteads. The economic base of numerous villages and towns will be altered by the changes brought to agricultural production and productivity. Migration to cities may increase. Shanty towns will risk mudslides and devastation. And diseases affect those with the least defenses – the poor."

It is well known, that our fossil fuel based energy system is the main cause for climate change, while a large part of the world's population has not even access to modern energy services, and has not partaken in the benefits of the fossil energy system.

Restructuring the energy systems in the North towards environmental sustainability and "leapfrogging into the solar age" (The Jo'burg Memo) in the South, while providing access to energy services to those so far excluded, is therefore not a luxury, but an imperative of justice towards the poor.

There can be no doubt: It is the duty of Northern countries to bring their greenhouse gas emissions dramatically down within the next decades to a level per capita that is possible to be realised by every citizen on earth without damaging the climate. To address this challenge to the North, the Heinrich –Böll Foundation has already commissioned two studies by the Öko-Institut:

- The study "Energy Turnround 2020" (German edition 2000, updated English edition 2002) analyses the scenarios for a sustainable energy future for Germany, and indicates the central policies towards this end.
- The policy paper "Sustainability and the Future of European Electricity Policy" (2000) outlines some key challenges and policies to redirect the liberalising European electricity market towards sustainability.

[1] Heinrich-Böll-Foundation (2002): The Jo'burg Memo. Fairness in a fragile World. Memorandum for the World Summit on Sustainable Development. By Wolfgang Sachs et al.- Available at www.joburgmemo.org

In a move from the national to the European and now to the global level, this third paper addresses the challenges of a global energy strategy, focusing on the windows of opportunity that exist in the rapidly expanding energy markets in the South, and on the need to provide access to energy services to those still lacking them. The idea for a policy paper that looks at the challenges of a global energy strategy was born prior to the Jo'Burg summit, when some hope still existed that the Summit might at least initiate a process towards a global energy strategy. We continued with the project even when it became clear, that the official Jo'burg process will not negotiate around a global energy strategy. We then presented the project during PrepCom IV in Bali and a draft of this paper at the Johannesburg Summit itself.

But Johannesburg proved to be just a small step on the long road towards a global energy strategy. The negotiating parties were reluctant to set clear, quantitative and time-bound targets for the expansion of renewable energy sources, not even to speak about the more ambitious endeavour of a global energy strategy. Once implemented, such a strategy could improve the quality of life for billions of people, and become the second pillar of global climate policy, complementing but not replacing the emission-oriented framework of the Kyoto-Protocol by co-ordinated policies and measures.

The stakes and resistances are high, energy is big business and a cornerstone of every modern economy. Exports of fossil fuels are the economic backbone of a number of Southern countries, who feel as threatened by any move away from them as some oil-addicted economies of the North. This alliance of the unwilling prohibits major multilateral progress at the moment. But Johannesburg was also the birthplace of a new form of partial multilateralism: the coalition of like-minded-countries that issued the declaration "The way forward on renewable energy". The upcoming International Conference on Renewable Energy, which will be hosted by Germany in 2004, will provide a further opportunity to strengthen this coalition.

The Heinrich –Böll Foundation will participate in the preparation of this conference and in its follow-up processes. We will support our partners in formulating their perspectives and demands, and provide space for international dialogue, thus contributing to strengthening international networks around these new forms of multilateralism.

We are convinced that sustainable energy holds the promise of a better future for all on this planet, and that the time has come to discuss central elements of a global energy strategy. This contribution is intended to give an impulse to this debate, and to bring a discussion into focus that is all too often fragmented into specialised circles. We will continue working on this issue: Your feedback is welcome!

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Darmstadt/Berlin, March 2003

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Contents

List of Tables

List of Figures

Executive Summary

A globally sustainable energy system must rely on energy efficiency and renewable sources of energy – this is the consensus from a variety of research and policy analysis carried out after the Rio '92 World Summit. An efficient world energy system run by renewables, thus fostering human development without compromising the global environment, offers a *feasible vision* for the 21st century

The shift towards sustainable energy systems creates tremendous opportunities for private investments, job creation, and economic development, especially in rural areas.

The positive interlinkages of sustainable energy with e.g., social development, health benefits, and reduced vulnerability, as well as price-stable services, make it the *cornerstone of any sustainability strategy* – as numerous studies have substantiated, and the World Energy Assessment, the CSD, the IEA, World Bank, and governments from industrialized and developing countries have acknowledged.

Since the transformation of today's energy systems towards sustainability requires a fundamental change in the sector, there will be losers, but also winners. Both are concerned by the uncertain scope, speed, and substance of potential changes in the decades ahead.

Beyond the principal vision of a globally sustainable energy system, no precise roadmap can be drawn, and no global management can govern the process from the top: if the transformation is to succeed, it will involve a multitude of actors, and will be built from the variety of circumstances in countries and regions.

Therefore, the key tasks of the coming years include encouraging and supporting the transition towards sustainability, involving both public and private stakeholders, and building alliances for the next crucial steps.

A *strategy* provides a guideline between today's challenges and visions for the future. Both guidance and alliances are especially needed in the starting phase to overcome manifold obstacles. A Global Energy Strategy should not only outline a clear vision, but also indicate a step-by-step approach with near term goals.

A GES may not be embraced initially by all but only by a group of like-minded countries and businesses – once it achieves momentum, however, others will follow.

Though the challenges of the transition towards a globally sustainable energy system were discussed at the World Summit on Sustainable Development (WSSD), the Plan of Implementation for energy issues is rather weak. Moreover, the failure to agree upon a global renewable energy target indicates the problems of building consensus for changes.

In the WSSD follow-up, the consequences of these challenges have *yet to be drawn*, to be discussed, and to be agreed upon politically – or at least, alliances of forerunners must be formed to further progress towards sustainable energy.

The following key recommendations were derived as a contribution to this process and as *preliminary elements* of a Global Energy Strategy still to be developed:

1. A global energy strategy must reflect the strong interactions between energy and sustainable development, and has to focus on crucial fields of action: building a more sustainable base for the future development in less and newly industrialized countries; significantly reducing health and environmental impacts of energy supply and use, both on the local, and global scale; introducing sustainable energy technologies to markets in industrialized, *and* developing countries; shaping energy *markets* to reflect social and environmental concerns.

2. Agreements on *key targets* either among the international community, or between groups of like-minded countries are essential for a GES. In a step-by-step approach, a GES should set *near-term* targets for increasing (rural) access to clean energy, for reducing CO_2 emissions from industrialized countries, for massively increasing overall energy efficiency, and for globally raising the share of new renewable energies. The GES should create procedural benchmarks and decision criteria for sustainable energy technologies in a process similar to the WCD, while the political implementation is the task of the international community or – as a first step – an alliance of like-minded countries.

3. To achieve a globally sustainable energy system in the medium- to long-term, a *massive shift* towards energy efficiency and renewable sources of energy is needed *within the next decade*. As population and economic growth drive the demand for energy services in developing countries, the energy infrastructures of these countries will need to be expanded significantly. At the same time, the energy systems of industrialized countries require re-investment needs of up to 35% until 2015. This opens a *window of opportunity* to avoid further "lock-in" to fossil and nuclear fuels, and to reduce the carbon-intensity of the global energy system. Toward this end, the GES must offer clear benchmarks.

4. Just as fossil and nuclear energy were developed in the 20th century with massive public support, a transition towards sustainable energy in the 21st century can be managed only if public support is shifted towards energy efficiency and renewables: A first benchmark is a *world-wide moratorium on public support* for the development of *new* coal mines and gas/oil resources for the next decade (2005 to 2015). This "break" will not only enable a re-focus of public financial resources towards the implementation of sustainable energies, but also send a strong signal to the private sector regarding the priorities of future energy business.
   A G8 commitment to such a moratorium would be the logical follow-up to its Renewable Energy Task Force Report and should be pursued in conjunction with a Multilateral Development Banks (MDB) and Export Credit Agencies (ECA) moratorium on bilateral and multilateral Official Development Assistance funding for *new* fossil resource extraction projects.

5. Simultaneously, a GES needs a *global implementation effort* for sustainable energy, which consists of public support, market guidance for private investments, and North-South cooperation. Several industrialized countries, some developing countries, and international energy companies have already started to re-orient their policies and business plans towards renewables and energy efficiency by setting their own targets. Lessons from the first movers should be included in poli-

cies to re-shape ODA in the energy sector and to create strong business opportunities through governmental commitments towards sustainable energy.
The EU doubling target, national commitments of e.g., Brazil, Germany, India, and others to increase the share of renewables, as well as renewable energy portfolio standards in US States (e.g., California) are *encouraging examples*. Policies like guaranteed feed-in tariffs for renewable electricity, tax incentives, and targeted market introduction grants should also be applied in developing and EIT countries and must be acknowledged by the WTO as necessary elements of the transition towards a globally sustainable energy system.

6. During the transition period towards a globally sustainable energy system, the more efficient and cleaner use of fossil fuels is needed especially in Economies in Transition and Developing Countries with domestic fossil resource bases. *Cogeneration* for electricity, heat, and cooling is a key technology for the commercial sector in (Mega)cities and industrial sites. ODA should be targeted to facilitate investments in this area, and *sector reform must adequately address* the environmental and economic benefits of cogeneration technologies.

7. With respect to Developing Countries, access to modern and clean forms of energy is crucial to enable development and to reduce reliance on unsustainable biomass, especially in rural areas where up to ¾ of the poor are living. The GES must include a *massive deployment* of solar and sustainable biomass technologies as well as micro hydro and diesel/wind hybrid schemes for village mini-grids as a joint project of bilateral and multilateral donors and private sector companies. The *Global Village Energy Partnership* initiative, REED of UNEP and UN Foundation, as well as other examples, might act as starting points toward this goal.

8. The re-orientation and re-focusing of ODA is certainly needed to *finance the transition* towards a globally sustainable energy system. GEF funds should not only be replenished, but also significantly expanded in the next decade. Furthermore, revenues from carbon trade and CDM/JI projects could cover *some* of the costs. But even a re-shaped ODA, a replenished GEF, new carbon funds, and national governmental sources for R&D are not enough: while they will serve (and already have done so) to *pull* private sector investments into pioneer markets for renewables and energy efficiency, they cannot deliver the full-scale deployment of a sustainable energy system within the time-frame needed.

9. Since sustainable energy development is a bottom-up process of engaging people and creating opportunities for economic development, a major shift of ODA to *micro-financing schemes for energy efficiency and renewables* is necessary. Micro financing could play a particularly important role in enabling access to modern energy services in the least developed and rural areas. As preliminary benchmarks, 35% of the ODA funds for sustainable energy should be managed through microfinancing until 2010, and 50% until 2015.

10. Achieving a timely transition necessitates a *global market push* substantiated by a Global Sustainable Energy Fund. The example of the Montreal Protocol shows that the private sector follows quickly once the right incentives exist.
However, the Energy Fund needs to be far larger than the Montreal example –an amount of $10 billion is needed annually. For its creation and replenishment, *new* financial sources should be used like user fees of Global Commons, fossil energy

taxes, or a Tobin Tax. Additionally, resources currently spent on subsidies for fossil and nuclear energy should be reallocated to the Fund, too.

11. R&D expenditures of *industrialized countries* should be targeted towards *global partnerships* to develop solar-thermal power, solar cooling, offshore wind, and biomass gasification. On the demand-side, advanced EE technologies, especially for buildings, and the industrial sector should be covered as well.

12. Privatizing and restructuring the energy sector to foster more competition in developing countries, and EITs, as well as in industrialized countries, *could* favour the changes needed – but this process must be adequately managed by good governance – *both on the governmental, and the private sector side.*
    The challenge for a GES is to integrate environmental and social impacts of energy production and use into the restructuring objectives and implementation processes. In addition to the phase out of subsidies for unsustainable energy sources, *competitive* policies to encourage efficiency and renewables should be formulated and implemented by governments, taking into account distributional effects on the poor. Toward this end, strengthening regulatory capacities comprises a main pillar of the GES. Considering the variety of specific circumstances, a multitude of decentralized activities is needed in collaboration with existing structures. Networks and decentralized approaches should be given priority in the design of institutional arrangements related to a GES.

13. Besides governments' *active shaping* of sustainable energy *markets* and the existence of adequate funding to invest in them, the magnitude of knowledge, technologies, and skills needed for the transition represents another core challenge to a GES. Effective management of the creation, exchange, and dissemination of the knowledge and skills requires a *collaborative process* between the North and the South and between public and private organizations. This process must overcome the fossil and nuclear "lock-in" of scientists, engineers, business leaders, and the political administrations around the world as well as their pre-occupation with the supply-side of the energy system. Instead of creating a new UN organization, it is recommended that this work be accomplished by linking and strengthening *networks* on sustainable energy throughout the world, in accordance with the UNEP *Global Sustainable Energy Network,* which was initiated at the WSSD as a Type-II-partnership. The coordination of this effort might well be the core task of a renewed and extended UNEP. The project coordinators would receive the resources and the mandate to work jointly with e.g., the UNDP and GEF and to support and promote efforts of capacity-building and technology transfer, as well as to serve as an information clearing house.

14. As a follow-up to the WSSD, a *Global Energy Strategy,* jointly funded by public and private sources, is supposed be developed in a multi-stakeholder process within the next few years. The GES also needs to address the transport sector, and to explicitly integrate gender aspects as well. Within the GES formulation process, active involvement and participation of developing countries and NGOs should be supported. The overall objective of the GES should be to establish – as far as possible – a *globally agreed base* for sector policies of MDB, ECA, and bilateral funding from industrialized countries, as well as a clear private sector business

perspective. As a first step, a joint policy paper with clear commitments of a group of like-minded countries could *serve as a core* from which a GES might emerge.

1 Introduction

Energy flows underlie all human activity and substantially influence both the economic and the ecological systems locally and regionally, as well as globally:

- Energy is a major source of *environmental burdens* – from land use to acid emissions, from solid wastes to greenhouse gases, and can also cause public risks - from oil spills in pristine areas to nuclear contamination of population centers.
- Energy trade is a significant *driver of globalization*. The oil market already generates global price signals, while hard coal, and liquefied natural gas are developing towards global markets as well. Major energy companies play an increasing role on the energy markets worldwide. Globalization trends can also be observed for many energy technologies, as well as energy appliances.
- Energy infrastructure expenditures consume up to 5% of the GNP in most industrialized (and a growing number of developing) countries. Furthermore, costs for energy use contribute another 5% of the GNP in the OECD, reaching up to of GNP in some developing countries.
- Energy is a *major business* – fossil-fuel extraction and processing is the source of up to 50% of the GNP in some countries. Because of the inhomogeneous regional distribution of fossil fuel resources, the vulnerability to both turbulences on energy markets and massive changes in the energy sector is significant for many countries.
- Energy technology is *developing rapidly* and energy and environmental policies are major drivers for economic developments, as R&D expenditures of OECD countries indicate.
- Access to clean energy services is a *key issue for development*. Since technological development requires a sufficient and stable energy supply, inaccessible clean energy presents a massive obstacle for development in many low or least income world regions.

Since the 1992 Rio Declaration, energy issues have been addressed in various circles, bodies, studies, and conferences. Energy was addressed at the WSSD[2], though mostly with respect to renewable energies. As energy is linked to infrastructure development, and poverty issues, it is a fundamental area of global concern.

Given this context, the *Heinrich-Böll-Foundation* commissioned the Öko-Institut (Institute for Applied Ecology) to prepare a policy paper on principal elements of a *Global Energy Strategy (GES)* as a contribution to the WSSD, and its follow-up process[3].

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[2] i.e. the World Summit on Sustainable Development (WSSD), held from August 26 through Sept. 4, 2002 in Johannesburg, South Africa (see www.worldsummit.org for details).

[3] In parallel, various other institutions, and organizations prepared inputs on energy issues for the WSSD (e.g., IEA, UNDP, UNEP, World Bank, as well as several NGOs).

This GES paper is not meant as a comprehensive study, or a final blueprint, but as a *focused outline* of the fundamental issues that a GES should address.

2 Objectives of the GES Paper

The paper addresses key challenges of the global energy system, especially regarding

- securing global commons and global public goods, in line with development options, i.e. a sustainable global energy economy (Section 3),
- technological prospects, promises, and myths as well as economic and political developments (deregulation, globalization, public-private co-operation), i.e. the general environment, which a global energy strategy has to deal with (Sections 4-5),
- experiences with, and recent performance of, major financial players (bilateral and multilateral development banks) regarding sustainable energy provision (Section 6),
- future options for energy financing (Section 7),
- and – to further the discussion – key recommendations for a GES (Section8).

The paper[4] mainly focuses on the interaction of industrialized countries with developing countries and European countries with economies in transition (EIT) with respect to energy. An introductory section deals with the overall global concerns and the role of the industrialized "North".

The paper does not give comprehensive treatment of the energy system nor the related problems in the different regions of the world. Such analysis is available from manifold studies presented by various institutions, both for the present situation, and future development options. Regardless of different approaches and perspectives, the outcome of all analysis reaches one consensus: today's energy system is *not* sustainable. The environmental burden of the current energy system is unacceptable, and for a large share of the world's population, access to adequate and clean energy services is lacking.

Not all problems result from global developments or interactions -- many must be solved with national or regional policies. However, *global action* is needed to address a plethora of challenges.

The GES paper is meant to highlight crucial issues and core elements of a global policy framework on sustainable energy, not to answer all questions, and is published to further (and substantiate) the discussion on global policies for the energy sector.

Based on some analysis and evaluation of experiences (Sections 4 through 6), the paper discusses the overall "policies and measures" toward sustainable energy provision in more detail. Derived from these findings, the authors indicate implications for the future financing of a sustainable energy transition (Section 7). The paper finally highlights some consequences for "good governance", financial institutions, and North-South policy (Section 8).

As the paper is meant to stimulate discussion, both the authors, and the Heinrich Boell Foundation, welcome responses – be it supportive or critical feedback.

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[4] A separate GES paper draws consequences for the national policies of Germany. This part is currently being prepared, and will be available in German only.

3 The GES Paradigm: Towards a Sustainable Energy System

3.1 Energy and Sustainability

Energy services are fundamental to social and economic development – they play an important political role, e.g., to eradicate poverty, to ensure the quality of life, to develop rural and urban areas, and to improve equal gender opportunities.

In the ensuing decades, the global energy system will be confronted with fundamental challenges: A growing world population, which could reach 8 billion in 2020, and close to 10 billion in 2050, needs sufficient supply of energy services. Population growth will mainly take place in countries that have limited access to clean energy, and almost all population increase expected during 2000-2030 will occur in urban areas of the less developed regions whose population will likely double to 4 billion in 2030 (UN 2001). This growth will increase both the "urban poor" and rural energy starving.

Today, 2 billion of the world's poorest people live on less than $1 per day, and consume jut 0.2 tons of oil equivalent (toe) per capita, while 1 billion of the richest people use 25 times more. Some 1.6 billion people have no access to electricity, and the energy supply of more than 2 billion comes from burning wood and dung.

The well-recognized connections between energy and economic growth, environmental and human health, gender equity, water, agricultural productivity, information and communications technologies, risk and disaster management etc. underline the importance of the energy sector for *any* sustainability strategy. Clearly, energy is a critical factor influencing the global community's responses to, and action on, several UN Millennium Development Goals[5], including those aimed at reducing poverty.

Since the Rio Declaration of 1992, the discussion on sustainability has evolved into a broad consensus among scientists, politicians, and the public that there are several key principals of sustainability. For energy, these basic principles can be formulated as follows:

- At a minimum, a sustainable energy policy must sufficiently supply the basic energy service needs of a growing world population and future generations.
- As economic wealth is unequally distributed between industrialized and developing countries and regions, and access to energy services also differs significantly *within* countries, equal opportunities to access basic energy services must be guaranteed for all society members.
- Environmental burdens must be limited to a level ensuring the (life-support functions of nature in the long-term. Endangering mankind and nature with environmental pollution and high risk technologies must be avoided.
  Currently, the energy sector causes serious environmental problems on global, regional, national, and local levels. The environmental impacts of energy extraction, processing, and use are manifold. From a global perspective, especially

[5] The UN Millennium Development Goals are available at www.un.org/millenniumgoals

the anthropogenic impact on the climate system from greenhouse-gas emissions (IPCC 2002), the decline of biodiversity from unsustainable biomass use, and devastation of ecosystems by energy infrastructures are of growing importance. But also the regional acidification of soils, lakes and rivers, and nuclear contamination generate heavy burdens for nature and societies (UNEP 2002). The destruction or contamination of ecosystems often accompany destruction or endangerment of large human communities (WCD 2000, UNDP/UNICEF 2002).

Based on these principles, general goals and directions can be derived for the transition of today's energy system towards a (more) sustainable one.

3.2 Implementation Principles of Sustainability

Taking into account the different technologies and options for the energy sector, a global framework of nine implementation principles are the core paradigm of a sustainable energy system:

1. Energy services should be sustained and expanded by energy efficiency improvements, renewable and low polluting/low risk technologies so that resources are sustained and environmental burdens and risks are minimized.
2. Utilization of renewable energies should not exceed their regeneration rate.
3. Environmental burdens of energy utilization should be limited to levels not exceeding the regeneration and/or adaptation capacities of ecosystems.
4. Utilization of energy technologies with large risk potentials and low fault tolerance must be minimized.
5. Energy services should be supplied at the least cost, taking into account their externalities.
6. The transition of energy systems towards sustainability should be implemented so that employment effects and other social aspects are positive. Negative impacts must be limited to levels that could be compensated with other policies.
7. Conflict management shall follow democratic principles, thus taking into account the interests of future generations sufficiently.
8. Global justice and equal opportunities in the energy sector lead to a special responsibility of industrialized countries, and call for fair terms of trade.
9. Technical and social innovations play a crucial role in the transition process towards a sustainable energy system, and therefore must be strengthened.

These management rules can be used for national policies as well as for the framework of a global energy strategy.

The potentially most prominent component of the GES paradigm is the fact that energy issues can no longer be separated from issues of globalization, economic restructuring, and human development (see Section 4), and that both the environment and economic activity must be treated politically so that their *interlinkages* are taken into account.

As conflicts in diverging interests and different emphasis on ecological, social, and economical issues will accompany the transition towards sustainability, the design of tran-

sition *pathways* which maintain social, economic and environmental capacities is far more challenging than defining ambitious long-term goals or visions.

3.3 The Special Responsibility of the Industrialized Countries

A true globally sustainable energy system will comprise all of the planet, all people, and all nations. Still, this paper focuses in the next sections mainly on the so-called developing countries and those with economies in transition (EIT) – and in the context of the WSSD, the UN und multilateral organizations are also covered to some extend.

Before going into that, though, the role of countries in the industrialized North with respect to sustainable energy must be - at least briefly - discussed, as this group of nations has been – and, for the years to come, will continue to be – the key driver of the current energy system and for the lion's share of global environmental concerns.

With respect to sustaining the global public commons, the "North" is responsible for some 75% of the global CO_2 emissions, consumes directly and indirectly up to 70% of the mineral and metal resources, and leaves its ecological footprint on more than 50% of the arable land area of the planet.

Notwithstanding the fact that population and economic growth in the South might change this pattern in the next decades, a *fundamental change of production and consumption patterns in the North* builds an essential precondition for any progress towards sustainable development in global terms.

Though large-scale changes in the North will be necessary, this will not be sufficient*:* the combination of a substantial change in the industrialized countries with an early integration of developing countries into a new development pattern is needed and, in the long run, inevitable.

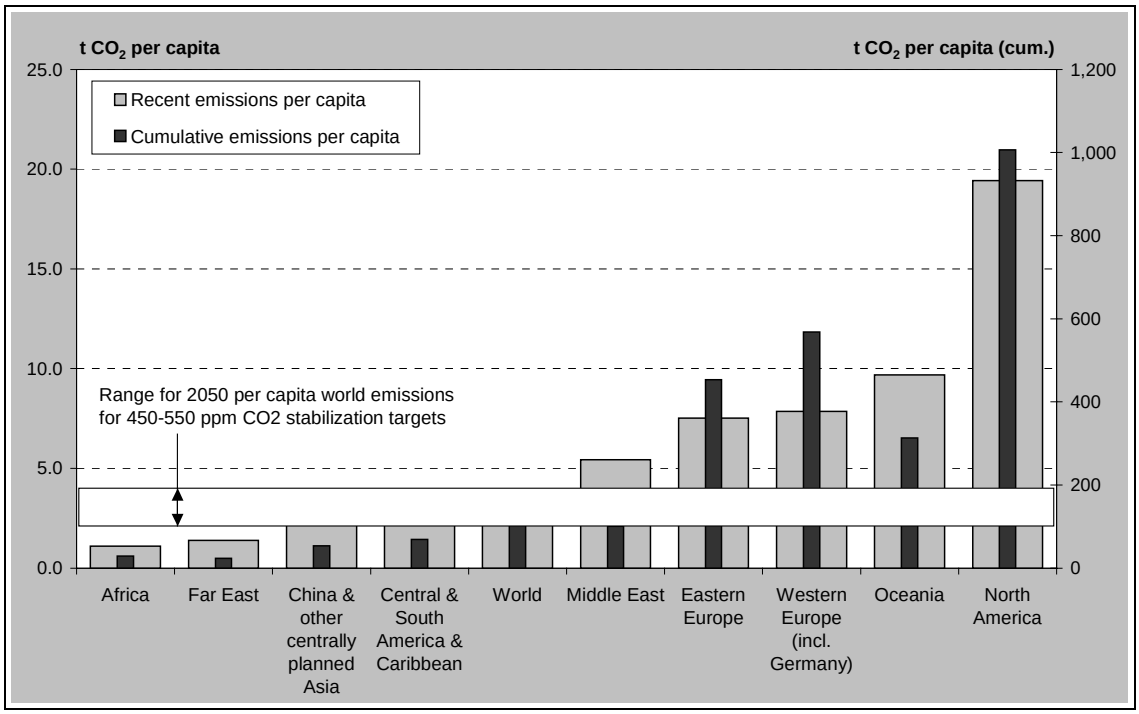
Global climate change is seen as a key challenge for sustainable development in the energy sector, and again, the recent *per capita* carbon dioxide emissions differ widely:

North America causes annual CO_2 emissions of about 20 t/cap., Oceania nearly 10 t/cap., and Europe less than 8 t/cap., which is between twofold and fivefold of the world average rate.

In contrast, many of the developing regions of the world emit CO_2 at a per capita rate below 3 tons per year. If historic emissions[6] are taken into account, the pattern becomes even more pronounced.

[6] Historic emissions in this paper are defined as anthropogenic CO_2 emissions from fossil fuels since the beginning of the industrialization in the 19th century.

Figure 1 Recent and Cumulative CO_2 Emissions



Source: Öko-Institut computations based on data from Marland et. al (2001).

As described later in Section 4.1, an adequate response to the challenge of global climate change requires CO_2 emission reductions of more than 50 % during this century.

The full range of analysis[7] shows on the one hand that industrialized countries have to take much stronger and earlier commitments for emission reduction to meet ambitious targets for stabilizing atmospheric CO_2 concentration below 550 ppm. But on the other hand, CO_2 emissions have to be limited until 2050 in the developing countries as well, and must be reduced beyond 2050, even in terms of per capita emissions.

Dealing with global climate change requires a fundamental change in the world energy system, shifting production and consumption patterns towards sustainability. Given the industrialized countries' contributions to the pressure on the environment and factoring in the need for sufficient economic and social development, in the developing countries (and other challenges to sustainable development described in section 3.1), a *strong and special responsibility of industrialized countries* in the transition process is inevitable.

The analysis of both recent and historical CO_2 emissions patterns indicates a special responsibility of the industrialized countries with respect to drastic emission reductions. But in terms of today's per capita emissions, some regions of the developing world *already* reach levels not to be exceeded in the framework of sustainable development.

The historical and projected emission trends indicate the need for significant global emission reductions, which in turn call for a participation of today's developing countries in future emission limitation and reduction strategies.

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[7] Cf. IIASA/WEC (1998), SEI (1998+2000), IPCC (2000), Meyer (2000).

An essential precondition for that is an in-depth discourse regarding the *distribution of future emission rights* which – given the limited time frame for action – is both fair in terms of global justice, and realistic in terms of policy implementation. The debate surrounding a fair distribution of emission rights is still far from consensus. But it seems clear that, in terms of emission rights, global justice goes beyond one-dimensional equity approaches.

First, procedural equity is a basic precondition for any progress in this debate. Second, consequential equity has to be seen as a key issue. This is a rather complicated matter because pollution contribution, vulnerability, adaptation and mitigation capacities, efficiency as well as the differentiation between "survival" and "luxury" emissions do not lead to clear, indisputable results.

Within this still underdeveloped debate, it must be recognized that progress in global climate and energy policy cannot resolve problems of global inequity. But, as a basic requirement, these policies should not exacerbate the situation.

Without any doubt, industrialized countries have a special responsibility. But the challenge of sustainability in the energy sector with its substantial long-term dimension cannot be met without change and real action in both the developed, *and* the developing world.

As a result, the distribution of global emission rights in general should be in line with an equal per capita approach in the long run. But for the transition period, more aspects and criteria have to be taken into account in order to ensure the start of the transformation process and to maintain a robust transformation pathway.

A *combination* of today's share of total emissions (consideration of status quo), total population (consideration of equity) and total GDP (consideration of capability) could form an adequate starting point for the process. In the subsequent periods, equity issues should play a increasingly prominent role.

3.4 Industrialized Countries and Renewable Energies

Subsequent to the climate change problem, a GES must consider the longer-term development of energy sources with respect to limited stocks and economic availability.

Here, renewable energies (RE) are seen as a core element of any sustainability strategy (see Section 4.1). Since the 1980s, RE have been developed by industrialized (OECD) countries as a means to reduce reliance on oil and as an option for future energy markets. The technological barriers have been at least partially overcome and significant cost reductions were achieved in the last two decades. In the 1992 Rio Conference on Environment and Development, RE were identified as a promising field of international cooperation and technology transfer. RE development was seen as a priority task for industrialized countries and their market introduction in the OECD as a step to reduce their costs. Once commercially demonstrated, RE were thought to be easily transferable to developing countries as well.

How have OECD countries performed in that respect? As the data in Table 1 indicate, the *overall* achievements in the last decade were small: a meagre 0.1 %-points increase in the RE share of primary energy supply, a reduction of approx. 1.5 %-points in electricity generation, and a 2%-points increase in electricity generation if hydropower is left out.

Still, there *has been* progress in *some* OECD countries: The EU succeeded in the last decade in promoting RE technologies, especially with respect to non-hydro electricity. Recent developments in OECD-Europe – mainly Germany, Spain, and the UK – accelerated the market introduction of RE in the electricity sector even more: wind is a prominent winner and modern biomass has also been employed.

Table 1 Share of Renewable Energies in OECD Countries from 1990-2000

Share of RE in OECD Primary Energy Supply			
	1990	**2000**	**average annual change 1990-2000**
OECD Total	5.9	6	0.1
North America	6.6	6.2	-0.5
Pacific	4.2	3.7	-1.1
Europe	5.7	6.7	1.6
Share of RE in OECD Electricity Generation			
	1990	**2000**	**average annual change 1990-2000**
OECD Total	17.1	15.6	-0.9
North America	17.7	15.3	-1.5
Pacific	13.5	9.8	-3.2
Europe	17.7	19.1	0.8
Share of RE in OECD Electricity Generation, excl. Hydropower			
	1990	**2000**	**average annual change 1990-2000**
OECD Total	1.6	2	2.3
North America	2	2	0.3
Pacific	1.9	1.6	-1.8
Europe	0.9	2.1	9.5

Source: IEA 2002c, data are given in per cent points (rounded figures)

Some recent experience with respect to disseminating RE technologies in developing countries indicates that *market development* is much more important than mere technology improvements (Martinot et al. 2002). In these instances, OECD countries have either directly, or via multilateral institutions like the GEF, helped to stipulate and stimulate important innovations for RE use.

Though the overall performance of industrialized countries in "leading the way" towards RE implementation is not impressive, some evidence does indicate that the logic of the Rio ´92 Conference is still valid, and that *at least some* industrialized countries *can deliver on their promises*.

For the GES, this means that the political concept of a special responsibility of "the North" with respect to RE development should be considered further.

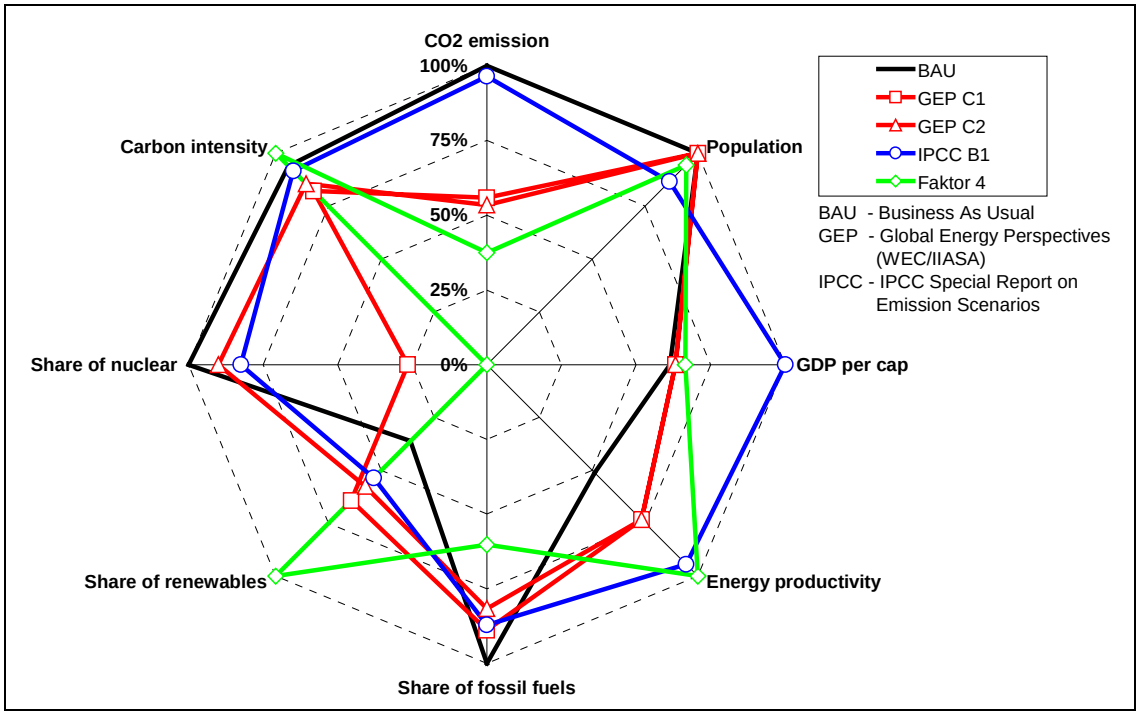
4 Background: A Disaggregated View on Global Energy

4.1 Which Energy Systems are Sustainable?

Energy is part of the sustainability challenge, and it is also part of any solution towards sustainable development. As energy technologies will play a key role for a future sustainable energy system, the assessment of the sustainability of different technologies must be carried out with respect to the overall development patterns of the global energy system.

Figure 2 shows the results of an analysis for different global energy scenarios. In addition to a business as usual (BAU) scenario, four projections were selected that follow a trajectory to stabilize CO_2 levels in the atmosphere below 550 ppm in the next century – which is often seen as the *level that would prevent dangerous anthropogenic interference with the climate system* (article 2 of UNFCCC).

Figure 2 Components of different energy scenarios, 1990-2050



Sources: WEC/IIASA (1998), IPCC (2000), Öko-Institut computations

Even if some of the basic assumptions differ, the comparison still shows some robust trends for the components determining global CO_2:

- *Energy productivity* must be significantly higher than in the BAU scenario if the stabilization targets are to be achieved. Compared with today's level, the overall energy intensity must be decreased by a factor of 2 to 3 during the next five decades.
- Although there is a certain variety in the *renewable share* of total primary energy supply between the scenarios, the importance of renewable energy is much higher

than today and in the BAU scenario. In relation to year 2000, the global contribution of renewable energy should be increased by at least three times until 2050.

- Concerning *nuclear energy*, two antagonistic approaches exist: Either societies accept the risks of nuclear disasters, the management burden of nuclear waste over thousands of years, and the problem of proliferation – then, nuclear capacities could be expanded considerably. Or, societies do not accept these risks, so that nuclear energy will be phased out. Within the OECD, a majority of countries has opted for a (medium to long-term) phase out policy, and the majority of developing countries has not introduced nuclear energy at all. Still, there is *no consensus* on this issue to date: several regions follow the phase out approach, others stick to the nuclear track. Given the significant financial costs alone[8] to implement, maintain, and expand nuclear power systems with current technologies, the nuclear prospects are still quite dim.
- *Fossil fuels* will maintain an important role during the next decades. But along a climate-oriented pathway, the carbon-intensive fossil fuel use must be reduced significantly. As part of a medium-term strategy, the shift away from coal to natural gas could play a major role in this context. Some industrialized countries explore options to "decarbonize" fossil fuels, and to capture and dispose CO_2 from fossil-fuel combustion ("zero-emission powerplants"). Since the disposal of separated CO_2 in geological formations or in the deep ocean is not only potentially hazardous to the environment, but also quite cost-intensive, these strategies are seen mostly as a potential option for a future with severe carbon emission restrictions.

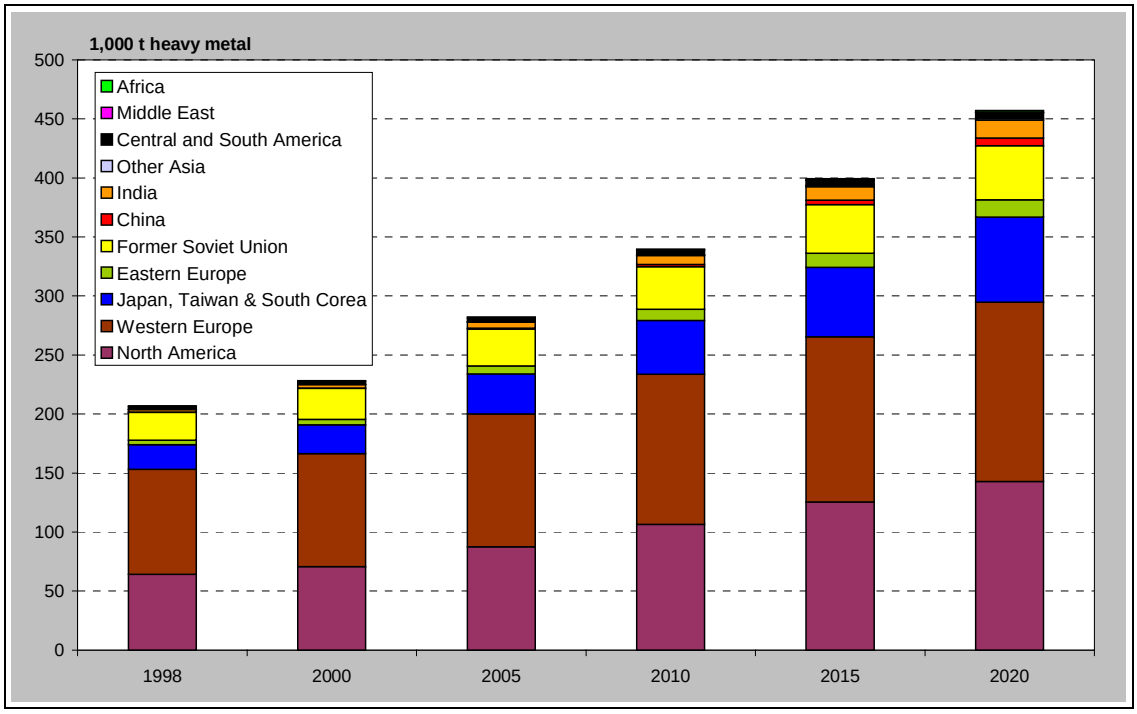
The global scenarios reveal that there is a consensus on energy efficiency, and (most of) renewable energy sources (excluding large hydropower). Regionally, there are different assessments regarding (clean) coal, and the role of natural gas.

Heated debates persist regarding nuclear and CO_2 capture/sequestration. The settings and outcomes of those controversies are quite different in various countries and regions of the world, and probably will remain unresolved during the next decades.

Nevertheless, a quantitative analysis shows that for the future decades, high risk technologies, like nuclear, are mainly an issue of industrial countries, even though countries like China and India might play a bigger nuclear role.

[8] There are other costs to nuclear energy as well: societal and human health costs from radiation-induced cancer from severe accidents (in the order of trillion $ if such events would occur in industrialized countries), and the costs to maintain the regulatory system, and nuclear "knowledge base".

Figure 3 Cumulative spent nuclear fuel by Region and Country, 1998-2020



Sources: Energy Information Administration

Without a doubt, high-risk technologies like nuclear energy, which put enormous burdens on future generations, cannot be part of a sustainable energy system. The debate on nuclear power is part of energy policy conflicts that have different characteristics and differing importance in the regions of the world. But this necessary debate should not replace the equally necessary debate on *key issues* of sustainable energy, which have far more importance:

The largest potentials for the increase of *energy efficiency* (EE) exist in the end-use sector. Many studies show technological and economic options to lower the energy demand for certain energy services between 20 and 70 % (e.g., WEA 2000). The range of technologies includes insulation of buildings, high efficient motors, lighting, other electric appliances, and many other options in the residential, commercial and industrial sectors, as well as for transport. Whereas some technologies have a more regional context (e.g. low energy houses), many high-efficient technologies (e.g. electric appliances, cars) can be used globally.

The application of high efficient end-use technologies is confronted with a variety of obstacles, from lacking information and financing to structural blockades (e.g. user/investor dilemma). Broadening the best practice experiences from all parts of the world could create a highly cost efficient contribution to the global increase of energy productivity on the one hand. But, on the other hand, decentralized activities needed for this approach do not fit into the institutional settings of today's international cooperation.

Power generation is another large energy consumer. The worldwide average efficiency of thermal power plants is less than 30%. Modern gas-fired combined-cycles plants

reach 55%, and some 45% for coal-fired plants[9]. Over the next decade, further improvements of up to ten %-points are possible at reasonable cost. Another quantum-jump of efficiency can be achieved by using combined heat and power production (CHP) and combined cooling and power production, respectively. With these technologies, an overall efficiency of 85-90 % is feasible already.

Although the average capacity of newly installed power generation units has already decreased during the past years, new technological developments (micro-CHP, micro-turbines, fuel cells) with capacities of a few mega- or even kilowatts will play an increasing role in the power sector.

The main obstacles for high efficient power generation technologies is lack of adequate financing, and unsuitable institutional structures and regulatory systems for more decentralized systems, especially adequate access to electricity grids (WADE 2002).

Fossil fuels will continue to play an important role throughout the next decades, even under the constraints of an effective climate policy. Besides the huge potential for energy efficiency and energy savings, a switch to cleaner fuels like natural gas may contribute significantly to lower air pollution and greenhouse gas emissions. The attitude towards an increasing use of *natural gas* differs widely between different countries and regions of the world: Whereas in some countries and regions, natural gas is seen as a bridge to a sustainable energy system, other regions see it as a means to stay "locked-in" to fossil fuels. However, for a transition period of several decades, a global energy strategy has to balance the need for clean fossil fuels with the transformation towards a fossil-free system.

Renewable energies (RE) have traditionally played a significant role in the energy systems of many countries. Nevertheless, not all use of renewable energy can be seen as sustainable: Non-commercial use of biomass has lead to degradation of forests and land, and some large hydro power projects destroyed precious ecosystems, human settlements, and cultural or historic sites.

Hydropower is one of the few renewable electricity-generating technologies which maintains a firm position in the market. Worldwide, a large potential exists for expanding hydro-electric generation. But new *large* hydro power plants are increasingly confronted with ecological (and financial) problems and social resistance. Therefore, the expansion of large hydro power generation will have a lower priority than medium and small-scale hydro plants. Furthermore, the rehabilitation and upgrading of existing hydro plants should receive more attention.

The use of *wind energy* is globally the fastest growing new renewable energy source. After rapid technological development and cost reduction by market introduction programmes in industrial countries, wind power can play an increasing role in developing countries with good meteorological conditions in the near future. Also, wind/diesel hybrid schemes could create a "backbone" of mini-grids in rural and remote areas.

The future use of *biomass* will gain considerable importance. Today, non-commercial use of biomass is twice as much as biomass use with modern technologies, and causes

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[9] Efficiency data are based on the higher heating (gross calorific) value of the fuel input. When using the lower heating (net calorific) value as a base, these efficiencies would translate into 60% and 50%, respectively.

serious environmental and health problems. But with modern technologies, sustainable biomass use can play a role not only for heat, but also for power generation. The development of robust technologies for biomass gasification is a prerequisite, so that biogas can be utilized with the highly efficient technologies of power generation developed for natural gas. An interesting low-cost option for the transition period is the co-burning of biomass in existing coal-fired power plants.

Solar heat generation could become of growing importance in the area of warm water production, but also in the area of solar-supported local heat systems and direct *solar cooling*. Here, the commercialisation of existing prototypes, and the development of appropriate storage systems will be most important. Decentralized solar systems could make a substantial contribution to replace unsustainable biomass use (i.e. firewood).

Photovoltaic (PV) power generation will remain - for the time being - the most expensive renewable energy source, but at the same time offer the greatest prospects. For regions without access to power transmission and distribution grids, PV applications are already performing well from an economic point of view.

Solar thermal power generation (e.g., with parabolic mirrors or Fresnel lenses) can gain importance especially in countries with high direct insulation, and in hybrid designs that include gas or oil-fired combined-cycles.

With *geothermal plants* utilizing hot water deposits close to the earth's surface, or with the use of hot-dry rock schemes to extract higher-grade steam from deep holes, geothermal energy can be used for heat and power generation in many regions of the world.

All in all, there is *no clear or consistent pattern* on sustainable energy sources. Every energy technology and every energy source will have impacts on nature and society. Last but not least, the costs of energy technologies must be considered in the framework of contradicting investment needs, e.g. versus investments in social services like health care or education. Nevertheless, some conclusions can be drawn on a global level regarding sustainable energy systems:

- Sustainability in the energy sector can only be achieved if energy efficiency is increased significantly. During the next decades, the improvement of energy productivity must exceed the business as usual *by a factor of two*.
- Renewable energy sources must play a much bigger role in the decades to come. Until 2050, renewable energy sources must - at a minimum - cover more than half of the global primary energy demand. But the future renewable energy mix depends on many factors (innovation, costs, infrastructure), which cannot be accurately foreseen, which leads to a wide range of possible developments.
- Fossil energy sources must be substituted with zero emission options in this century. A large step in this direction must be made during the next five decades.
- High-risk technologies like nuclear energy do not meet the requirements of a sustainable energy system, and should be phased out in the transitional period.
- There are technologies and energy sources for which the general assessment and the timeframe of their utilization will remain under discussion for at least a couple of years. For these, *no priority* should be given in the next decade.

As a consequence, the pathway towards a sustainable energy system will largely be characterized by a trial-and-error process. Even for those technologies and options that are generally considered sustainable , the sustainability assessment could differ significantly for different countries or regions, as well as for different time frames.

4.2 Technological Implications for the GES

Considering the different assessments of some technologies, the uncertainties in cost, potentials, and acceptance, as well as the remaining strong controversies surrounding some technologies, a key issue of a global energy strategy is to identify *robust* technology clusters.

Taking into account the whole variety of options, several technology clusters can be identified for different regions of the world.

In the most industrialized countries, as well as in the most emerging (urban) regions or countries in the developing world, a *full range of energy efficiency measures* can be applied. In particular, highly efficient electrical appliances, also for heating, ventilation, and air conditioning (HVAC), are appropriate and proven technologies. For power generation, a special focus should be given to combined heat and power as well as combined cooling and power production. Modern grid connected renewable energy technologies (wind, geothermal, etc.) as well as biofuels can play an increasing role. Efficient centralized power generation options will be combined with high efficient decentralized technologies.

For more basic energy efficiency options (cooking, etc.) and decentralized power generation, *renewable energy sources* will play the most important role for least developed countries and rural areas to enable access to sufficient energy services. Micro technologies (biomass, hydro) and hybrid systems (PV/diesel or wind/diesel) can contribute to rural electrification.

These two different technology clusters will address different dimensions of sustainability in the energy sector. Sustainable energy technologies for industrialized, emerging regions and urban areas can massively reduce the environmental burden of energy use. Modern energy technologies for least developed regions and rural areas can improve the social situation and contribute to stop the rural exodus, which is to some extent also caused by the lack of access to sufficient energy services and creates major social and economic problems in developing countries.

There is a third cluster of technologies that is *highly controversial* in the framework of sustainable development. Nuclear energy is definitely one of these, but also so-called clean coal technologies as well as greenhouse gas emission separation and sequestration belong to this cluster. A global energy strategy should differentiate these technologies:

Technologies like nuclear power, where no consensus on the sustainability assessment can be reached between different countries/regions, or societal subgroups, *should be excluded*. The controversies on those technologies rely mainly on ethic assessments that differ fundamentally and could significantly obstruct the consensus on a global strategy ies.

Technologies, for which different regional assessments have to be taken into account, or for which uncertainties remain high (clean coal, role of natural gas, etc.), should be treated as future options to be addressed in a *second step of the GES*.

There is a clear consensus in the energy policy field about the use of energy efficiency (EE) and sustainable renewable energy (RE) sources. They build appropriate starting points for the development of a global energy strategy. By concentrating on EE and RE, it should be possible to avoid obstructing the whole GES process with endless debates on "the" sustainable options. Nevertheless, for some energy technologies (clean coal, oil and gas exploration and extraction) it seems realistic to develop methodologies and guidelines regarding the extent to which these technologies could be included into a strategy towards sustainable development in the energy sector, at least for a transitional period.[10]

All in all, a global energy strategy will require:

i) the definition of targets for energy related emission limits, future contributions of renewable energies, the development of energy productivity, and performance standards for key energy products and systems;

ii) the establishment of guidelines for the assessment of environmental and social effects for all energy systems, taking into account environmental, health and other damages caused by energy-related activities;

iii) the obligation to develop global, regional, national, and local strategies and plans for energy efficiency improvements, safety controls, waste management and emissions reductions in the production, storage, transportation and use of all types of energy;

iv) the promotion of exchange of technology, know-how, education, training programs, information, statistics, and data on best available environmentally sound energy technologies, environment-conscious human behaviour, energy efficiency and energy saving, performance standards, safety codes as well as relative and absolute energy cost.

v) the improvement of existing and the development of new financial instruments and investment mechanisms, involving both the public and private sectors in synergy with each other, for the financing of EE improvements and best available, environmentally sound energy technologies, with special arrangements for countries that would otherwise not be able to introduce such measures, and support mechanisms for industries in the developing world to ensure that they can take part in the necessary technology supplies and market transformation;

vi) the definition of fields in which further analysis, research and communication could lead to a better understanding of whether and to what extent certain technologies and strategies could contribute to a sustainable energy system, including roadmaps for further decision making on this topic.

Given the wide range of assessments and uncertainties regarding different technologies, a global energy strategy must follow a *step-by-step approach:* Starting with options facing low uncertainties and a high degree of consensus, and then creating a process to reduce uncertainties and build consensus where it seems feasible in the medium term. The GES should definitely not consider options surrounded by great controversies and high obstruction potentials for the global process.

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[10] The World Commission on Dams seems to be an interesting model for this type of settlements.

4.3 Financing Sustainable Energy

In addition to research and development (Section 4.4) and suitable regulatory frameworks (see Section 5), *financing* is a key issue of a global energy strategy.

Society's infrastructure – transport systems, buildings, industrial facilities, and energy supply networks – change only slowly (see Section 4.4). Due to their long lifetime, missed opportunities to implement more efficient and cleaner stocks when the opportunity arises can perpetuate excess energy use (and its environment effects) *for decades* to come.

Until 2020, almost two-thirds of projected world investment in new power-generating facilities is expected to occur outside of the OECD. Much the same is true of the infrastructure of Eastern Europe, where most of the building stock, and district-heating infrastructure will require refurbishment in the coming decades.

The IEA World Energy Outlook 2000 (IEA 2000c) projects that over the next twenty years countries outside the OECD will need investment of some *US $2 trillion* to install 1,900 GigaWatts of new electricity generating capacity.

Table 2 Urban and Rural Electrification Rates, 2000

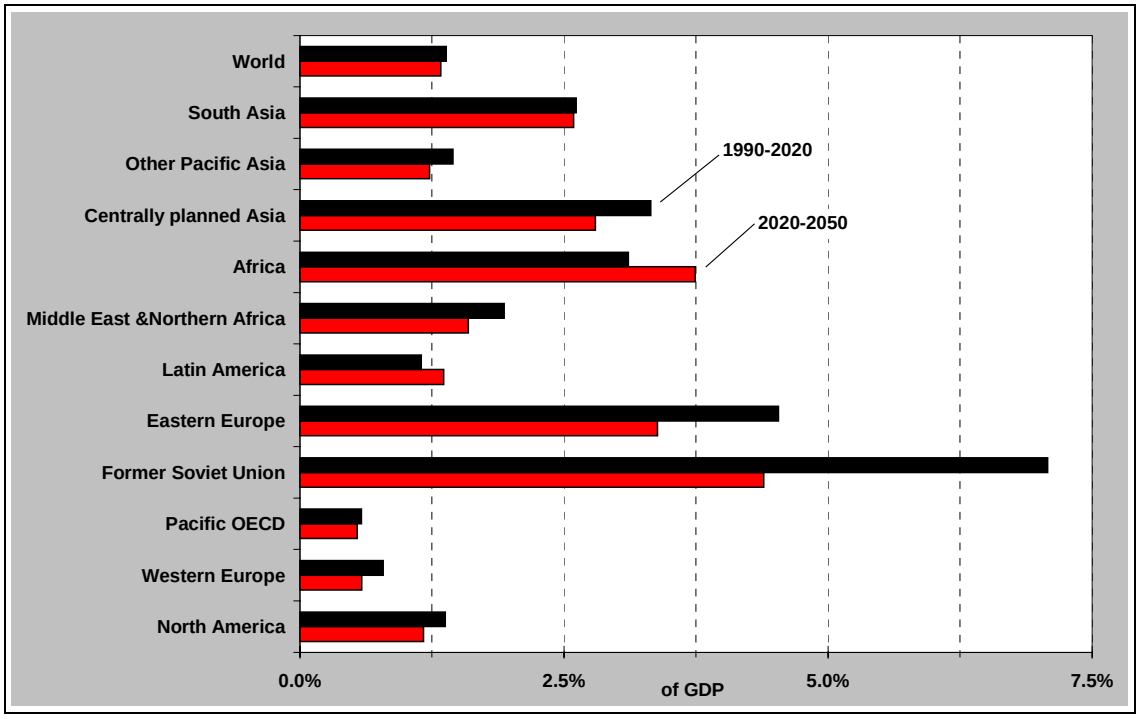
	Total population	Urban population	Electrification rate	Urban electrification rate	Rural electrification rate
	million		%		
North Africa	138	74	90.3	99.3	79.9
Sub-Sahara	657	226	22.6	51.3	7.5
Africa	795	300	34.3	63.1	16.9
South Asia and sub-Sahara	2,010	608	34.9	61.9	23.2
Latin America	416	314	86.6	98.0	51.5
East Asia/China	1,835	633	86.9	98.5	81.0
South Asia	1,353	381	40.8	68.2	30.1
Middle East	165	109	91.1	98.5	76.6
Developing countries	4,565	1,739	64.2	85.6	51.1
World	6,035	2,828	72.8	91.2	56.9

Sources: IEA (2002b)

This investment is required not only because of growing prosperity and population, but also to meet basic needs of development. As Table 2 clearly shows, there is an urgent need for access to electricity as a base for future economic and social development in many - especially rural - regions of the world.

The failure of the traditional energy system to supply more than 2 billion people with clean energy services is not just an issue of missing monies or lack of technologies. This fundamental flaw is also caused by the economics of the traditional energy system and by the regulatory environment in which it is allowed to operate.

Figure 4 Future investment needs for energy supply, 1990-2050



Sources: IIASA/WEC (1998), Öko-Institut computations

Figure 4 gives an indication of the scale of the challenge for future financing in the energy sector.

The analysis shows that particularly in the developing and EIT countries, the *annual* investments for the energy supply alone, calculated as share of the GDP, exceeds the financing volume in industrialized countries dramatically, even in the business as usual case.

As a shift towards sustainable energies in the next decades will increase the upfront investment needs even more (though reducing operating costs), the order of magnitude for sustainable energy financing is in the $100 billion range for DC, and EIT countries.

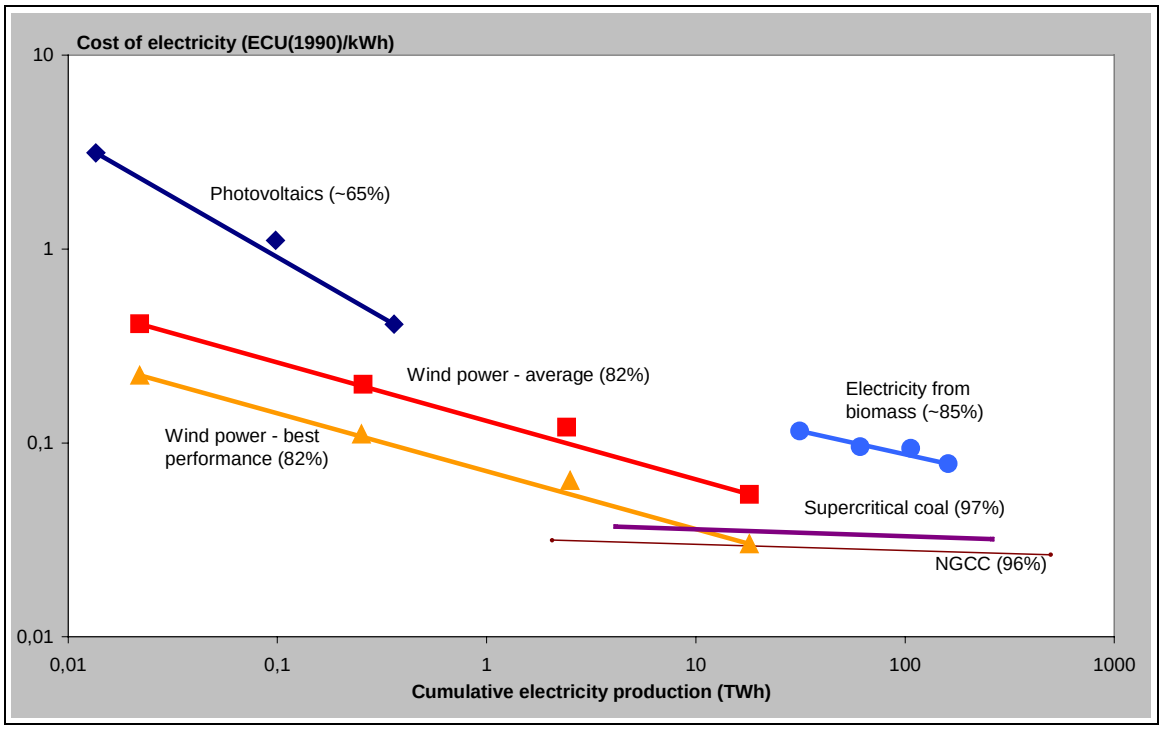
Clearly, these figures call not only for a targeted and concerted approach to new sources of finance for the energy sector (see Sections 6, and 7), but also for the creation (rsp. strengthening) of regulatory policies to adequately deal with energy investments, and their financing in the market (see Section 5).

4.4 R&D and Technology Transfer

As new technologies play a major role in a globally sustainable energy system, the roles of research and development (R&D) and technology transfer are also becoming important.

In the past decade, new renewable electricity technologies were implemented in Europe and North America, which has led to significant cost reductions (see following figure).

Figure 5 Learning Curves of Electricity Technologies in the EU, 1980-1995



Source: IEA (2000b)

In considering future energy policies, the "learning" associated with the market introduction of technologies must be addressed adequately – and this learning is not an independent, simple constant, but a highly dependent variable that could change in a non-linear fashion.

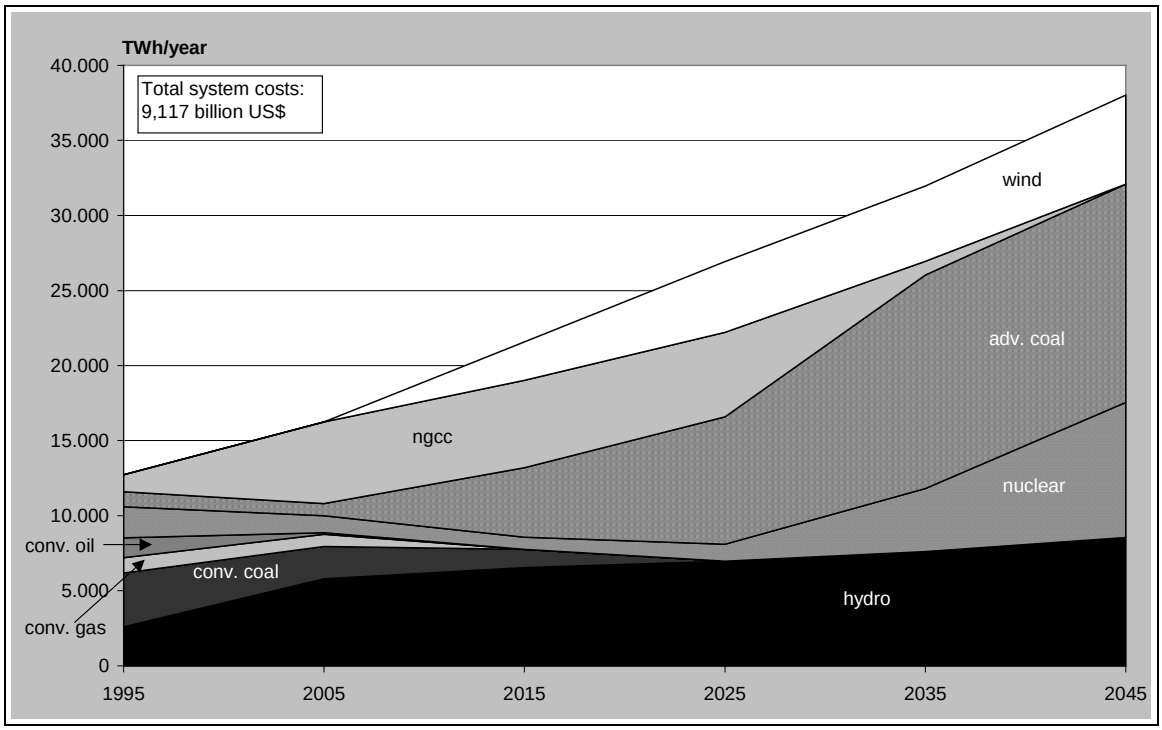
To illustrate this effect, the following figure shows the path-dependency[11] of technology development for the case of PV and fuel cells.

The first part of the figure shows a reference scenario in which no "learning" is assumed for solar PV and fuel cells.

In the second (lower) half of the figure, technological learning is introduced –the overall response of the (simulated) energy system is to "break away" from the reference case in a far more than linear development – and the learning completely changes the structure of the supply system.

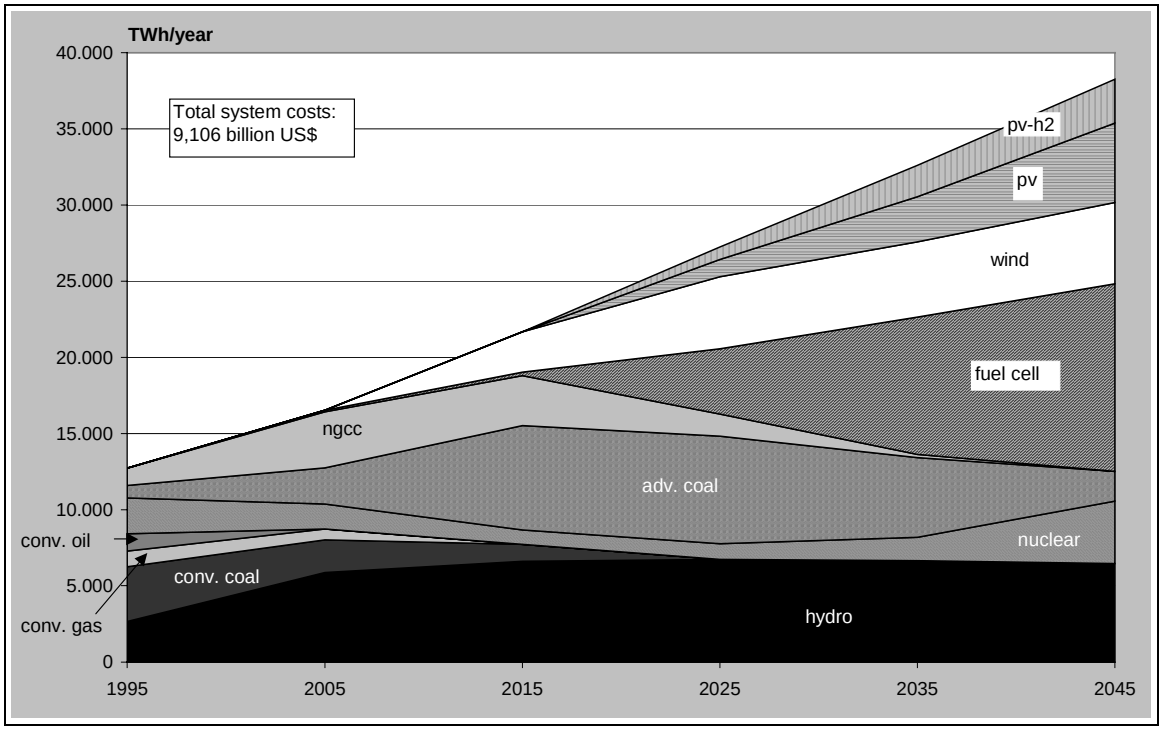
[11] This term is used in evolutionary economics to describe the "lock-in" phenomenon (Kemp 1997).

Figure 6 Projection with no Learning Investments, 1995-2045



Source: IEA (2000b)

Figure 7 Projection with Learning Investments, 1995-2045



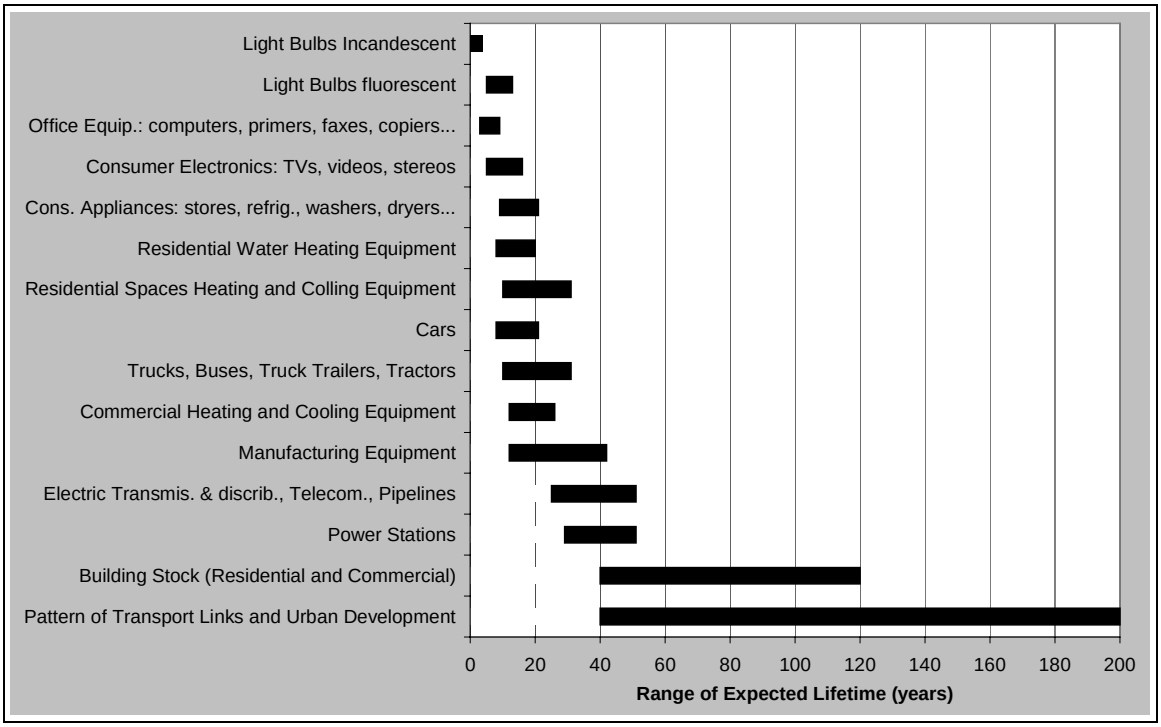
Source: IEA (2000b)

R&D investments represent *learning*, and therefore, are important elements of any sustainable energy strategy. Besides the internalization of external costs, learning investments are an essential element of an R&D strategy towards sustainable development.

While for supply-side technologies, such learning is already quite well-known, knowledge on learning curves for the demand-side, i.e. energy efficiency, remains scarce.

Given the different life-spans of energy infrastructure, and end-use appliances (see following figure), energy efficiency could become a quite near-term option for R&D in the energy sector – but so far, only a small number of real investments have been made in this field.

Figure 8 Average Life-Spans for Selected Energy-related Capital Stock



Source: IEA (2002a)

With life-spans of 5-15 years, innovative end-uses can be introduced into the energy systems far more quickly than most supply-side options. Therefore, extended R&D efforts on energy efficiency, the exchange of innovative designs, and efforts to introduce innovations in the markets are relevant goals for a Global Energy Strategy. (GEF 2001)

Once R&D has delivered on new forms of sustainable energies and technologies, market acceptance of these technologies will mainly be subject to adequate regulatory frameworks and financing.

Technology transfer will then occur nearly automatically – as the example of wind and some biomass technologies, as well as off-grid PV systems, have shown in the past.[12]

[12] "Quasi"-automatically means that a technology is transferred by market actors – this assumes adequate knowledge, skills, and organizational capacities. Therefore, a prerequisite for technology transfer is dissemination of information and capacity-building for specific knowledge and skills.

5 Energy Markets, and Regulation

Beyond energy resources and technologies, a Global Energy Strategy must deal with the *markets* in which energy demands are met with supply options – and with the rules under which these markets operate.

5.1 Privatization and Deregulation

In the 1990s, the wave of privatization, and deregulation (restructuring in US terminology) reached the energy sectors of developing, EIT, and industrialized countries.

The neo-liberal economic paradigm called for less involvement of governments, more private activity, and for market-based, competitive approaches in restructuring former vertically integrated monopolies. Accordingly, utilities around the world faced privatization policies, and governments shifted (scarce) resources away from energy infrastructures, inviting independent power producers to invest in electricity production.

Analyzing the experience from the last decade leads to ambivalent results: On the one hand, the breakup of strong monopolies enabled a variety of new approaches. The increasing success of explicit or implicit nuclear phase-out policies in many (industrialized) countries has a foundation in the liberalization process, which for the first time put economic pressure on utilities. As a result, new players entering the market brought new and cleaner technologies into the system. The role of customers and the consideration of their preferences increased in many countries.

On the other hand, the pressure of competition led to massive job cuts in utilities all over the world. Market concentration processes occurred in several countries, and large-scale market manipulations took place, which led to economic disasters with far-reaching consequences (see Enron case, etc.).

Simple-minded and underdeveloped regulatory approaches generated disincentives for investments and led to supply cuts. Unsurprisingly, a lack of social and environmental frameworks and respective regulatory capacities generated market failures.

Since the development of energy markets and especially the privatization and restructuring of the electricity sector are key concerns of any sustainable energy strategy, the discussion of the issue must be put into perspective of future policies.

So far, the traditional approaches of liberalizing and privatizing in developing countries has failed to deliver on increased access of the poor and on integrating environmental concerns into the market rules.

This is not surprising, since both developing countries, and their “coaches” from multilateral banks, bilateral donors, and associated consultants never really considered those concerns. The assumed increased efficiency should free up public resources, which then could be spent to deal with such “secondary” issues.

In a publication as recent as 2001 regarding the lessons for developing countries from the California Power Crisis, the World Bank argued that,

"…For many developing countries, the status quo in the power sector is the riskiest alternative of all. The status quo often creates a drag on economic growth through inadequate and poor-quality power supply. In addition, limited government funds are frequently diverted to the power sector that would otherwise be available for schools, clinics and roads. Therefore, most countries simply have no alternative to a substantial and basic reform of the sector that almost always requires restructuring and privatization." (IBRD 2001c).

At that time, the Bank staff could have read the World Energy Assessment, which argued that,

"…Given proper signals, the market could deliver much of what is needed. But because market forces alone are unlikely to meet the energy needs of poor people, or to adequately protect the environment, sustainable development demands frameworks (including consistent policy measures and transparent regulatory regimes) to address these issues." (WEA 2000)

One year later, the Bank significantly changed its wording toward sector reform:

"There is rather little evidence as to whether sector reform directly benefits the poorer members of society and assists in poverty reduction. Studies of the impact of the energy sector reform process have to date largely stressed the overall performance of the sector (reduced electricity tariffs or fuel prices, increased total number of connections to the grid, etc.) but in general have not focused on the direct impact, if any, on the poorer members of society. In 1999, ESMAP commissioned a review of the issues and the literature on the impact of power sector reform on the poor. One of the review's key conclusions was that information on this topic is sketchy and existing data is limited to a handful of countries" (IBRD 2002c).

The 2002 report continues:

"Thus, as governments withdraw from the direct provision of energy services, it is critical to work toward removing barriers to entry while developing an enhanced environment for the private sector in providing energy solutions for the rural and peri-urban poor. Beyond this leveling of the playing field, evidence increasingly suggests that incentives will be required to motivate the private sector to invest in service provision to the oftentimes remote and underdeveloped areas where the poor reside. Subsidies to enhance access should be well-targeted at the poor and should subsidize the capital costs of initial provision of service and not on-going consumption and maintenance".

Similarly, the member governments of the IEA recently affirmed that,

- "liberalisation of energy markets needs to be accomplished, within policy frameworks put in place to protect the environment and enhance social welfare. These frameworks should be stable, predictable, transparent, and promote open competition in all sectors of energy industries;
- in order to achieve competitive energy markets with minimum distortions, price signals reflecting the full costs of energy should reach consumers; signals can be conveyed by reducing trade and tariff barriers and by gradually phasing out environmentally harmful subsidies and internalisation of externalities;
- incentives, regulatory measures and standards will be needed to stimulate sustainable choices in a market-place that is still economically imperfect;
- new and innovative approaches are needed for financing of renewable energy projects" (IEA 2002a).

Nowadays, even the British subscribe to the necessary role of regulation: "With privatisation and restructuring of the power sector, the importance of regulation will increase" (DfID 2002b).

The decade-long rhetoric on the virtues of deregulation had to face the reality of the IPP business and its interlinkages to public donor interests, as indicated in the Enron case.[13]

[13] For a detailed report on Enron, see SEEN (2002). For other examples, and a broader critique of the deregulation/privatization paradigm from an NGO perspective, see e.g., TNI (2002).

The transition to open electricity markets *could* bring economic benefits for customers, and it may also be possible to utilize competitive forces to stimulate technology and service innovations, which will encourage more environmentally sound options of electricity supply and use.

As of now, electricity restructuring not only in DC, but also in industrialized countries, was mostly driven by pure financial considerations – freeing public resources, increasing economic efficiency. To become an instrument for sustainable development in the energy sector, the current restructuring process for the electricity sector must change to include environmental concerns and social public benefits as integral parts of reforms.

The far-reaching challenges of sustainable development will require an extensive search for technologies and options. Market forces could make a valuable contribution to this effort. However, the restructuring of energy markets can only constitute one pillar of the necessary strategy. Effectively enhancing *regulatory capacities* provides a complementary and unavoidable strategy for restructuring.. Without global efforts to increase regulatory capacities, restructuring will be essentially counterproductive .

On the other hand, some empirical evidence shows that monopolistic structures may be sufficient to maintain a status quo but will not be able to implement a fundamental structural and technological transformation, which will be necessary in the framework of sustainable development.

In other words:

Restructuring could prove to be a *basic requirement* for the development of a sustainable energy system. But strengthening of regulatory capacities before and during the process of restructuring is much more important, and represents perhaps the more ambitious challenge for sustainable development.

Consequently, a global energy strategy must have a strong focus on how to improve regulatory capacities and performance on global and national levels.

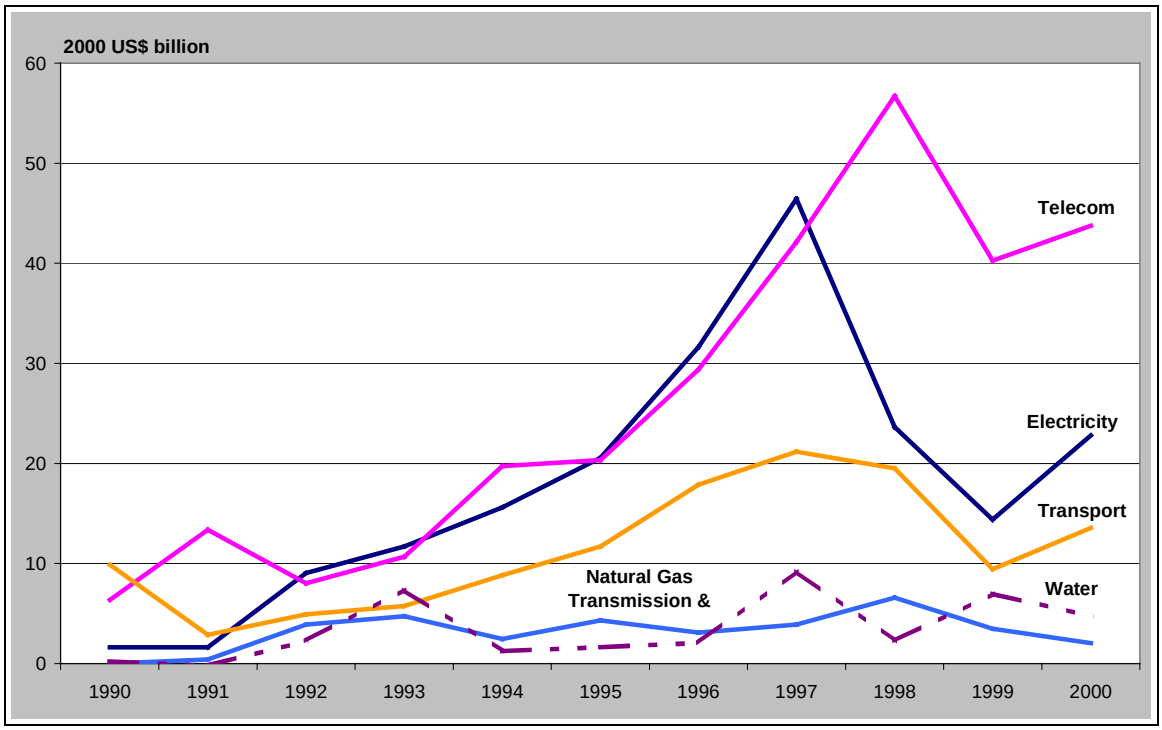
5.2 Energy Market Restructuring and Development

The restructuring process led to a significant rise in private sector involvement in (energy) infrastructure, while ODA expenditure in the energy sector fell drastically.

Still, after growing rapidly to a record of some $123 billion in 1997, investment flows to private provisions of infrastructure (PPI) projects in developing countries dropped to some 110 billion in 1998, and $74 billion in 1999 (all data in US$ 2000).

Investment flows somewhat recovered in 2000, reaching some $88 billion. However, the present global economic slowdown, coupled with the events of September 11, permit no positive expectations. In particular, responses from the financial markets suggest that, in the developing country electricity sector, rates of return relative to risk levels do not match investor expectations.

Figure 9 Infrastructure Investment with Private Participation



Source: ESMAP (2002)

As shown in Figure 9, investment in electricity projects went down after the 1997 global financial crisis, while natural gas transmission and distribution projects remained relatively constant, although low.

The Latin America and Caribbean region attracted approx. 50% of total private investment flows, while South Asia and Sub-Saharan Africa received only 5% and 3% of total PPI, respectively. Nearly no private capital went to regions where basic access to electricity represents the most significant problem.

This is a clear signal against an over-reliance on private capital flows for energy investments in (less) developed countries.

Furthermore, analysis from banks highlights the importance of *human* capital and know-how as key drivers in the reform process:

"While there is a clear correlation between enterprise restructuring and energy use, there is little evidence that privatisation, on its own, will reduce energy intensity. This is consistent with the notion that private ownership, per se, is not sufficient to effect the necessary technological and managerial improvements in an ailing company. Privatisation is only successful if ownership is transferred to the right party – a committed and competent investor with access to the necessary capital" (EBRD 2002b).

Given the lack of skills to perform in competitive environments in the electric utility sectors of most DC, the result of a recent survey on the electricity restructuring status in DC (IBRD 2002c) is not surprising: less than of DC have implemented restructuring policies, and most are reluctant to do so in the future.

Concerns on the Developing Country side refer to problems with equity, distributional effects, and loss of control. These concerns are substantiated, as a recent study clearly showed (WRI 2002):

Drawing on past experience from six country studies, the report urges that the approach to restructuring electricity sectors throughout the world should be changed.

Otherwise, social benefits and environmental considerations could be easily discounted as rich and poor countries focus on making their power markets more competitive.

With respect to the challenge of providing access for the poor, the report underlined that profit alone did not provide enough incentive to reach rural customers and the urban poor. The reforms, often targeted at reducing subsidies and increasing tariffs, have also triggered social hardships and political opposition.

In that context, especially least developed countries (LDCs) need special attention if sustainable development is to be achieved globally. To overcome the major deficiencies of these regions, i.e. the lack of social infrastructure, and the inability to maintain their human capital, must be an integral part of a strategy towards a sustainable global energy system.

In general, more attention needs to be given to the heterogeneous nature of the developing countries and the situation *within* the developing countries.

However, the focus on mainly private investments stimulated by energy market restructuring has failed to maintain the comprehensive needs of development. Too few developing countries have gained from capital inflow from private investors in the energy sector, and too many problems in social and environmental terms were not solved sufficiently, or even generated.

As a result, the search for an adequate policy mix, an expansion of official development aid directed to the energy sector, strong efforts to enhance regulatory capacities, and the attraction of private capital for developing countries with very different characteristics and political approaches are all mayor challenges for which a GES must provide answers.

6 Current Global Financing for Energy

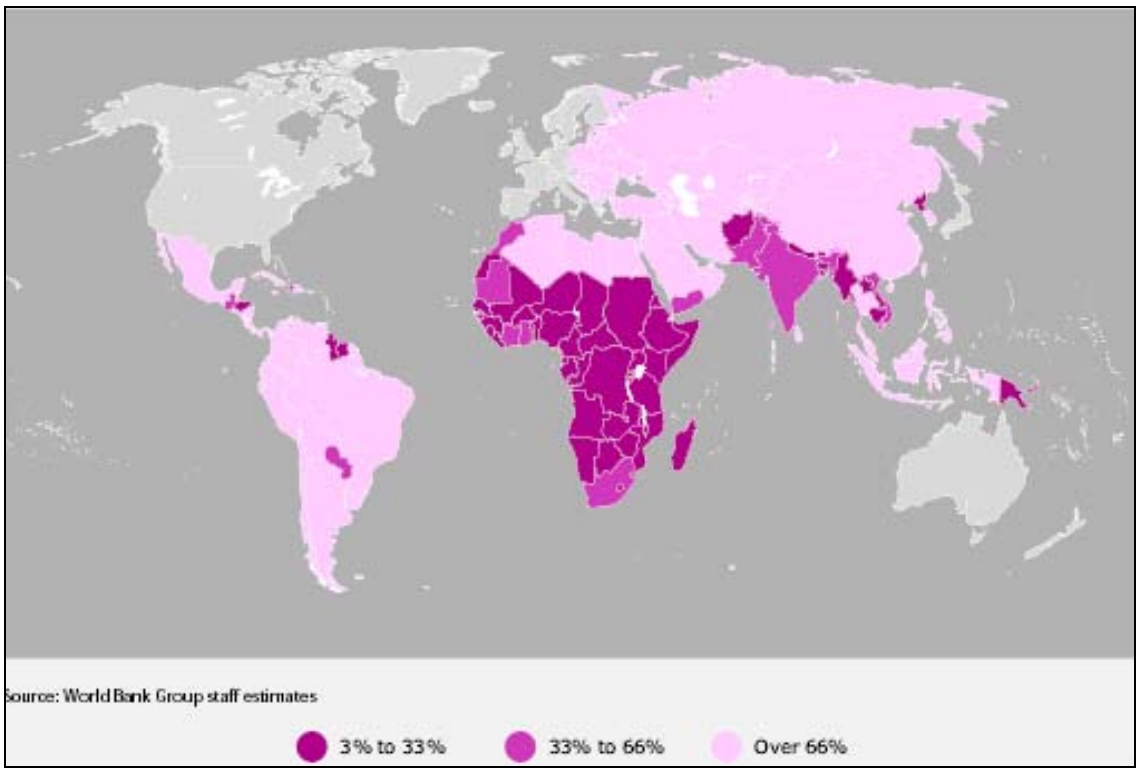
6.1 Preliminary Remarks

As has been already – but briefly - argued in Section 4.3, financing is a crucial issue for sustainable development in the energy sector.

As a simplified *relative benchmark* of the current performance of International Finance Institutions (IFI) with respect to sustainable energy, the funding for energy efficiency and renewable energy as a share of their total expenditure for energy will be used in the following.

Clearly, the last 50 years of IFI activities did *not* succeed in "serving the poor", as the distribution of access to electricity indicatively shows.

Figure 10 Percentage of Population with Access to Electricity



Source: IBRD (2001a)

Also, the role of IFIs with respect to the energy sector has changed significantly in the last decades, as it is discussed more deeply in the following.

Still, a review of the relative performance is needed as a baseline against which recommendations for policies towards a globally sustainable energy system can be derived.

6.2 The World Bank Group

The most prominent IFI in the energy sector – and several others – is the so-called World Bank Group which was established after World War II in order to bring forward economic and social development in non-industrialized countries. The Group currently consists of for bodies:

- International Bank for Reconstruction and Development (IBRD)
- International Development Agency (IDA)
- International Finance Corporation (IFC)
- Multilateral Investment Guarantee Agency (MIGA)

Their cumulative lending is in the order of $ 0.5 trillion, and their current lending is about $ 23 billion (see Table 3).

Table 3 Total Lending of the World Bank Group

	Cumulative billion US$	2001
International Bank for Reconstruction and Development (IBRD)		10.5
International Development Agency (IDA)	127.0	6.8
International Finance Corporation (IFC)	21.8	3.9
Multilateral Investment Guarantee Agency (MIGA)	9.1	2.0
Total	517.9	23.2

Source: WB (2002)

The major players of the Group with respect to lending to DC governments are the IBRD and IDA, while the IFC is mainly concerned with private-sector lending to companies in DC. In the following, IBRD and IDA will be referred to as the World Bank, while the IFC will be treated separately.

6.2.1 IBRD and IDA

The World Bank Group has been active in the energy sector for five decades. Until the early 90ies, around 25 % of total lending in the energy sector. After that, this proportion has fallen to below 10%.

After the Rio '92 Summit, the World Bank officially recognized the overall assessment of failure of the public sector to deliver sustainable energy, and oriented the activities toward the liberalization and privatization of infrastructure, especially in the energy sector. This was quite a move away from integrated, state-owned monopolies whose development the Bank had previously supported (see WB 1993)[14].

The Bank polity towards sustainable energy was further developed in 1996 with respect to rural energy (WB 1996), and in 2000 with special respect to energy efficiency, and renewable energies (WB 2000).

[14] Also, IFC and MIGA started to expand their energy sector activities towards private investment flows.

The financial performance of the World Bank is shown in the following table.

Table 4 Distribution of IBRD/IDA Lending to Sectors

	loan-by-loan basis				loan component basis	
	FY 92-97	FY 98-99	FY 2000	FY 2001	FY 2000	FY 2001
In millions of dollars	21,543.2	28,795.0	15,276.3	17,250.6	15,276.3	17,250.6
Electric power, other energy	2,547.2	1,253.6	994.2	824.4	990.5	944.9
Environment	738.3	711.5	514.1	515.9	918.8	791.2
Mining	218.1	845.8	54.5	36.0	20.0	36.0
Oil & gas	550.9	78.8	167.0	81.6	159.7	155.1
Shares of lending to sectors						
Electric power, other energy	12%	4%	7%	5%	6%	5%
Environment	3%	2%	3%	3%	6%	5%
Mining	1%	3%	0%	0%	0%	0%
Oil & gas	3%	0%	1%	0%	1%	1%
Energy total	14%	5%	8%	5%	8%	6%
Energy + Mining total	15%	8%	8%	5%	8%	7%

Source: IBRD (2002)

From the average annual lending in the energy sector of close to $ 3 billion in 1992-97, the fraction diminished to about $ 1 billion per year in the last years. Oil & gas extraction, including some downstream activities, are around 10% of the total energy lending, while approx. 55% are still going into fossil-fueled powerplants, some 20% into transmission and distribution, and only the remaining 15% serve sustainable energies[15].

The renewable energy (RE) projects are mainly small- and medium-scale hydro plants, some photovoltaic and biomass programs, and a small wind and geothermal portion.

Of the total active World Bank projects, only about 10 are targeted to energy efficiency (EE) with a total Bank contribution of approx. $ 0.5 billion - of which two projects in Russia alone account for $ 0.4 billion[16].

The World Bank has significantly shifted its former funding for RE and EE to the IFC (see below), and the GEF (see Section 6.3), seeing its role more as a moderator, and facilitator than as a prominent financial promoter.

On of the few substantial initiatives of the World Bank towards EE and RE is the is the *Renewable Energy and Energy Efficiency Fund* (REEF), which became operational in March 2002. It was launched by the World Bank with support from the GEF and several other private and public sector groups. It is the first global private equity fund devoted exclusively to investments in emerging market renewable energy and energy efficient projects. Due to the early state of development, no evaluation of the REEF performance is possible.

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[15] This breakdown is based on a review of the project portfolio of IBRD/IDA. Due to the unclear separation of funding for renewables, energy efficiency, and "sector reform", these figures are estimates. The analysis is further blurred by a missing distinction between IBRD/IDA, and ESMAP projects.

[16] 0.1 for rehabilitation of gas distribution networks, and another 0.3 billion for a building rehab project where the energy efficiency part is yet unknown.

This brief analysis clearly indicates that the NGO critique of the Bank as being "fossilized" (e.g., SEEN 2000) still holds true.

In a recent paper, the World Bank announced quantitative objectives for its operations, to be reached until 2010 (IBRD 2002d):

- The percentage of households in developing countries with access to electricity increases from 65% to 75%.
- The share of large cities with acceptable air quality increases from 15% to 30%.
- The average CO_2 emission intensity of energy production declines from 2.90 tons per tons of oil equivalent (tOE) to 2.75 tons per tOE.
- The average energy consumption per unit of GDP in developing countries declines from 0.27 tOE per 1000 dollars of output to 0.24 tOE per 1000 dollars.
- The share of developing countries where industrial consumers have a choice of supplier increases from 15% to 40%.
- The share of developing countries where the power industry stops being a burden on the government's budget increases from 34% to 50%.
- The share of developing countries where private ownership and financing play a dominant role in the energy sector increases from 25% to 40%.
- The share of developing countries where regulators oversee natural monopolies in an objective, transparent, and nondiscriminatory manner increases from 35% to 50%.

These goals are to be reached across all developing countries – quite an ambitious task.

Unfortunately, the World Bank does not indicate how these targets will be integrated into the Bank's desk officers day-to-day work – given the current amount and pattern of lending, there is little hope for achieving the Bank's goal.

6.2.2 The International Finance Corporation (IFC)

The IFC is the legally and financially independent private sector instrument of the World Bank group, but it coordinates its activities with the other institutions.

The current overall portfolio of IFC investments is shown in Table 5. As can be seen, the energy sector accounts for approx. 30% of current IFC investments, of which about 30% can be allocated to EE and RE (including cogeneration, and hydro). The other energy investment is tied to oil and gas development (approx. 35%), and electricity T&D (approx. 35%).[17]

The overall distribution of the budget is more in line with sustainable energy, but the rather huge investments in the oil sector (e.g. Cameroon-Chad pipeline) is a very controversial issue.

[17] These rough figures were derived from an indicative review of IFC projects. The IFC does not report aggregated figures for RE, and EE in its annual reports.

Table 5 IFC Investment Portfolio for Fiscal Year 2001

Commitments by Sector*	US$ millions	%
Financial**	1,185	30.2
Utilities & transportation	827	21.0
Information	701	17.8
Oil, gas & mining	309	7.8
Industrial & consumer products	151	3.8
Nonmetallic mineral product manufacturing	149	3.8
Health care & education	139	3.5
Chemicals	118	3.0
Primary metals	71	1.8
Other	281	7.2
Total Commitments	3,931	100.0
* All commitments data include guarantees and risk management ** Includes finance, insurance and collective investment vehicles		

Source: IFC (2002)

A positive element of the IFC strategy is to actively include microfinance schemes which have a much better outreach to rural areas, and semi-urban regions.

6.2.3 The Energy Sector Management Assistance Programme (ESMAP)

ESMAP is one of the World Bank's four trust-funded energy programs[18] with an overall budget of about $ 25-30 billion.

It offers funding for small-scale projects, studies, and capacity building, and is also carrying out country reviews, and energy-environment sector studies.

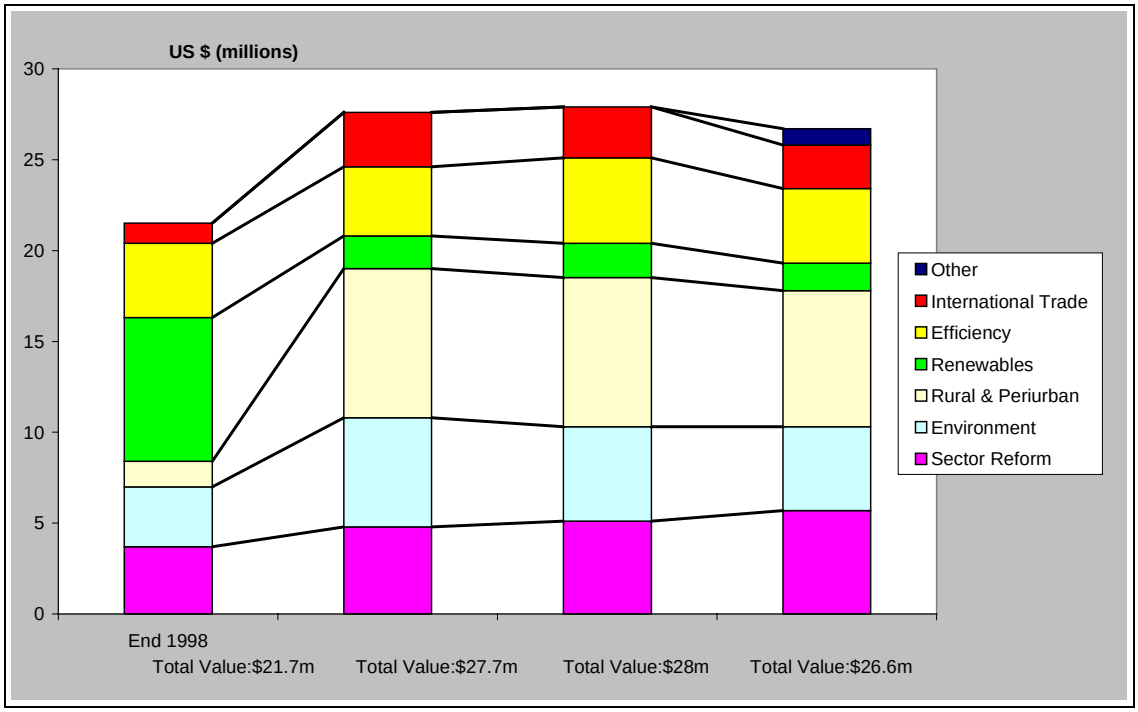
The development of ESMAP's activity portfolio is shown in Figure 11. Since 1998, the activities targeted to rural energy increased significantly, in parallel to "sector reform" projects.

The share of RE project dropped drastically, though – as with the World Bank in general, most of these former activities were shifted to the GEF (see below). Still, energy efficiency projects are continuing to play a role, and concern especially cross-country exchanges, and enabling activities (e.g., ESMAP 2002b).

Furthermore, the various ESMAP studies on rural electrification (ESMAP 2000a+b, 2001) are quite valuable, even if their relevance to affect donor programs remain arguable.

[18] The others are: The Asia Alternative Energy Program (ASTAE), concerned with renewable energy and energy efficiency policies and technologies in Asia; the Africa Rural and Renewable Energy Initiative (AFRREI) aimed at scaling up rural energy access and renewable energy market development in Sub-Saharan Africa; the Regional Program on the Traditional Energy Sector (RPTES) assists the governments of Sub-Saharan Africa in the planning and development of the traditional energy sector.

Figure 11 Thematic Distribution of ESMAP Portfolio 1998-2001



Source: ESMAP (2002a)

A recent external evaluation of ESMAP activities concluded that it should prioritize its projects, especially to develop regulation and governance of electricity and downstream gas sectors in a market context, to combine market reforms with reduced environment impacts from energy sectors, and to mitigate possible negative effects of sector reforms on poverty alleviation, access and gender.

Furthermore, ESMAP should avoid to engage in new technology development – its efforts should concentrate on economic and financial aspects and on policy issues facilitating technological transfer (see ESMAP 2002a for details).

Especially the last recommendation is of importance – as ESMAP is currently active in studies, and outreach activities regarding "clean coal", fuel cell development, and other area of technology development.

Given the quite small resource base of ESMAP, and its rather limited relation to worldwide R&D activities, it should be considered to *completely withdraw* from such endeavors, and concentrate on e.g. rural energy, and energy efficiency.

6.3 The Global Environment Facility (GEF)

Established in 1991 as an experiment, the Global Environment Facility (GEF) is *the* financial mechanism for international agreements on biodiversity, climate change, and persistent organic pollutants. GEF also supports projects that combat desertification and protect international waters and the ozone layer.

GEF was restructured after the 1992 Rio Summit, and in 1994, and 1998, its funds were stocked with $ 2 billion. The replenishment negotiations for the GEF were finalized on August 7, 2002, resulting in an increased budget of approx. $ 2.9 billion for 2003

through 2006. Although this is the good news, it should be kept in mind that in the parallel to the replenishment, the scope of activities eligible for GEF funding was broadened to cover also projects to combat desertification, and to reduce persistent organic pollutants (POP).

A specific operation condition for the GEF is that its projects are implemented only by so-called Implementation Agencies – originally those were restricted to UNDP, UNEP, and the IBRD/IFC, now the broader group of Regional Development Banks, and bilateral donor organizations is eligible as well.

The distribution and spending of the overall GEF budget is given in the following table.

Table 6 Allocation of GEF funds to Focal Areas

Focal Area	Full-Sized Projects		Medium-Sized Projects		Total Allocations	
	# Projects	US$ Million	# Projects	US$ Million	%	US$ Million
Biodiversity	175	1,294.2	75	57.0	41	1,351.2
Climate Change	140	1,170.5	29	21.4	36	1,191.9
International Waters	53	456.0	7	5.5	14	461.5
Ozone Depletion	17	163.8	4	2.9	5	166.7
Multiple Focal Areas	13	137.6	6	4.5	4	142.1
Total	398	3,222.2	121	91.2	100	3,313.4

Source: GEF (2002d)

As can be seen, the focal area of climate change receives about of the overall project funding – and here, nearly all projects concern either energy efficiency, or renewable energies.

The overall findings of the GEF evaluations in the climate area are quite good, and the private sector involvement has been successfully demonstrated – especially with respect to micro-financing (see Section 7.6)[19]. Still, the intended replicability of projects is not well-monitored, and current restrictions of direct GEF representation in target countries are an obstacle to broader dissemination, and replication of project findings.

GEF staff has published several "lessons learned" papers regarding EE and RE which are of high quality, and substance. Furthermore, the GEF considered to be more active in the important area of policy formulation, and regulation for energy markets to directly input its experiences into the decision-making process (GEF 2000). This endeavor should be supported more prominently by the international community, as GEF could be a decisive partner in re-shaping and advancing the debate on energy sector reform.

With regard to future operations, the GEF "ties" to the original implementing agencies *should be abandoned*, and a direct representation in key world regions and major countries must be implemented shortly.

[19] A good example is the GEF funding for the Grameen Shakti organization in India. The 1998 GEF funding enabled Grameen to offer favorable credit terms, increasing the payment period for solar home systems from one to three years. This had a significant effect on demand: between 1997 and 1999, Grameen sold 1500 SHS. In 2000, it installed 20- 25,000 systems. Grameen believes that after 3 to 4 years of profitable growth, it will be able to obtain financing from commercial banks.

Given the growth of focal areas for the GEF, it should also be considered to establish a specific sustainable energy fund within the original GEF which would concentrate on EE/RE activities, while maintaining close ties to the remaining climate change, and other focal areas. The overall GEF funding for EE/RE should be drastically increased, and its efforts to affect markets in "bundling" projects should be further developed.

6.4 The Regional Development Banks

Besides the World Bank Group, ESMAP, and GEF, there are also Multilateral Development Banks with a more regionalized focus.

6.4.1 Asian Development Bank

The Asian Development Bank (ADB) had a total lending from 1968-2001 of $ 93 billion, of which an average of 21% was allocated to the energy sector. In 2001 alone, $ 0.7 billion (8%) were for energy sector projects out of a $ 5.3 billion total lending, i.e. the energy share dropped substantially.

The energy lending of ADB in the last years mainly focused on transmission and distribution systems for electricity, and natural gas, with minor shares of (coal-fired) power-plant co-financing, and some very minor activities regarding EE, and RE.

6.4.2 African Development Bank

The African Development Bank (AfDB) is a rather small institution, its total loans and grants in the energy sector (1967-1998) were around $ 2 billion, and in 1999-2001, around $ 0.25 billion. The current projects mainly concern rural electrification schemes, and co-financing of small-scale hydro plants.

In the 2002 project pipeline, no energy projects are included[20]. The AfDB Energy Sector Policy Paper is of January 1994 (!), and no known effort was made to update it.

Due to the relatively low economic performance of most sub-Saharan countries, AfDB faced severe financial problems, and has focused on its internal restructuring and budget consolidation. Therefore, AfDB has not been a major player in the African energy sector.

6.4.3 Inter-American Development Bank

The Inter-American Development Bank (IDB) is covering investments especially in Latin America, and the Caribbean.

The current project portfolio already covers renewable energy development, energy efficiency, and a variety of cogeneration systems[21], though its share in the overall budget remains quite low.

Due to restrictions in time, no deeper analysis was possible.

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[20] As of May 2002 – see http://www.afdb.org

[21] see http://www.iadb.org/exr/doc98/apr/apener.htm

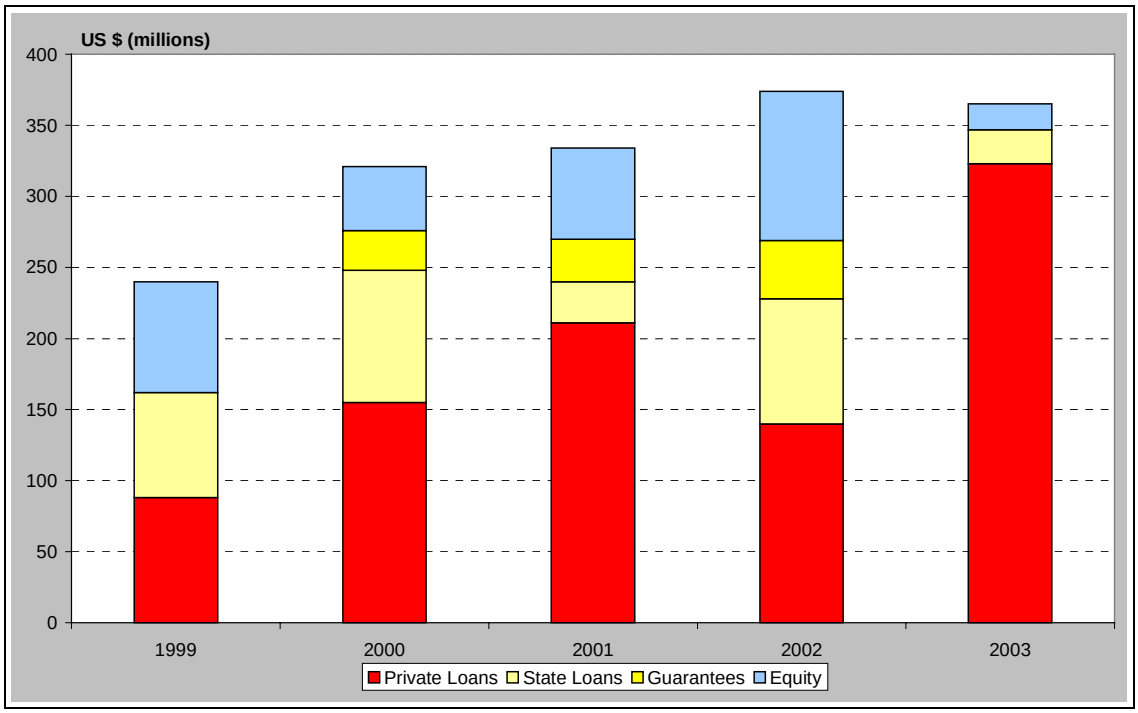
6.5 The European Banks

6.5.1 European Bank for Reconstruction and Development

The European Bank for Reconstruction and Development (EBRD) was established in 1991 by Western nations to support the development of market economies in Central and Eastern Europe. The EBRD is the first international financial institution with a pro-active environmental mandate – it should **"promote in the full range of its activities environmentally sound and sustainable development"**.

In 1995, an Energy Efficiency Unit was set up by EBRD, and as a consequence, energy saving investments in some EIT countries increased.

Figure 12 Funding for Energy Projects of the EBRD, 1999-2003



Source: EBRD (2001a)

The EBRD involvement in the energy sector until 2001 was about $ 1.5 billion. Most of the projects were in the power sub-sector (approx. $ 1 billion of Bank financing), and nearly all involved efficiency improvements. The Bank has financed in the area of end-use efficiency about $ 0.4 billion. 10 of the Bank's projects had renewable energy components: 9 hydro power plants and one geothermal, though their share of total funding remain below 10%. Overall, the contribution of the energy sector to the Bank portfolio was about 14% in 1999 (about $ 0.2 billion).

As shown in the figure above, commitments are expected to increase to $ 0.35 billion in 2002. This increase arises from the more than threefold increase in the areas of end-use efficiency and district heating, from about $ 30 million in 1999 to $ 100 million in 2002.

In an internal evaluation of EE projects, most were found to perform "good" or "excellent", both with respect to environmental, and economic terms (EBRD 2002a). Still, the report underlined that "it is impossible to judge the quantitative impact of Bank projects on energy efficiency because the Bank does not collect systematic data on energy saving and consequent abatement of atmospheric emissions".

Furthermore, energy efficiency is still a relatively minor topic in the EBRD, and available time for EE considerations during Environmental Audits of projects has shortened.

As the EBRD focuses its activities in the energy sector mainly towards rehabilitation of existing power systems in EIT, and restructuring/privatization of the sector to increase private sector involvement, and competition, it is not surprising that EE activities like cogeneration and building insulation comprise between 20 to 30 % of the energy sector budget. Still, the RE part is quite small – to fulfill its mandate regarding sustainable development, RE should receive at least 25-35% of the budget.

Besides RE and EE, the EBRD is also quite active in controversial oil/gas investments in central Asia[22]. With respect to sustainable energy, these activities should be reduced, and are subject to the moratorium recommendation made later.

The EBRD also administers grant funds for the Nuclear Safety Account (NSA, approx. $ 0.25 billion) and the Chernobyl Shelter Fund (CSF, currently $ 0.4 billion).

The NSA was established in 1993 with priority given to supporting closure of high-risk nuclear reactors in Central and Eastern Europe and the former Soviet Union, in particular to supplying equipment to improve the short-term operational safety of the plants prior to accelerated closure. To date, this vehicle was implemented rather weakly, and – with some exceptions - the accelerated nuclear phase out still needs to occur. As the EBRD states: "Whilst the short-term upgrades are near completion, discussions regarding firm dates for plant closure are still ongoing".

The CSF was formally established in 1997 to assist the Ukraine in transforming the existing Chernobyl sarcophagus into a safe and stable system.

6.5.2 European Investment Bank

The European Investment Bank (EIB) is the key instrument of the European Union for supporting infrastructure investments in EU countries. In addition, the EIB also funds projects in DC and EIT, while to a much lesser extend (EIB 2001a).

The EIB's cumulative loans to DC and EIT in the field of renewable energies are approx. $ 0.5 billion in the period of 1993-2001, out of a total lending to DC in the energy sector of about $ 2.1 billion - a surprisingly high share which concerns mainly hydro, and some wind projects (EIB 2001b).

In 2001, 27% of DC financing was targeted to the energy sector (out of approx. $ 2.8 billion), i.e. $ 0.8 billion – but these funds include controversial projects like the Chad-Cameroon oil pipeline, and also transmission and distribution system extensions for electricity (EIB 2001b).

[22] see www.bankwatch.org

The EIB statement on sustainable development referred to the key role of EE and RE in the energy sector within Europe, but made no reference to the developing world (EIB 2001c). Given the controversial lending in the oil & gas sector, it remains doubtful if the EIB is committed to sustainable energy investments outside of Europe.

6.6 Export Credit Agencies (ECA)

Export Credit Agencies (ECAs) are publicly funded institutions that promote exports, either by directly offering credits, or by guaranteeing risky credit lines.

For this, ECAs use public money to provide exporters and their banks with insurance, guarantees against different types of risk and, in some cases, debt and equity.

During the 1990ies, ECA funds grew to the order of $ 100 billion, and some 50% of those are targeted to large infrastructure projects in DC, and EIT.

Reviews of the performance of ECAs with respect to sustainable energy have been published (Rich 2000; WRI 2001; WWF/IPS 2001), and critically reviews on ECA activities is available in the internet as well[23].

The ECA reform campaign calls for a "greening". i.e. in the energy sector, ECAs should commit to supporting the deployment of sustainable energies instead of fossil fuels, large dams, or nuclear power.

As a detailed analysis of ECA performance is outside of the scope of this paper, it should only be mentioned that – compared to other IFIs – ECAs tend to offer very minor public accountability, restricted access to project pipelines and documents, and a rather vague concept of public disclosure of relevant operation policies.

The key reason for this difference can be seen in the direct involvements of ECAs with the private sector, where companies usually claim exclusive right on their business plans.

Though on can follow such reasoning in principle, the nature of public resources used for ECA businesses substantiate the request for public accountability, and civil sector involvement. As seen from a sustainable development perspective, multi-stakeholder involvement, and transparency are key factors. So far, the record of ECAs in that respect is rather unimpressive, though North American ECAs tend to be more "open" when compared to ECAs from other countries.

The current role of ECAs with respect to sustainable energy is quite doubtful – and even *if* their policies would be radically changed towards favoring EE and RE projects, ECAs would not serve as an additional source for funding the sustainability transition, because their role is mainly to guarantee foreign investments, not to provide for the investment itself.

Still, success of ECA reform campaigns of various NGOs is crucial to the financing of EE and RE: as long as large-scale hydro, fossil and nuclear projects receive preferred treatment as regards foreign direct investment, a significant barrier against more sustainable alternative investments will remain, and will hinder the emergence and dissemination of the alternatives.

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[23] see www.ecawatch.org

Similarly, traditional ECA policies in the energy sector support the traditional energy business, and continue the lock-in to unsustainable energy options. As the private sector *will* be needed in financing the sustainability transition especially in developing and EIT countries, the re-orientation of ECA energy sector policies towards priorities for sustainable energy is a key factor in attracting direct foreign investors for larger-scale EE and RE programmes.

The aggregation of a variety of smaller localized EE and RE investments into such programmes is another factor to be considered. Here, ECAs can help in creating *fast tracks* for such programmes, and in communicating their successes more prominently to their clients. In this respect, the ECA reform is a quite important element of future financing for sustainable energies.

6.7 Bilateral Donors

In addition to MDBs and ECAs, also *bilateral* donor organizations are active in the energy sector.

Besides funding for MDB and ECA, industrialized countries from the "North" generate the lion's share of so-called official development aid (ODA).

The overall budgets of bilateral ODA from countries of the OECD's Development Assistance Committee (DAC) group in the last 10 years is shown in the following table.

Table 7 Official Development Assistance form DAC Members

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	share
						mln US$					
Australia	961	969	973	1,027	1,091	909	932	997	982	1,065	1.90%
Austria	577	510	538	618	624	469	506	441	527	483	0.90%
Belgium	879	807	806	688	848	777	740	855	760	933	1.70%
Canada	2,215	2,227	2,236	2,195	1,980	1,681	1,926	1,732	1,706	1,683	3.00%
Denmark	1,305	1,389	1,416	1,474	1,432	1,579	1,625	1,684	1,733	1,860	3.30%
Finland	779	593	408	298	320	355	365	382	416	417	0.70%
France	7,582	7,709	7,807	8,044	7,091	6,324	6,032	5,512	5,639	4,721	8.40%
Germany	7,369	6,676	6,808	6,392	6,104	6,409	5,645	5,396	5,515	5,838	10.40%
Greece	-	-	-	-	-	167	167	178	194	262	0.50%
Ireland	81	72	92	119	152	173	184	196	245	259	0.50%
Italy	3,035	3,550	3,217	2,835	1,636	2,191	1,237	2,212	1,806	1,556	2.80%
Japan	12,938	12,175	10,755	11,611	11,744	8,918	9,798	12,058	15,323	13,007	23.10%
Luxembourg	44	37	52	57	56	72	93	110	119	141	0.30%
Netherlands	2,644	2,649	2,528	2,412	2,678	2,798	2,881	2,967	3,134	3,516	6.30%
New Zealand	103	106	103	104	103	95	125	128	134	130	0.20%
Norway	1,160	1,163	1,079	1,205	1,149	1,183	1,253	1,363	1,370	1,238	2.20%
Portugal	236	286	257	322	235	198	251	256	276	305	0.50%
Spain	1,137	1,263	1,289	1,307	1,198	1,092	1,218	1,354	1,363	1,335	2.40%
Sweden	1,781	1,968	1,848	1,840	1,539	1,674	1,622	1,521	1,630	1,978	3.50%
Switzerland	901	1,136	809	912	861	849	886	871	984	988	1.80%
UK	3,635	3,479	3,667	3,878	3,676	3,596	3,573	3,859	3,426	4,724	8.40%
USA	10,992	12,337	11,277	10,834	7,868	9,825	7,069	8,918	9,145	9,756	17.40%
TOTAL DAC	60,354	61,099	57,963	58,173	52,384	51,335	48,126	52,988	56,428	56,194	

Source: OECD

As can be seen, major donors in absolute terms are Canada, Denmark, France, Germany, Italy, Japan, the Netherlands, Sweden, the UK, and the USA. The European countries together contribute more than 50%, followed by 23 % for Japan, and some 20% for North America.

Table 8 Bilateral ODA Commitments to Energy, 1989-1999

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Share
						mln US$						
Australia	7.23	4.35	2.87	17.85	37.38	28.99	22.49	18.62	15.68	10.40	4.05	0.2%
Austria	20.32	8.67	88.21	77.20	68.40	62.48	12.96	9.39	1.90	2.14	4.30	0.2%
Belgium	5.71	4.49	13.25	10.86	9.64	9.26	3.52	3.87	2.26	1.15	1.35	0.1%
Canada	70.63	40.28	61.72	44.32	50.85	24.03	20.39	82.12	55.40	47.05	43.71	2.3%
Denmark	10.30	23.11	28.67	11.79	38.23	87.81	26.79	56.66	32.10	30.65	19.34	1.0%
Finland	72.80	15.59	139.21	17.33	19.39	1.60	2.10	30.53	4.18	5.28	9.48	0.5%
France	342.74	600.08	222.13	234.09	239.16	172.08	155.65	183.40	103.82	208.53	-	-
Germany	517.31	667.47	505.04	358.13	668.19	227.09	300.66	448.84	506.73	189.38	300.50	15.5%
Greece	-	-	-	-	-	-	-	-	-	0.13	-	-
Ireland	-	-	-	0.32	-	0.05	0.79	0.79	-	0.00	-	-
Italy	243.51	282.31	564.53	237.37	35.93	129.10	116.77	34.61	28.59	0.14	6.63	0.3%
Japan	495.24	546.95	1,959.95	1,141.94	1,898.44	2,565.89	4,144.17	2,061.27	3,084.33	1,747.44	1,244.53	64.2%
Luxembourg	-	-	-	1.31	0.98	-	-	-	1.09	1.41	1.56	0.1%
Netherlands	18.13	37.35	2.21	19.11	24.65	37.63	77.43	68.45	40.60	34.21	15.23	0.8%
New Zealand	-	-	1.02	0.92	0.97	2.35	2.35	-	-	1.22	1.05	0.1%
Norway	13.50	45.17	118.28	24.54	62.24	25.15	140.68	76.18	61.55	53.09	36.34	1.9%
Portugal	-	-	-	0.19	-	1.91	0.09	0.27	1.78	0.55	0.09	0.0%
Spain	-	-	485.55	113.67	53.56	110.38	34.84	79.79	32.23	60.51	5.09	0.3%
Sweden	195.90	50.06	59.77	69.31	103.92	70.53	55.29	103.56	73.95	31.71	29.45	1.5%
Switzerland	14.84	4.09	15.24	1.42	1.10	4.24	2.12	0.10	-	1.24	9.29	0.5%
United Kingdom	227.62	206.50	486.69	133.11	127.72	125.93	123.28	95.87	77.67	80.82	119.75	6.2%
USA	282.94	308.32	308.32	293.56	276.22	206.80	213.40	166.00	91.52	135.80	87.56	4.5%
EU	-	-	-	-	-	-	28.05	-	-	-	-	-
Total	2,538.72	2,844.79	5,062.66	2,808.34	3,716.97	3,893.30	5,455.77	3,520.32	4,215.38	2,642.85	1,939.30	100.0%

Source: G8 (2001)

The share of ODA commitments in the energy sector amounted to about 3.5 per cent of total ODA in the late 1990ies, the main donor was Japan (Table 8). But ODA flows for energy *decreased much stronger* than the total ODA during the last decade.

Table 9 ODA Commitments to Renewable Energy, 1989-1999

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Share
						mln US$						
Australia	0.48	-	-	-	0.38	-	0.01	18.44	8.20	1.32	1.64	0.4%
Austria	-	-	1.63	25.20	21.01	52.27	-	5.44	0.42	0.84	1.47	0.4%
Belgium	-	-	-	-	2.27	3.52	1.03	0.08	0.27	0.55	0.29	0.1%
Canada	1.34	4.78	5.85	14.26	21.28	11.17	11.54	36.32	27.53	3.23	30.68	7.5%
Denmark	-	8.17	5.52	0.34	0.14	33.32	5.37	19.19	20.19	9.29	7.61	1.9%
Finland	4.84	0.93	41.57	7.93	9.31	-	-	15.24	0.91	0.84	-	
France	261.48	239.27	24.57	8.16	33.50	28.45	42.06	42.66	71.37	88.43	23.07	5.6%
Germany	-	27.29	66.22	112.22	10.28	108.08	134.56	251.55	91.22	190.12	238.54	58.2%
Italy	214.71	92.41	112.32	82.67	1.14	123.37	74.87	3.02	23.40	0.09	2.60	0.6%
Japan	283.12	145.14	701.19	121.06	584.94	680.06	1,518.77	943.28	816.01	389.23	35.38	8.6%
Netherlands	0.39	0.37	0.76	5.57	0.94	2.44	2.87	27.96	18.91	19.11	9.26	2.3%
New Zealand	-	-	-	-	-	-	0.46	-	-	-	-	
Norway	0.03	7.91	62.82	6.62	6.19	4.60	87.53	13.58	4.66	9.54	2.36	0.6%
Portugal	-	-	-	-	-	-	0.30	-	-	-	-	
Spain	-	-	58.19	37.78	-	2.91	-	10.00	0.64	41.07	19.80	4.8%
Sweden	307.87	-	39.37	-	0.04	0.92	33.64	11.95	0.07	1.13	9.92	2.4%
Switzerland	-	0.70	13.11	-	1.01	0.74	2.09	0.59	0.73	-	-	
United Kingdom	28.68	44.67	7.94	53.26	43.36	35.93	3.12	0.39	4.33	3.64	0.09	0.0%
USA	-	-	-	-	-	-	-	10.97	3.70	7.14	6.89	1.7%
EU	38.71	10.77	54.39	1.39	2.52	3.86	0.19	24.26	0.32	5.92	20.46	5.0%
Total	1,141.66	582.41	1,195.42	476.45	738.29	1,091.64	1,918.40	1,434.92	1,092.88	771.51	410.04	100.0%

Source: G8 (2001)

Although the role of renewable energy in an sustainable energy system became more clearer in the last years the ODA commitments to renewable energy decreased dramatically during the last years (Table 9). The share of renewable energy projects in the total ODA commitments to energy in 1999 was only slightly higher than in 1989! Among the

DAC group, Germany and Japan played an increasingly dominating role during the last decade.

In addition to the overall ODA figures, some of the bilateral donor organizations are covered indicatively in the following.

6.7.1 Japan

The Japan International Cooperation Agency (JICA) reports that 2.5 % of its budget is dedicated to the energy sector (JICA 2002).

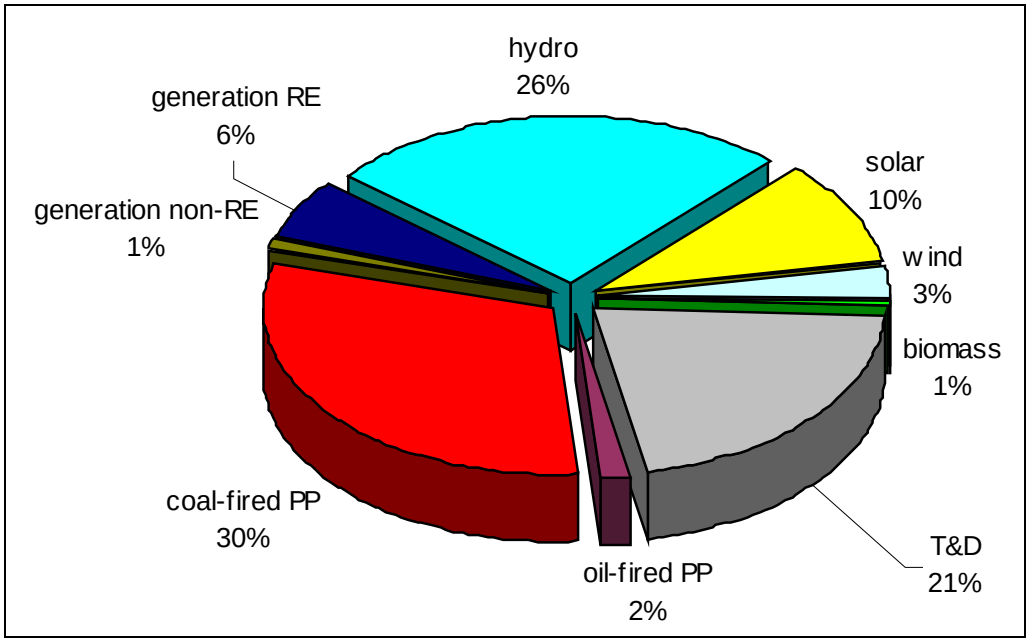
Due to the large absolute amount of Japanese bilateral aid, this rather small figure translates into some $ 0.5 billion per year. In the past, JICA financed coal- and oil-fired powerplants, and large hydro, as well as minor renewable projects.

Meanwhile, at least some shift towards gas-based cogeneration, more renewables (especially PV), and some EE projects can be observed. Still, the structure of JICA funding is (yet) far away from significantly promoting sustainable energy.

6.7.2 Germany

The German financial aid agency is Kreditanstalt für Wiederaufbau (KfW) [24], its share of energy projects in the energy sector funding is shown in Figure 13.

Figure 13 Shares of Energy Options within the KfW Energy Portfolio



Source: KfW (2001) Energy Sector commitments 1997-2001, excluding sector policy

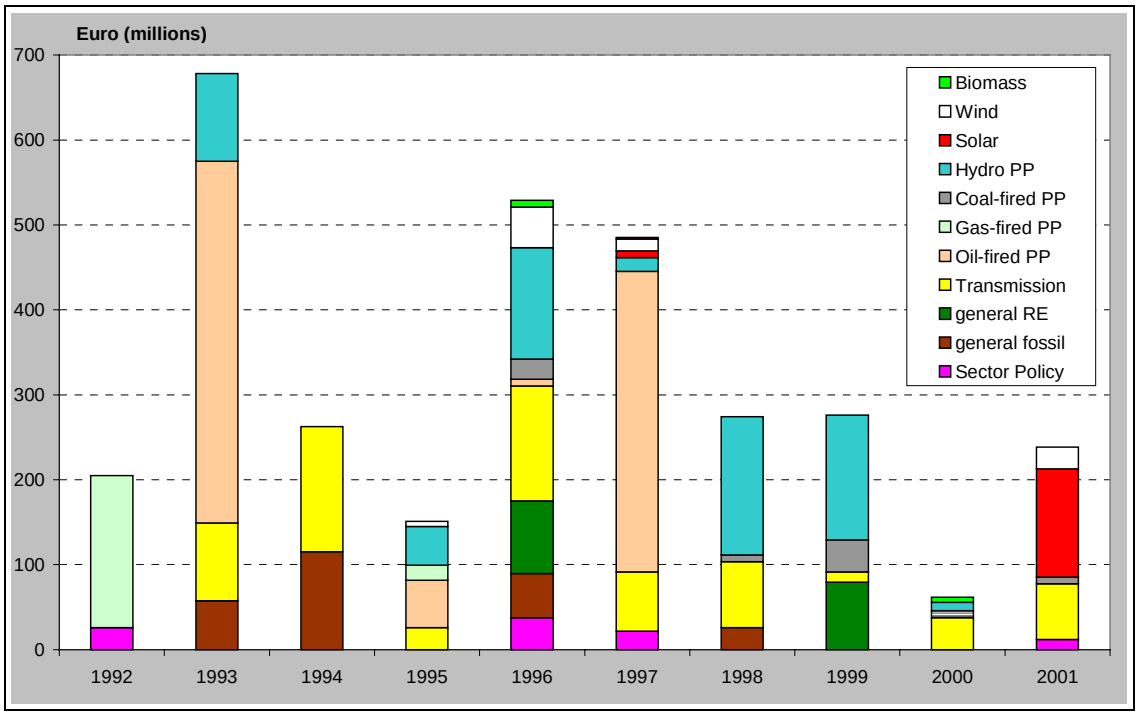
[24] In Germany, Technical Assistance is carried out by a separate entity (GTZ) which at least partially covers EE, and capacity building for EE, RE, and climate change issues (e.g., CDM). GTZ's budget for EE and RE is much smaller than KfW's, but it plays a crucial role in preparing for investments, implementing "enabling activities", and supporting developing countries in the process of energy policy formulation, planning, evaluation, and organizational development. GTZ has also been pioneering in the area of PV applications for solar home systems, solar-driven water pumps, and solar cookers.

As can bee seen clearly, the aggregated budget from 1997-2001 shows a large portion of coal-fired powerplants (especially in China, and India), and 25% of (mainly large-scale) hydro.

After the Government changed in 1998, KfW's strategy was re-oriented toward more RE, and less fossil investments – this is shown in Figure 14.

The earlier massive investment in coal powerplants (especially in 1993, and 1997) was shifted towards (large-scale) hydro plants, and - since 2001 - to solar-thermal power[25].

Figure 14 Development of KfW's Energy Funding, 1992-2001



Source: KfW (2001); data is given in €.

Still, the overall budget for energy declined, and nearly no direct EE investments are part of KfW's portfolio.

6.7.3 UK - DfID

The UK Department for International Development currently spends about $ 1 billion per year in the energy sector (approx. 9% of total budget), and focuses on RE (especially hydro, and PV), and to a smaller extend also EE projects. Their share in the energy sector funding is around 15-20%, depending on the year (DfID 2002a).

According to a recent DfID consultation paper on "Energy and Poverty", the priority of EE and RE, especially for rural energy, will increase in the future (DfID 2002b).

[25] This reflects mainly a 140 MW-project in India which will demonstrate an integrated solar-combined-cycle power plant. The project is co-sponsored by the GEF.

6.7.4 Other European Countries

Bilateral ODA from Denmark, the Netherlands, and Sweden is very actively concerned with sustainable energy and EE, especially regarding smaller-scale projects, enabling activities and capacity building, and technology transfer.

6.8 The 2002 Financing for Development Summit

The Financing for Development (FfD) Summit in Monterrey (March 2002) was seen as a pivotal event to provide for new and additional funds for sustainable development, even when the prospects from the preparatory process where disappointing.

As it is now history, the FfD Summit did offer some perspectives for "fresh" ODA commitments from industrialized countries, and in that respect on might hope that this will translate also into some additional funding for EE and RE under ODA schemes.

But if the FfD consensus is seen as an indicator for the priority of governments for financing sustainable energies, the consensus document is sobering: not a single word can be found regarding energy, and sustainable development isn't mentioned at all.

Whether the FfD Summit is seen as a failure or as a moderate success on the road to the Johannesburg Summit, no direct positive consequence can be drawn with respect to the challenge of financing sustainable energy.

Indirectly, though, the Monterrey Consensus of the FfD Summit underlines that *good governance* in the energy sector – and here, sustainability goals might well be subsumed – is not only needed, but is a pre-requisite for more DFI.

The Consensus can be read as a counterpoint against the credo of unconditional liberalization of (energy) markets:

"We will pursue appropriate *policy and regulatory frameworks* at our respective national levels and in a manner consistent with national laws to encourage public and private initiatives, including at the local level, and foster a dynamic and well functioning business sector, while improving income growth and distribution, raising productivity, empowering women and *protecting labour rights and the environment*. We recognize that the appropriate role of government in market-oriented economies will vary from country to country" (cited from FfD 2002, *emphasize added*).

In that sense, the FfD Summit made at least a clear *political* statement towards future governmental policy "intervention" in the energy field.

6.9 Conclusions: The Role of ODA

As our brief analysis of current ODA in the energy sector has indicated, both the share of energy sector finance, and the relative shares for EE and RE within the sector fall dramatically short – with the exception of the GEF, no IFI has yet a clear priority for sustainable energy investments.

As governments from industrialized countries continue to underscore their own 0.7% target for ODA (expressed as a share of their GNP), there is little hope to rely on the established, traditional patterns – this would simply result in far to small financial resources for the sustainable energy investments, and would also continue to give the

lion's share to unsustainable energy technologies[26]. As a consequence, ODA in the energy sector must be re-considered in terms of establishing clear targets for EE and RE, and in being only *one of several sources* for financing the sustainability transition (GEF 2002a).

[26] As a positive sign, the EU decided to bring the Union average of ODA from 0.31% to 0.39% by 2006. This will result in additional ODA of about 21 billion US$ between 2002 and 2006, and a further annual 9 billion US$ as of 2006.

7 New Options to Finance Sustainable Energy ?

Where could the monies and investments needed for sustainable energy – beyond a re-structured and focused ODA – come from?

Several options have been discussed in the context of the FfD Summit and the WSSD (e.g., UNEP-FI 2002; IBRD/UNEP-DTIE/IMF 2002), but no real progress has been made so far. The following chapter contains a brief discussion of potential new sources to finance global sustainable energy.

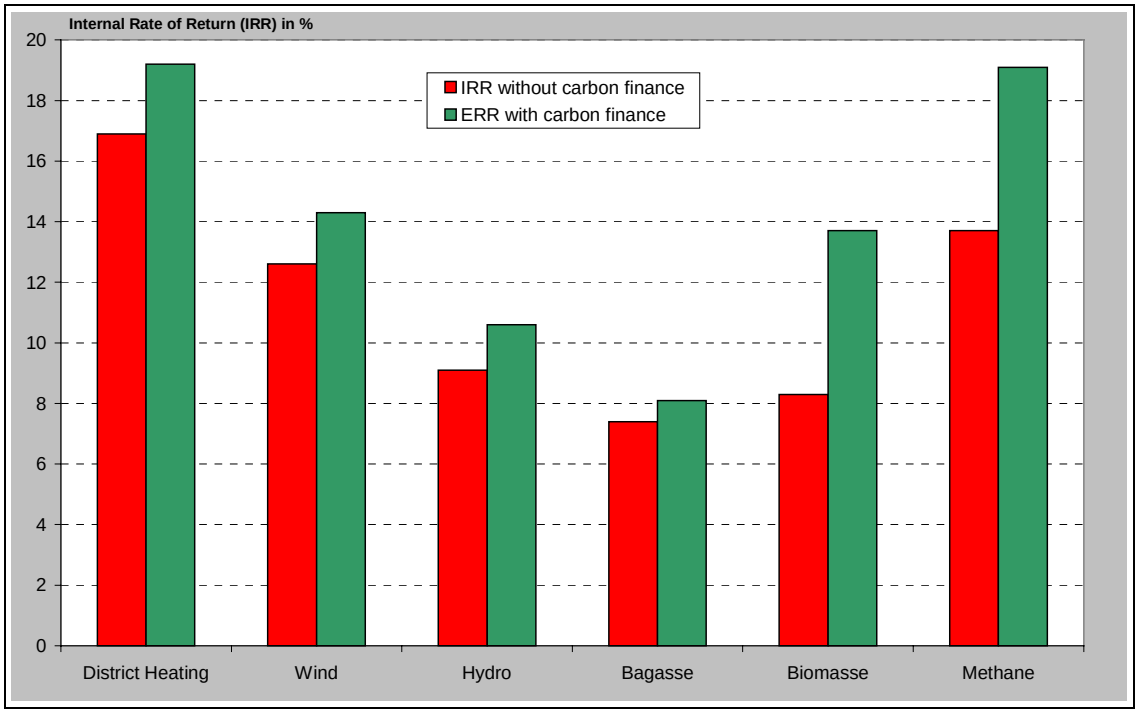
7.1 Project-Based Kyoto Mechanisms: Joint Implementation (JI) and the Clean Development Mechanism (CDM)

Since the Marrakech Accord to the Kyoto Protocol was contracted at COP-7 in late 2001, and the near-term ratification of the Kyoto Protocol is looking more and more realistic, the search for additional funding for EE and RE projects turned to a new kid on the block: potential *revenues from carbon-based trade* on the project level.

After the Kyoto Protocol introduced the so-called project-based flexible mechanisms to achieve greenhouse-gas reductions by joint project development between industrialized and EIT (JI) or industrialized and developing countries (CDM), several initiatives were started to create international "carbon markets," which could be used to finance energy efficiency and renewable energy technologies in developing countries.

Depending on the project under consideration, its economic environment, and the potential price of greenhouse-gas emission reductions, carbon financing could create a real incentive for EE and RE projects, as the following figure indicatively shows.

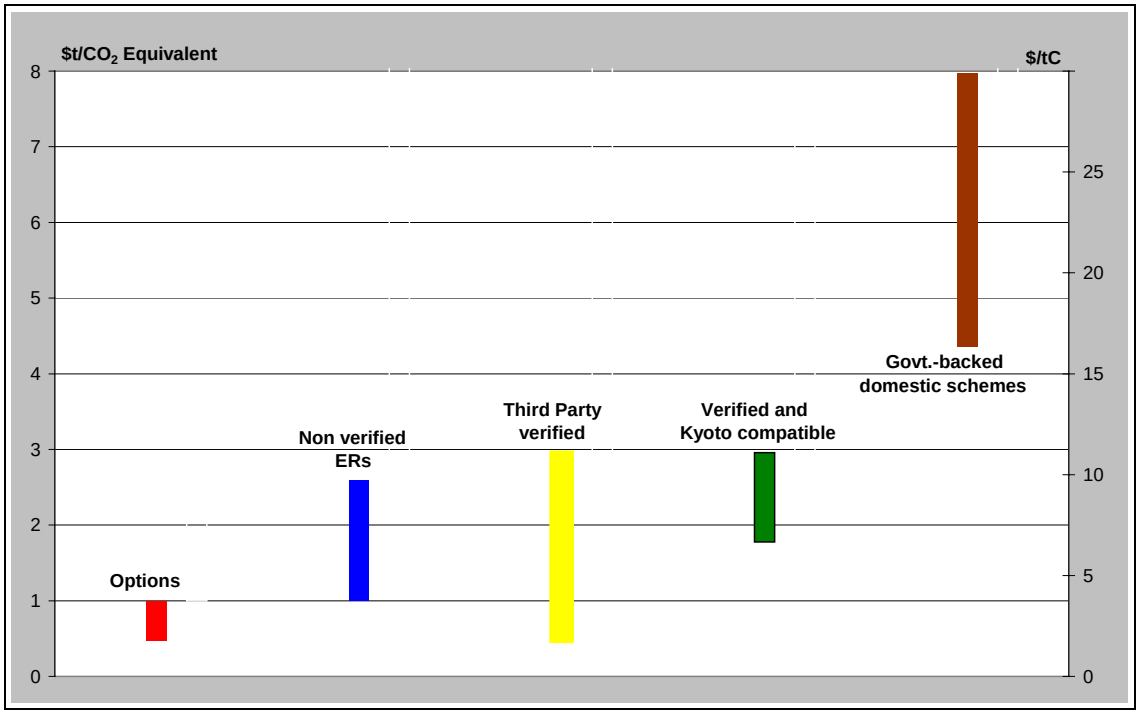
Figure 15 Effects of Carbon Finance on EE and RE projects



Source: PCF (2002), data refer to $ 3/t CO_2 equivalent of verified emission reductions

Besides unresolved issues of how to determine "real" greenhouse-gas reductions on the project level, and how to verify such reductions, the key uncertainty for the attractiveness of carbon financing arises from the future price level of greenhouse-gas emission reductions, usually expressed in CO_2 equivalents.[27]

Figure 16 Development of CO_2 Equivalent Reduction Prices



Source: PCF (2002)

The above figureshows the different price levels for emission reductions of various "qualities."

In addition to these qualities, the key factors affecting future emission reduction prices will be demand growth (economic growth in Annex I countries, plus voluntary and potential future US commitments), abatement costs, and the market for "hot air."

In a medium growth scenario, and if the US remains out of the global initiative to reduce greenhouse gases, demand for certified, project-based emission reductions (under CDM or JI) – and hence their prices – would be close to zero.

Under different assumptions, prices for certified emission reductions could go beyond 5 $/t CO_2 equivalent. The most important variable in determining market prices is US commitment to emission reduction targets – as long as the US stays out of the Kyoto Protocol, emission reduction prices will remain low.

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[27] The CO_2 equivalents are a measure to aggregate several greenhouse gases such as CO_2, CH_4, and N_2O into a single mass-based equivalent, taking into account their different atmospheric residence time and radiative forcing (specific global-warming potentials).

According to the IEA, emission reduction prices could be ten times higher *with* US participation.

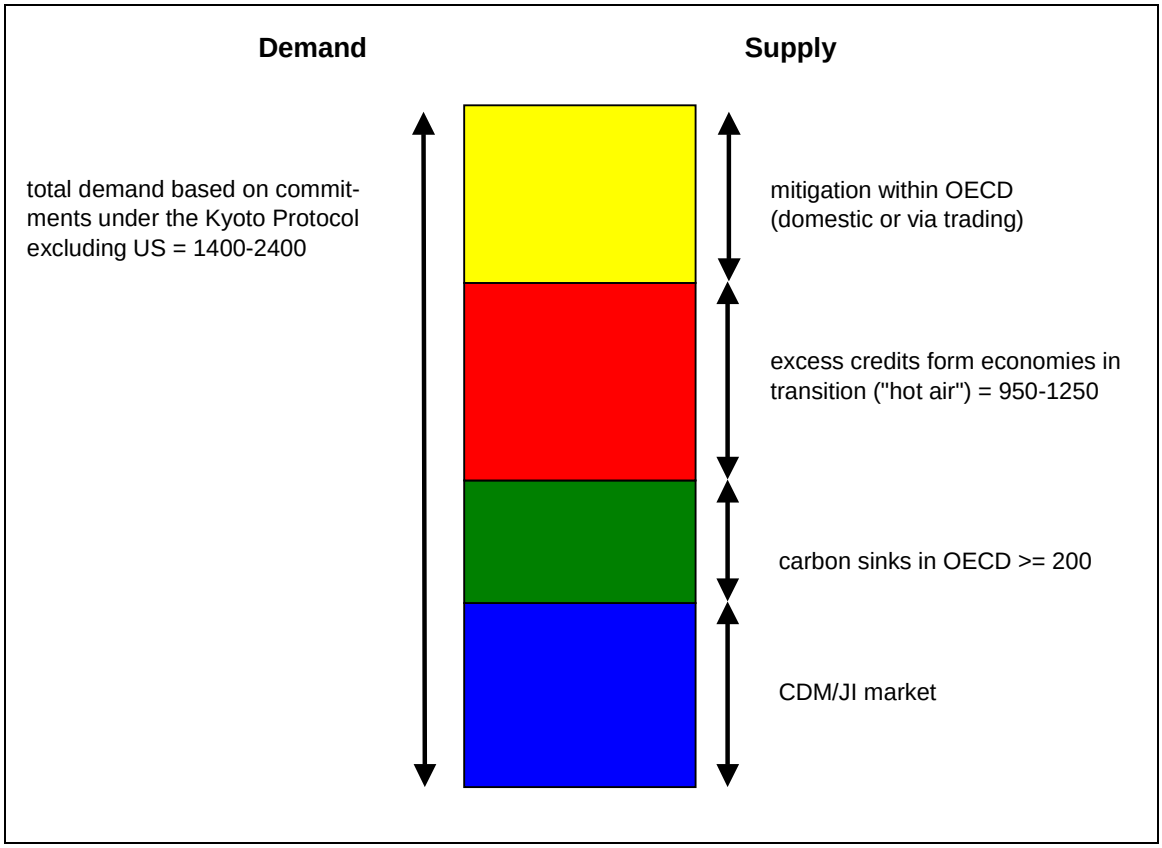
The overall uncertainty of future emission reduction prices arises from the uncertainty of the extent of a carbon market – the less "hot air" factored into this market by EIT countries, and the more OECD countries relying on JI and CDM, the larger the market for the project-based mechanisms would be. This is shown schematically in the following figure 17.

Given this uncertainty, CDM and JI remain a *potential* source of funding for the near future. But projects using carbon finance are also exposed to risks and face transaction costs in acquiring certification and adequate trade partners.

On the positive side, carbon finance will establish additional revenue for projects, which would enhance their financial viability and facilitate the "matching" of e.g. grant money from donors.

Depending on the future climate policy of the USA, and– in the longer-term – the outcome of the negotiations for the 2nd commitment period of the Kyoto Protocol (i.e. the post-2012 time frame), the role of carbon finance might indeed become more prominent and, to some extent, could lessen the need for additional financing resources for EE and RE projects in EIT and developing countries.

Figure 17 Potential Demand and Supply of Emission Reduction Credits



Source: PCF (2002), data given in million tons of CO_2 equivalents

Still, this prospect remains unsure, and there is a need to establish appropriate project certification and emissions verification rules for JI and the CDM, which allow to "aggregate" multiples of small-scale or distributed energy systems, which are typical for rural EE and RE projects.

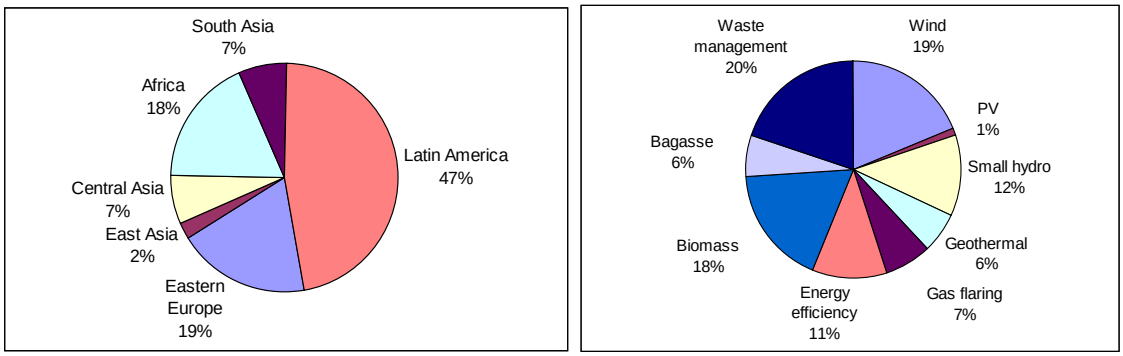
7.2 The Prototype Carbon Fund (PCF)

The Prototype Carbon Fund was created in 1999 by the World Bank to explore new options for "carbon-based" financing (PCF 2002). It is a *private-public partnership* that aims to mobilize new and additional resources in order to address climate change and promote sustainable development. Until 2002, it attracted some $145 million in its fund, both from governmental and private sector sources.

The PCF acts as a facilitator in carbon trading – shareholders of the PCF receive verified ER for their shares, and projects receive ER funding, currently assumed to be $ 3/t of CO_2 equivalents.

As the following figure shows, the 2002 PFC project pipeline is well-balanced with respect to world regions and EE/RE technologies.

Figure 18 Geographical and technological distribution of PCF Projects in 2002



Source: PCF (2002)

In addition to project funding, the PCF is active in capacity building and knowledge management regarding climate change and greenhouse-gas reduction options and mechanisms, respectively. Given the vast need for these initiatives, the PCF makes a valuable contribution to a sustainable energy strategy.

7.3 Other Carbon-Finance Activities

Besides the PCF, a variety of national, bilateral, multilateral, and private-sector activities developed in the realm of carbon finance since 1996.

Most prominently, the Dutch program on CDM and JI should be noted, which is now in the process of becoming fully-operational.[28] Carbon financing and carbon trade are increasingly becominge issues for consultants, brokers, private banks, and (some) larger energy companies – the examples of Shell International and BP account for the most outstanding activities in this field.

[28] See http://www.carboncredits.nl/ for more information.

Still, all this activities should be regarded as *preparatory*. Before real monies can be linked to (certified) greenhouse-gas emission reductions, the open questions addressed in Section 7.1 must be resolved.

7.4 Public-Private Partnerships (PPP) and Foreign Direct Investment (FDI)

In the mid-1990s, another "buzzword" entered the international financing arena and gained significant attention: public-private partnerships (PPP).

PPP can be seen as the conceptual answer to the privatization wave of the 1990s and beyond, as discussed in Section 6.4. To attract private investment – especially in the form of foreign direct investments (FDI) – governments around the (developing) world set out to create favorable investment climates and targeted potential foreign investors, in particular for infrastructure projects including the energy sector.

As the 1990s also showed, some movement of (especially) multinational firms towards New Corporate Strategies -- Corporate Citizenship, the Global Compact, Sustainable Business, etc. – the two concepts fruitfully interacted, unfortunately only in a few cases.

Bilateral and multilateral donors have made PPP the "key" rationale of their outreach policies to the private sector – and found that PPP can *deliver only in the long-term*: the rather small incentives made available for FDI, the global competition for investors, and the time-consuming process of establishing the "adequate" regulatory frameworks for more prominent private-sector involvement in developing countries together contributed to only a few noteworthy successes.

With respect to sustainable energy financing, the PPP concept, in its current shape, *will yield only minor results*, e.g. business involvement in rural PV schemes – which should be followed-up, though, for they are landmark examples of how to do business under the sustainability paradigm.[29]

Nonetheless, it is a *real* challenge to adequately integrate environmental and social concerns into PPP schemes, while simultaneously attracting FDI partners.

Given more than two decades of "streamlining," the deregulation paradigm and the fossil-fuel lock-in are present in the mind of most desk officers in MDBs[30] and their business partners as well.

Therefore, initiatives like the BCSE and various WBCSD projects are urgently needed to expand the "mind-base" for PPP schemes in the sustainable energy sector.

To become a truly additional option for sustainable energy development, PPP schemes need very thorough guidance from the public sector and scrutiny regarding the financial dealings of the private partners.

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[29] Among others, a good example is the Rural Energy Enterprise Development (REED) initiative, a partnership of UNEP with the UN Foundation and US-based non-profit clean energy investor E+Co. (see UNEP-DTIE 2002 for details). REED currently benefits rural communities in five African countries, Brazil and China. The concept behind REED is simple: Start-up capital and training is provided to small-scale entrepreneurs who have identified a market niche for rural energy provision but who cannot attract the necessary seed financing to begin or scale up their operations. Examples include businesses making fuel-efficient stoves, repairing wind pumps, or providing solar crop dryers.

[30] See e.g. the Duff (2002) for a snapshot of IFC thinking – sustainability is not mentioned once and neither are environmental or social concerns.

In general, the regulatory capacity of most governments in Developing Countries is *currently too weak* to adequately work with the private sector, especially where larger FDI projects are concerned – issues like corruption and fraud come into play, and the human resources available for regulating PPP schemes are scarce. The negotiating power of private FDI partners is usually not matched by similar capacities and (political) standing of their public sector counterparts. As a result, real partnerships will depend on the strengthening of the regulatory capacities of Developing Countries.

This need calls for a new focus of ODA on the development of human and organizational resources for private sector regulation (and consultation, negotiation, etc.). The more PPP schemes are promoted in the post-WSSD world (see Section 7.5 below), the higher the demand for such a strengthening, and the more scrutiny and transparency is needed in PPP dealings.

7.5 WSSD Type-II Outcomes: Innovative Schemes?

Along the road to the WSSD, the preparatory process indicated the reluctance of several industrialized countries – most prominently, the USA – to envision new binding commitments as an outcome of the WSSD.

In reaction to this, the term *Type II outcomes* was coined, meaning that voluntary arrangements (partnerships) between governments and private or civil sector organizations to achieve at least some contributions to the UN Millennium Targets, and the Agenda 21 in general, would be most welcome.[31]

The Type-II initiatives are meant to *complement* the – rather few – negotiated outcomes of the WSSD. With regard to the energy sector, guidelines for Type-II outcomes were recently prepared (UN-DESA 2002).

Consequently, five key areas for Type-II partnerships in the energy area were identified:

1. Access to energy and modern energy services
2. Energy efficiency improvements
3. Contribution of renewable energy
4. Contribution of advanced fossil-fuel technologies, and
5. Energy and transport

These key areas are compatible with the definition of sustainable energy given here, although item 5 is beyond the scope of this paper.

[31] In the official UN-CSD language, this reads as follows: "Partnerships and initiatives to implement Agenda 21 are expected to become one of the major outcomes of the World Summit on Sustainable Development. These 'second type' of outcomes would consist of a series of commitments and action-oriented coalitions focused on deliverables and would contribute in translating political commitments into action.". Source: Annex I: Explanatory Note by the Chairman of the Preparatory Committee entitled, "Partnerships/Initiatives to strengthen the implementation of Agenda 21", available at http://www.johannesburgsummit.org/html/sustainable_dev/type2_part.html/partnerships2_form.doc

With respect to item 4, it remains to be seen which "advanced" technologies will be presented in Type-II partnerships.[32] The registry of Type-II schemes is still open, and has already shown a very large variety of activities.[33]

Encouraging examples of partnerships are, among others,

- The *African Rural Energy Enterprise Development* (AREED) initiative, funded by UNEP, seeks to develop sustainable energy enterprises that use clean, efficient and renewable energy technologies to meet the energy requirements of the poor. AREED provides enterprise development services to entrepreneurs and early-stage funding to help build successful businesses that supply clean energy technologies and services to rural African customers.
- The *Global Village Energy Partnership* (GVEP), initiated by UNDP, and the World Bank, seeks to create a 10-year program to reduce poverty and enhance sustainable development through the accelerated provision of modern energy services to those un-served or underserved. Electricity services, thermal energy and clean liquid and gaseous fuels must become more available to people living in rural areas as a means to support sustainable development. Renewable energy, energy efficiency, liquefied petroleum gases (LPG), modern biomass, and expanded use of distributed energy options can meet the range of unmet energy service needs (lighting, mechanical power, heating and cooking) in an environmentally sound and cost-effective manner.
- The *Global Network on Energy for Sustainable Development* (GNESD), initiated by UNEP, and sponsored by the UN Foundation, E7, and the Governments of Denmark, France, and Germany. GNESD will create a network of "Centers of Excellence" regarding EE and RE in Developing Countries, thus supporting existing bodies and strengthening their further development and outreach.
- E7 *Partnership on Availability, Accessibility and Affordability of Electricity*. E7 is a non-profit group comprising 9 leading electricity companies working together for sustainable development. The E7 proposed two initiatives: Electric companies to implement best practices (business to business partnership), and Electric companies to expand access to electricity (Public/private, multi-stakeholder partnership opportunities)

One governmental Type-II partnership is the EU *Initiative on Energy for Sustainable Development*: its objective is to contribute to providing access to energy necessary for the achievement of the Millennium Goals. Through the partnership efforts, the EU will work with developing countries towards creating the necessary economic, social, and institutional conditions in the energy sector to achieve its national development goals, in particular by providing and improving energy services for the 'energy poor.' The EU hopes to work with developing countries on the basis of a full menu of technical and institutional options.

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[32] E.g., so-called "clean" coal technologies usually include coal gasification/combined-cycle schemes which –given the state of the technology – offer nearly no greenhouse-gas benefits and are far more expensive than e.g. cogeneration with coal-fired fluidized-bed combustion.

[33] See http://www.johannesburgsummit.org/html/sustainable_dev/partnership_initiatives.html

Another governmental Type-II partnership, the US-Australian "*Clean Energy Initiative: Powering Sustainable Development from Village to Metropolis,*" aims to invest $43 million from public funds to leverage more than $400 million of private sector and civil society investments. A very broad list of partners, including some 20 governments, NGOs, MDBs, and the energy business from the USA and Australia, is supposed to work with the initiative on investing in e.g. energy efficiency, cleaner transport fuels, and to collaborate with the Global Village Energy Partnership.

As of now, it is too early to evaluate the effectiveness of the Type-II approach – once the partnerships start to acquire and require funding for their efforts, one will know to what extent they are "concrete."

For now, it remains doubtful whether the Type-II partnerships will raise new (additional) monies for EE and RE investments in Developing Countries – both the EU, and the US/Australian initiatives seem to draw funding from already allocated ODA sources – the only potential benefit might be the attraction of more private or civil sector co-funding than the "usual" ODA projects would allow.

In that sense, Type-II partnerships could *help to focus* energy investments on sustainable technologies, and support the more general PPP approach discussed in Section 7.4. However, they will also face the problems associated with PPP, and initiators have not indicated any broader mechanism to deal with those problems.

However, as an element of a multi-stakeholder strategy needed for the sustainable energy transition, Type-II outcomes will – at the least – help to communicate the issues of sustainable energy to a larger audience.

7.6 Bringing the Money to the People: Micro-Financing Schemes

As adequate financing comprises one pillar of a global sustainable energy strategy, and adequate regulation of the power sector another one, how monies for sustainable energy investments will *reach those who are in need* becomes an important issue.

As our brief analysis in Section 6 has shown, the traditional approach of massive lending programs for the energy sector of Developing Countries (and EITs as well) has led to a chronic undersupply of rural, low-income, or no-income customers with respect to clean energy. Similarly, foreign investment projects, and most PPP schemes (see Section 7.4), are also targeted at economically "valid" customers – the investors expect a return on their monies, and governments often like to participate in such returns.

In the past decades, alternatives to such centralized financing schemes have been successfully developed, and became known as "micro-financing":

In such schemes, the money for investments e.g., in solar-home systems, biogas lighting, or efficient lamps for small-scale enterprises in rural villages, is delivered in "micro" packages suitable for these rather minor users, and the payback schemes are also adjusted to the local circumstances. The fundamental idea is that with the investment, people will progress – in learning, working, businesses, or services – and will repay the credit according to the benefits from the investment.

Surely, liability issues, transaction costs, and cultural factors must be taken into account for these schemes. But similar to the decentralized technologies for which the financing is meant, the overall record of micro-financing is quite good: people repay the loans,

and a small profit does result, which can be used to extend the financial sources for further loans.

There is currently a variety of good examples for several developing countries – both for NGO grassroots levels, ODA-based schemes, and civil sector activities. Also, micro-crediting is an important element of most Type-II Initiatives, and UNDP is operating a special unit to broaden the application of micro-financing.

7.7 From Bad to Good Subsidies

In searching for new sources of financing for sustainable energy investments, suggestions were also made to "free" existing resources tied-up in governmental subsidies, which favor unsustainable energy supply and use (e.g., IBRD/UNEP-DTIE/IMF 2002).

For the OECD countries, it has been estimated that energy subsidies amount to some $20 billion (IEA 2000a), while for developing countries, and EITs, estimates are in the range of some $30-50 billion. Several studies of the past years have shown that the removal of subsidies for – especially – fossil fuels and their infrastructure would also yield positive economic and environmental results for developing countries– some examples are given in the following table.

Table 10 Results of Subsidy Removal in Eight Developing Countries

	Average Subsidy (% of cost)	Annual Economic Efficiency Gains (% of GDP)	Reduction in Energy Consumption %	Reduction in CO_2 Emissions %
China	10.89	0.37	9.41	13.44
Russia	32.52	1.54	18.03	17.10
India	14.17	0.34	7.18	14.15
Indonesia	27.51	0.24	7.09	10.97
Iran	80.42	2.22	47.54	49.45
South Africa	6.41	0.10	6.35	8.11
Venezuela	57.57	1.17	24.94	26.07
Kazakhstan	18.23	0.98	19.22	22.76
Total Sample	21.12	0.73	12.80	15.96
World	n.a.	n.a.	3.50	4.59

Source: IEA (1999)

However, subsidies remain an important element of regulating energy markets, especially to ensure social and environmental objectives that are beyond the market logic. Their adequate targeting and implementation could even foster RE investment for rural development, as several good examples have demonstrated (UNEP-DTIE/IEA 2002).

A GES must distinguish between "good" subsidies, which support the transition towards sustainability, and "bad" ones which hinder the process. In principal, some $10 billion could be expected for EE and RE investments if monies spent on "bad" subsidies is untied. To start shifting subsidies and "freeing up" money, the international community should consider negotiating a convention to eliminate subsidies on non-sustainable energy technologies until 2010. At least a share of those untied resources should be used for a Global Sustainable Energy Fund.

Beyond obvious subsidies that directly or indirectly offer monetary incentives, there are also "hidden" ones, especially for fossil-fuel and nuclear energy. Their (economic) impact on nature and societies in causing environmental, health, and security burdens is

not part of the traditional “costing” of energy markets – these *externalities* are not reflected in the calculation of generation costs, and prices for electricity, or fossil-fuels. This phenomenon clearly distorts the economic competitiveness of EE and RE options, and further creates a strong bias for unsustainable investments in the energy sector. In the context of a GES, these hidden subsidies could be partially removed by charging user fees on Global Commons, e.g., fossil energy or CO_2 taxes. Suggestions on how those might be structured have already been made (e.g. WBGU 2001) – all it takes is the political will for their implementation.

8 Recommendations for a Global Energy Strategy

In drawing conclusions from the previous sections and developing recommendations for a Global Energy Strategy, this section of the paper creates the bases for future discussions and highlights the most prominent findings.[34]

A comparison between the energy-specific issues of the WSSD Action Plan from September 2002 and the different challenges and issues raised in the last chapters clearly shows that an approach towards a global energy strategy will be a very complicated one. The GES must consider the crucial role that energy plays in worldwide environmental, economic, and social development.

Understanding a strategy as a guideline between today's challenges and visions for the future, the GES must overcome many barriers, especially initially.

Against this background, the GES should follow a step-by-step approach. Particularly in the beginning, the GES should focus on an assortment of issues, include perhaps only a group of like-minded countries, and focus on interim goals.

The experience from different international negotiation processes shows that first mover initiatives of like-minded countries is an increasingly appropriate way to overcome massive blockades. Because a fundamental transformation of the global energy system will have significant impacts on economic and trade structures, differentiated initiatives will become more promising in the future.

The WSSD initiated first steps to start this process. Initiatives like the one of the European Union (EU 2002) and the German Initiative for a Global Conference on Renewable Energy (now planned for early 2004) could serve as a *starting platform to launch the political dialogue* on a Global Energy Strategy, and to build a core group of supporters from "forerunner" countries.

A *strategy* is meant as a guideline between today's challenges and visions for the future. Both guidance and alliances are especially needed in the starting phase where manifold barriers must be overcome.

A Global Energy Strategy should outline a clear vision, but also indicate a step-by-step approach with near-term goals.

A GES must not be embraced by all, but might well be supported only by a group of like-minded countries and businesses – once it achieves momentum, others will follow.

A global energy strategy must reflect comprehensive interactions between the energy system and sustainable development, and needs to focus on crucial fields of action in the first phase:

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[34] In preparing the conclusions and recommendations, a variety of policy initiatives, proposals, and action plans from a multitude of stakeholders were reviewed. Most prominently, the NGO Energy & Climate Caucus came up with policy recommendations, which in several areas are quite similar to those developed here – though the Caucus' time-scale, impetus, and goal-formulation is far more drastic than the approach taken here (see ECC 2002 for details).

- building a more sustainable base for the future development, especially in the developing countries;
- significantly reducing health and environmental impacts of energy supply and use, both on the local and global scale;
- introducing sustainable energy technologies to markets in industrialized and developing countries;
- shaping energy markets to reflect social and environmental concerns.

Furthermore, in the first phase, the GES should concentrate on those options and technologies that are *widely accepted* as non-controversial, and that could significantly contribute to sustainable development, i.e. energy efficiency and renewable energies. It should give priorities for *decentralized capacity building and widespread technology dissemination* relying on a large variety of change agents, i.e. human beings and their innovative organizations.

Considering the special importance of *developing countries*, the GES must highlight the necessity to increase energy services, particularly in DC. However, it should pay attention to the heterogeneous nature of DC, and should focus on emerging (urban) regions *and* rural areas *and* least developed countries.

An agreement on *key targets*, either for the international community or groups of like-minded countries, is essential for a GES. Bearing in mind the step-by-step approach, the following key targets could be central elements of a GES

- halving the share of population without access to commercial energy in the next two decades;
- reducing CO_2 emissions from the industrialized countries by at least one third in the first quarter of this century, and limiting emissions of key developing countries to a certain corridor;
- doubling the total energy efficiency increase from the business as usual during the next decades;
- doubling the share of new and sustainable renewable energy in the global energy mix in the next ten years.

Given the fact that *restructuring of energy markets* will remain to be a strong issue for the energy policy debate, either because it could be a necessary (but not sufficient) mechanism for fundamental changes in the sector or it be seen as a mega trend, the issue of strengthening regulatory capacities on the global and national level will be one of the most crucial challenges.

Governments must continue – or resume – to playing a key role in framing energy markets through a combination of regulations, economic instruments, and market-based mechanisms. In turn, this will require a strengthened environmental role for energy sector regulators, with respective needs for institutional strengthening and capacity-building.

Strengthening *regulatory capacities* in the different regions of the world must be a main pillar of the GES. A multitude of decentralized activities is needed in the framework of existing structures to take into account the variety of specific circumstances.

Therefore, decentralized structures and networks should be given priority in the design of institutions related to a GES.

In this respect, it is high time to develop national and transnational policies towards *integrated energy sector regulation*, to exchange ideas and experiences, and to bring forward a joint approach for the energy markets between developing countries, those with economies in transition, and the industrialized world. The active shaping of *markets for EE and RE in all countries and* the implementation of innovative schemes to develop those markets will be the second main pillar of the GES.

To *make sure* that restructuring accomplishes economic ***and*** environmental improvements, a variety of market incentives, and tools to effectively promote a level playing field for competition between sustainable and (existing and new) conventional electricity options are needed.[35] This includes internalization of externalities as a basic requirement and needs to address the variety of market distortions and other barriers. Such tools are, e.g.,

- environmental taxes, ambitious cap and trade schemes as well as the elimination of subsidies for fossil and nuclear energies;
- Environmental Disclosure: requires utilities to reveal their generation mix with respect to energy sources used, and the associated environmental impacts;
- Certification: requires electricity product labeled "green" to meet specified standards which are independently verified;
- Renewable Portfolio Standards (RPS): requires a percentage of generating capacity to be generated from renewable sources, and Set Asides, which require that a percentage of new generating capacity come from renewable sources;
- Feed-In Tariffs for renewable electricity: guaranteed (but potentially dynamic) prices for electricity from renewables, differentiated for the RE technologies;
- System Benefit Charges (SBC): Charges imposed on all customers to fund public benefits, including environmental, low-income, and EE programs.

In the brief analysis of MDB and ECA performance (see Section 6) and the subsequent discussion on the *financial dimension of the sustainable energy transition*, it was argued that current policies of those IFIs are not in line with the requirements of the sustainability challenge.

They played a major role in shaping the current energy situation in developing and EIT countries by delivering substantial public support for fossil fuels and nuclear energy investments during the 20th century.

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[35] A discussion of approaches to adequately integrate environmental concerns into deregulated electricity markets is given e.g. in CEEP 2000.

Now, at the beginning of the new Millennium, it is high time to shift IFIs towards sustainable energy – the transition in the 21st century can only be managed if public support is *clearly* transferred towards energy efficiency and renewables.

As a first step in doing so, a *world-wide moratorium on public support* for the development on new coal mines and gas/oil resource development is needed for the next decade (i.e., from 2005 to 2015).

This "break" in fossil-fuel resource development is urgently needed to re-focus public financial resources on the implementation of sustainable energies, and to send a *strong, coordinated signal to the private sector* regarding the priorities of future energy business. A commitment of the G8 to such a moratorium would be the logical follow-up to its Renewable Energy Task Force Report, and should be paralleled by a MDB and ECA moratorium on bilateral and multilateral ODA funding for new fossil resource extraction projects. In a second step, the ODA funds previously targeted to fossil-fuel resource development must be re-allocated towards energy efficiency and renewable energies.

In a *Global Market Transformation Campaign*, IFIs could join forces with interested private-sector parties to create a massive global implementation effort for sustainable energy in developing and EIT countries.

As a part of this effort, the more efficient and cleaner use of fossil fuels should be one area of the Global Market Transformation Campaign – these technologies are needed especially in higher-income areas of developing and EIT countries. For the commercial sector in (Mega)cities, as well as major industrial sites, the use of *cogeneration* for electricity, heat, and cooling is a key technology in the transition period to a sustainable energy system. ODA should be targeted to facilitate investments into such technologies and their upgrading, and sector reform must adequately address their environmental benefits

With special respect to developing countries, access to modern forms of energy is crucial, especially in rural areas. To this end, the Global Market Transformation Campaign should revolve around a massive *deployment* of solar and biomass technologies. Furthermore, micro hydro and diesel/wind hybrid schemes for village mini-grids is needed as a joint project of bilateral and multilateral donors and private sector companies.

Since sustainable energy development is a bottom-up process engaging people and creating opportunities for economic development, a major shift of ODA to *micro-financing schemes for energy efficiency and renewables* is necessary. Micro financing could play an important role particularly in enabling access to modern energy services in least developed and rural areas.

As preliminary benchmarks, 35% of the ODA funds for sustainable energy should be managed through micro-financing up to 2010, and 50% up to 2015.

R&D expenditures of *industrialized countries* should be targeted at *global partnerships* for the development and implementation of solar-thermal power, solar cooling, offshore wind, and biomass gasification. On the demand-side, advanced energy efficiency technologies, especially for buildings and the industrial sector, should be targeted as well.

As it has been argued before, the re-allocation of ODA funds and R&D expenditures alone are not sufficient to substantiate the Global Market Transformation Campaign.

With investment needs in the order of $100 billion *annually*, even a total allocation of ODA to the energy sector alone would not be enough. Furthermore, it would be an unbalanced and unrealistic approach towards sustainable development in general.

Prospective revenues from carbon trade and CDM/JI projects could cover *some* of the costs of the transition – but it remains unlikely that those revenues will go beyond $1-5 billion in the coming years.

All likely available financial resources, including a replenished GEF, new carbon funds, and national governmental sources for R&D will serve (and already have done so) to *pull* private sector investments into pioneer markets for renewables and energy efficiency. Otherwise, they cannot deliver the full-scale deployment of a sustainable energy system within the time-frame needed.

To achieve such a timely transition, a *global market push* is called for, substantiated by a Global Sustainable Energy Fund. The example of the Montreal Protocol clearly shows that the private sector follows quickly once the right incentives are given.

The Global Sustainable Energy Fund would have to be far larger than the Montreal example – at least $10 billion is needed annually.

For its creation and replenishment, new financial sources should be used like user fees on Global Commons, fossil energy or CO_2 taxes, or the Tobin Tax. Suggestions on how those might be structured have already been made (e.g. WBGU 2001) – all it takes is the political will for their implementation. Simultaneously, freeing up existing resources spent on subsidizing fossil and nuclear energy should contribute to the Fund, too. To start the process of "freeing up" money, the international community might negotiate a convention to eliminate subsidies on non-sustainable energy technologies, e.g., until 2010. At least a share of those untied resources should be used to replenish the Global Sustainable Energy Fund. It would also be possible that first steps towards "subsidy-swaps" can be taken by a group of forerunners, i.e. an alliance of like-minded countries.

Besides the active shaping of sustainable energy markets by governments, and adequate funding to invest into them, the magnitude of knowledge, technologies, and skills needed for the transition is a real challenge to all societies.

To effectively manage their creation, exchange, and dissemination, a collaborative process between the North and the South, and between public and private organizations is called for.

This process must overcome the fossil and nuclear "lock-in" of scientists, engineers, business leaders, and the political administrations around the world, and their preoccupation with the supply-side of the energy system.

Instead of creating a new UN organization, as several initiatives suggest, it is recommended that this work be carried out in linking and strengthening *networks* on sustainable energy throughout the world. This recommendation is in accordance with the UNEP *Global Network on Energy for Sustainable Development (GNESD)* Initiative and the recommendations of CSD-9 in 2001.

The coordination of this effort might well be the core task of a renewed and extended UNEP, having the sources and the mandate to work jointly with e.g. UNDP and the GEF, and to support and promote efforts at capacity-building and technology transfer activities, as well as serving as information clearing houses.

In summing up, the development of a comprehensive *Global Energy Strategy (GES)* should be agreed upon as a follow-up to the WSSD.

The GES process should be set up in a multi-stakeholder process until the end of 2005, jointly funded by UN sources and the private sector. If there is no way to overcome the barriers towards a coordinated GES process, a like-minded countries´ initiative would build an appropriate alternative to go ahead and let others follow.

This GES should not only focus on sustainable energy, but also adequately cover the transport sector (which has not been addresses here), and integrate gender aspects as well.[36]

Within the GES formulation process, active involvement and participation of developing countries, and NGOs should be supported.

[36] As the CSD-9 in 2001 pointed out, lack of access, or uneven access to energy within a country raises problems of social equity, particularly with regard to the role of women. There are burdens on women owing to collection of fuels in rural areas, owing to lack of refrigeration of foods and medicine, and owing to increased time required for cooking with traditional fuels. Indigenous people throughout the world also face inequities regarding control of energy resources and access to energy services, even in land areas over which they have nominal control. For a more detailed discussion on the linkages between energy and gender , see e.g. Böll/BMU (2001).

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