

# Water, water everywhere – nor a drop to drink

by Ashok Khosla

To some, humankind might well appear to be winning its battle with nature but, if the conflict continues for much longer, it is certain to lose the war. Long before we have managed to extinguish all the other species that share this planet with us, the destruction of its fragile life support systems will surely have wiped out whatever we value as civilization today.

More and more persons inhabiting the planet, each wanting more and more things is hardly a sustainable proposition in the face of a finite resource base. Human ingenuity and technology can only buy us a little time – they cannot solve the underlying, fundamental problem. Only slowing the growth of demand for the services our environment provides can do that.

Over the past thirty years, though the limits set by nature have become increasingly evident to some of us, to many more they have not. The main reason is, of course, that for most people – as for most ostriches -- it is easier to ignore impending danger than to make the inconvenient changes needed to deal with it. For them, such limits will become apparent only after these limits have already been transgressed. The trouble with *that* is, given the exponential mathematics of natural processes and the long lag times between cause and effect, it is already too late when the proof becomes available.

But how much proof do we need? Fossil fuels may well appear to be plentiful today, but even dyed-in-the-wool petroleum geologists admit that it will not be many decades before they become quite scarce, particularly if everyone starts using them as cavalierly as in the industrialized countries today. Indeed, there is considerable evidence (though not yet widespread knowledge) that the discovery of new sources of oil has already peaked. Why else would well-informed nations go to war with others to protect the supplies of such resources? And why else would otherwise highly responsible corporations report inflated figures for the reserves they own?

The threats to other life support systems – the stratospheric ozone shield, global climate, biodiversity – have already reached stages where these issues have, within a decade or two of being recognized, raced their way up to the top of the international agenda.

Of all the resources and natural processes, water is the one over which major conflict is most likely to occur within the next few decades. Not only among nations, but also between provinces and within communities. The signs of such conflict are already with us, sometimes manifest in outright violence, sometimes camouflaged by uneasy truces and agreements: in the American South-West, in the Danube basin, in the Subcontinent.

Water is the lifeline of most human activities: agricultural, industrial, domestic. Nearly 70% of all living tissue and more than 50% of all raw materials in industrial production consists of water. Not only civilization but life itself go hand-in-hand with water.

The reason water has been taken so much for granted, and never explicitly treated as a resource is that for most of history, and in most parts of the world, it was freely and plentifully available. But, all of a sudden, it no longer is. Population growth and economic activity has, within the space of a few decades, taken it from worldwide abundance to local scarcity.

The primary reason for this is that, by tradition, water has been an “open access” resource. It has been available, on a first come first served basis, freely and for free. This meant that it was used, and misused, without concern for its intrinsic cost or for its contribution to value addition. Or for the impact on its long term availability. And, of course, as it becomes increasingly scarce, it goes mainly to those who have the political power or economic capital to appropriate it by controlling the sources and the distribution channels.

Recent studies have shown that water, more perhaps than any other resource, is grossly under-priced. Many users in agriculture, industry and homes get it at a price that is one-hundredth that of the cost of delivering it. And one-thousandth that of the value it adds to the products or services it makes possible. No wonder our agriculture and industry depend on technologies that waste this precious resource with so much profligacy. And result in such rapidly accelerating scarcity.

Water, like any other scarce resource, needs to be priced. Neither too high, nor too low – but judiciously graded to make it accessible to all segments of society. It also needs to be placed within the local control of communities, which can decide on its distribution among the different uses and users who need it. Only thus will it be conserved and sustained -- and also be available to everyone, rich and poor, equitably and fairly.

We are now at a point where water scarcity is constraining not only agriculture and industry, but severely jeopardising the health of our people. As the population grows and each person demands more and more goods and services that depend on water, this scarcity can only get worse.

Unavailability of water in adequate quantities to meet the basic needs of people is at the root of two of the prime examples of the vicious cycles that socio-economic processes can get caught up in. In the first case – the vicious cycle of poverty and water – lack of clean water leads to disease, loss of productive time and financial costs, which in turn lead to loss of disposable income and therefore to inability to pay for clean water, which in turn leads to further deterioration in health and productivity, which in turn leads to loss of income, which in turn leads to ....

The second, perhaps not so obvious, outcome is the vicious cycle of affluence and influence. Those who can afford to do so, buy high quality water for all their needs, and

ensure that they are adequately insulated from the impacts of the general scarcity of the resource. This is not a minor phenomenon: the money spent today in many countries on bottled drinking water is comparable to the total funds spent by public agencies on drinking water supply. The rich no longer have a major stake in the quality and performance of the public service and little incentive to use their influence to change policies or investment priorities. The result is a move towards privatisation of services for the rich and marginalisation of the services accessed by the poor.

Neither type of vicious cycle can ultimately be good -- for anyone, rich or poor.

To achieve a viable balance between supply and demand for water is not an easy task. The issues are complex and causes often get mixed up with effects. Moreover, supply and demand are often not independent of each other: interventions that increase supply can also increase demand, frequently resulting at best in little net improvement and at worst in a counterproductive boomerang effect. Most present policies and actions unfortunately have a tendency to deal with symptoms and cures rather than prevention, getting short term gains at the expense of long term societal goals.

No problem that is complex can be solved with simple, one dimensional solutions. That, particularly, is how it is with water. Even so, it is useful to work on such issues through conceptual frameworks that are easily and widely understandable. For water, as for other resources, these boil down to the three primary pillars of sustainable development:

- The people-nature issues -- management of water resources
- The people-machine issues -- technologies for water
- The people-people interactions – institutions and policies for water

The solutions lie in bringing back the trees and regenerating the aquifers, installation of local, small water harvesting structures, full-cost pricing, very careful, judicious use of subsidies, water conserving technologies and responsive management systems. And these in turn need the same three pillars of human endeavor: good management practices to encourage the natural resource conservation, good science to design such practices, and good institutions of governance to help internalize these practices into community decision making processes.

The difference between how much rain and snow falls on the land surface of the subcontinent and how much water is available for productive use is largely a matter of how well our “natural” ecosystems are functioning. Before the massive destruction of forests, and precipitate fall of groundwater tables, these ecosystems produced more than sufficient fresh water to meet the needs of the people of India. Now, as a result of gross human interference, these ecosystems are no longer able to provide the natural reservoirs and buffers needed to maintain steady year round supplies of water. The result: a growing cycle of droughts and floods, each year increasing in intensity and human cost.

### *Management of water resources*

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A powerful and historically successful, though no longer popular, method lies in regenerating local water cycles by constructing water harvesting structures such as check dams, gully plugs and reservoirs. Such structures are far more effective, in terms of returns on investment, short gestation periods and control by the community. They can immediately help local communities bring back to life rivers and streams that have, over the past few decades, virtually died in many parts of the Third World. Because of progressive deforestation and over-utilization of water, they are either in flood during the rainy season or quite dry for the rest of the year.

The solutions lie in a combination of traditional and high technology: land and water management techniques used for centuries by earlier civilizations, together with satellite imagery for site selection. Forestation, cropping and other land management practices reinforce the infiltration of water into the ground water aquifers, leading to year round flow of water in the streams. Several rivers have thus been rejuvenated in India and other countries through community action supported by various funding sources including government agencies at the national, state and local levels, private sector sponsors and foundations.

Industry, agriculture and other water intensive activities must now be designed in the light of their impact on the hydrological cycle as much as on their economic and development implications. For this purpose, it becomes necessary to develop indicators of sustainable water use, for which some initial work has been done by various NGOs and International Agencies.

### *Technologies for water*

Extensive field experience shows how important it is to mobilize community participation in solving basic resource problems such as water, and also how difficult it is to achieve this. The sense of dependency created over the past five decades by the systems of governance adopted in many developing countries, have destroyed almost completely the desire and capacity of the people to take responsibility for their resources, even when the outcome of doing so would mean a radical improvement in their living conditions

Water scarcity is not only a problem of quantity, but often also of quality. Technologies for testing water quality, purifying water and delivering water without recontaminating it are now urgently needed at costs affordable by local communities. Because of their public health impact, this is one area that warrants initial subsidies, particularly if they are geared to making the delivery of clean water sustainable.

Water is one resource for which school children can take effective responsibility. A coordinated program with school children can monitor the quality of water sources in cities cost-effectively. Well trained monitors, equipped with the portable water testing kits can take responsibility for assessing water quality in their communities. These campaigns generate widespread awareness of the need to reduce the wasteful use of water. The children's brigade in each city or town designs communications materials and exhibits to show how water resources can be better managed and works to convince the wider public of the need for responsibility on every one's part to conserve them. Such a program, under the title of Community Led Environmental Action Network (CLEAN-India) has already spread through more than 100 cities and towns of India.

### *Institutions for water*

As for other resource, the possibility of solving the water scarcity problem ultimately is one of management. And this relates to the whole issue of governance. Recent work in India and elsewhere reinforces the growing understanding among development practitioners that only when there is a sense of ownership among the local community over a resource can it be managed for the benefit of all and on a sustainable basis.

Unfortunately, most policies relating to water have been somewhat shortsighted and narrowly conceived. Probably the most stark examples of such short-sighted policies and actions lie in the area of subsidies and pricing. In the management of water, as for many other resources, subsidies often lead to perverse results – more or less the opposite of what they were intended to achieve. Introduction of subsidies is generally justified in terms of promoting equity, environmental improvement or use of better technology. But it is the rich who appropriate the benefits and it is the environment which suffers from excessive use of resources. Water for industrial, urban and agricultural use is grossly underpriced (often by a factor of 100 below either the cost of supplying it or the value addition it leads to).

Neither privatisation of such resources nor their delivery by government can maximise the direct benefits to the members of the community or minimise the indirect costs to the marginalised or to nature. A study of successful common property resource management systems quickly shows that properly designed community decision making systems are capable of distributing a resource such as water not only equitably but also efficiently. Recent lessons point to solutions in which the government or the private sector should be responsible for "wholesale" (large scale, long distance) delivery, and the community (or "water cooperative") in the village and the neighborhood in the town should be responsible for retail distribution.

In any case, it has become clear that water can no longer be considered a free resource, both in that it costs money to deliver it and in that value is added by its use. When it is underpriced, it gets overused and if it is overpriced, it limits the value adding potential of other resources. Either way, it is sub-optimally used. Setting a price on water is, however, not a simple matter of neo-classical supply-demand economics: the marginal

value of water and the capacity to buy it varies radically, not only from person to person but from time to time. Under these circumstances, neither the goals of efficiency nor of equity are served by the market. Nor are they served by mindless, knee-jerk, simplistic socialist ideas.

Water must be priced, but needs to be priced differentially. The price of water has to be graded to ensure that this resource is available to all sections of society, not only on the basis of how much it costs and how much financial value it creates but also for the human and social impact it generates. Those, such as villagers or slum dwellers vulnerable to pathogens and illness, who need to use more of it should be encouraged to have greater access than their purchasing power now allows. On the other hand, the price of water for industries and rich farmers must be much higher than it is today to discourage awful, wasteful use they currently make of this precious resource.

Finally, there is the pressing question of how the private sector can take part in the management of this vital resource. Water, particularly drinking water, is a basic human right. As such, it is unquestionably the responsibility of governments (both at the national and the local level) to ensure that everyone has access to his or her minimum requirements.

Public systems are not always efficient, and there is growing desire among economists and decision makers to hand over the responsibility of delivering water to private companies. The trouble is that the primary job of private companies is to make money, and they are not usually concerned about the rights of individuals or of the need for equitable distribution of their products. There clearly is good money to be made in delivering water and the private sector is ready and willing to add this vital resource to its range of products, as indeed they have already done in huge quantities with bottled water. But efficiency alone is not enough to justify handing over such a resource to an outside agency unless it is willing to take on a universal service obligation to ensure that all basic needs are met, on a transparent, accountable and permanent basis.

If the private sector is to be a part of the solution, rather than an additional cause of the problem, a whole new kind of public-private partnership is needed, far more complex than the simplistic solutions so far mooted – mostly by vested interests. Corporations recognize the opportunities when they see them. A group of them has pronounced, at the World Water Forum that “water lies at the heart of protecting the global environment, promoting social progress and nurturing economic growth.” They have also presented a number of projects on education, sustainable agriculture and forestry, financing water development and valuing water for better governance.

Naturally, their pronouncements are met with some scepticism in the environment and development communities, where they are seen as disguising the business community's real agenda: to deregulate the water sector and treat water as an economic good subject to the laws of supply and demand and profit-making, rather than as a human right and environmental necessity. Moreover, the very people most directly affected by water crises

around the world are conspicuously absent in most such partnerships and international meetings.

If companies can demonstrate that businesses can be environmentally and socially responsible with regard to this ultimate natural resource, and they are willing to commit themselves to the long haul, there may be some possibility for the kinds of partnerships needed. Changing corporate policy is one thing, setting up a socially equitable and ecosystem approach to water management in practice is quite another. It requires years of work and negotiation to set up productive partnerships, to gain the commitment and involvement of stakeholders, to negotiate trade-offs, to establish values and set prices both to service the poor and to pay for environmental services and, most of all, to transform the justified suspicion of local people into trust.

# Energy for All

by Ashok Khosla

The modern economy would appear to be headed for a world where cheap machines produce ever cheaper products for other cheap machines to use. As a consequence, human beings have less and less to do. It is common to see more and more automation in the face of more and more unemployed people -- followed by more and more products chasing less and less purchasing power. At every step, more energy is consumed, and more entropy is created. Today's labour saving technologies and mechanistic economic structures can only lead to growing supply and stagnant demand -- until, of course, we reach the catastrophic environmental transition when supplies will have collapsed altogether and both human populations and their demands have collapsed with them.

The technology choices on which our current systems of production are based and the paradigms of economic development that determine the allocation of what is produced simply do not work. They place people over nature and machines over people. Growth, they claim, must come first, even at the expense of distributive justice and human well-being. Efficiency is more important than equity and the interests of the rich must be given higher priority (in action, if not in words) than those of the poor. They do not lead to outcomes that satisfy either the basic human values of social fairness or the imperatives of ecological balance. In fact, as this year's Nobel Prizes underline, they are often not even economically efficient.

But the global economy, which is based on these assumptions, is heading for trouble. No fine tuning of the neo-classical doctrines, no more of the same medicines -- that, after all, are causing the problems in the first place -- can get us out of it. When the social, environmental and natural resource costs of the past century's experiments with "modernisation" are all counted, it will become obvious that the current form of "development" is not sustainable. The widespread social and economic ills of today are just the early symptoms of a terminal disease that human society can avoid not by a change of dosage or even a change of the medication, but by a fundamental change to an altogether different system of social (and economic) medicine.

SUFFICIENCY AND EFFICIENCY

The goals of sustainable development clearly cannot be reached with today's urban-industrial lifestyles. Nor with the disparities that exist within or between countries. Sustainable development implies not only efficient and ecologically sound management of resources, but also the need to establish social equity and political empowerment. What hope is there for this planet if the countries of the South start to consume energy and other resources as the North does today? Or if the vast numbers of poor in our world demand what the rich few already have? They are not only entitled to do so under any concept of fairness and justice, but are also being encouraged to by the forces of the global market.

And what will be the demographic, economic and environmental impact in the longer term if poverty and marginalisation in our economy further delays the stabilisation of our population?

In the perennial international debate that pits northern consumption patterns against southern population growth, the central issues are, of course, sufficiency and efficiency. How much is enough, and how little do we have to use to get it? This means that sustainable development goals also require us to reorient the way we produce the goods and services that we consume. The sustainability equation inexorably brings together sufficiency of consumption and efficiency of production. And this means that all sectors of society, the public, the private and the civil will have to work more closely together to redefine the goals of development and the roles they play in the economy.

The central goals of our production systems have to be not only the generation of goods and services, but equally the creation of jobs and the efficient use of natural resources. Today's industrial methods are no good. They involve too much capital. They waste too many resources. They cause too much pollution. And they disrupt too many life support systems -- the material flows generated today by mankind are estimated to be already comparable to geological flows. Such flows cannot be sustained for long. Large scale industry is not necessarily the only way to produce the goods that people need: it can cause large scale disruption, both ecologically and socially.

We need new technologies and also a new science of economics. We need to create work places - jobs - at one tenth and even hundredth the cost of the ones we are creating today in our globalized economy. And we need to increase the productivity of material resource use by at least 10 times what it is today. Sustainable industrialisation will unquestionably have to be more decentralised, efficient and responsive to social and natural constraints than it is today. And it must be based on a better understanding of resource pricing, environmental accounting, scales of production, financing systems and the many other factors that are in need of fundamental change.

A synthesising concept that might offer some clues to the directions needed is that of sustainable livelihoods. A sustainable livelihood is one that gives dignity

and meaning to life, provides adequate remuneration and thus creates purchasing power, and produces goods and services that people need. Above all, it does not destroy the resource base. Sustainable livelihoods tend to strengthen local economies, empower women and regenerate the environment. Large scale (but widely dispersed) generation of sustainable livelihoods and adoption of more sustainable lifestyles – concepts ultimately applicable both in the North and the South – may well be the surest way to attain our sustainable development goals.

## ENERGY AND THE DEMOGRAPHIC TRANSITION

Next to the need to create sustainable livelihoods and sustainable lifestyles, and as a primary factor in achieving these goals, the central issue facing society, globally, is the need to create sustainable energy systems. Sustainable energy, like sustainable livelihoods, is a synthesizing concept that is applicable under a wide variety of circumstances, and can help us design more viable economic systems for the future in any country, rich or poor. The question for which we now must find an urgent answer is: "how can each person on this, our one planet have access to adequate energy to make those livelihoods possible?"

The implications of energy use, both in terms of resource depletion (e.g., growing scarcity of fossil fuels, materials consumption) and in terms sink overload (e.g., carbon emissions, air pollution, climate change) are cumulative and increase with time. As per capita energy use rises, and the population grows, the impacts multiply, leading to exponentially increasing pressures on both reserves and sinks. The difference between the pressures that will exist, say in the year 2050, as a result of current trends in energy use and population growth and those that would exist if either or both of these factors increase more slowly could be enormous.

There is now considerable evidence that overall energy use and materials flows – including those caused by the extraction of energy and other resources -- must be reduced considerably if we are to avoid causing a massive disruption to the earth's life support systems. In the case of energy, this recognition has already led to the signing of the UN Framework Convention on Climate Change and the Kyoto Protocol. Much more political work will be required to bring about international recognition of the threats posed by current trends in anthropogenic material flows. However, considerable evidence collected by the Factor 10 Initiative and others shows that even current levels of material use are not sustainable in the long run and will have to be cut down by a substantial amount.

Whether it is energy or materials, the one half of the world's population which lives in poverty will need to use substantially more resources before their legitimate basic needs are met. They will need even more of these resources if they are to achieve some kind of parity in lifestyle with the other half, which has

had the benefits of two centuries of industrialization. Of course, the additional resources they will actually need could be lower in quantitative terms than was the case for their counterparts in industrialized countries if they have access to more efficient technologies. But use of more energy and materials is an inevitable requirement if the poorer half of the world's people are to fulfill their legitimate development aspirations.

And the need to accelerate the process of achieving these aspirations becomes a primary concern not only of the poor but also of everyone on this planet. This is simply because the concept of sustainability implies a longer time horizon. The consumption of energy and material resources need to be brought down quickly and kept down thereafter. This means that both the resource consumption patterns and global population growth must be drastically reduced. Carbon emissions or material flows in the year 2030 or 2050, say, will depend primarily on three factors: per capita resource consumption, technical efficiency of resource conversion and the total population. The sooner we bring the resource consumption and population growth down to sustainable levels and raise the efficiency of our technologies, the higher are the chances of attaining a sustainable trajectory for the global economy.

On current trends of resource use and population growth, there can be little hope of bringing energy and material flows down to levels that no longer disrupt the biosphere. These trends must, therefore, clearly change drastically. To accelerate the demographic transition in the poorer countries, which is one primary requirement, what is needed is to raise the quality of life of their people. This means a substantial and immediate *rise* in the energy they use and the efficiency with which they use it, both of which serve as surrogates for the quality of life they have.

## SOME ENERGY OPTIONS FOR THE SOUTH

Energy issues are, of course, conceptualized and designed by those who control the "modern" sector - the elites for whom commercial (i.e. non-renewable, fossil based) fuels are the only acceptable, legitimate sources of energy. In such a society, it is natural that development becomes identified with growth, and growth with increasing energy uses; energy with electricity; electricity with centralised grid systems; and national grids with petroleum based fuels. Within this modern sector, decisions are made primarily by economists and engineers. Because of their grand scale, hydro-electric projects and nuclear power plants have also come to acquire a legitimacy close to that of fossil fuel based power stations - of all these, we have many in the countries of the South. The installed capacity for generating electricity in any developing country is more than enough for energy-hungry industries and towns, and an increasing amount is available for agricultural needs to satisfy another important political constituency, the farmer.

The poor have to be satisfied with what are euphemistically called "non-commercial" energy sources such as wood, cow-dung, twigs and agricultural wastes. Non-commercial energy in many developing countries constitutes nearly 50% of the total energy used! This is a trend that has continued over the decades and given present growth rate of different energy sources, can be expected to continue into the future. Only a massive reforestation programme in these countries can help to prevent total destruction of the forests.

Despite sizable investments made by governments, international agencies and even some corporations, the penetration of commercial sources of renewable energy has a long way to go. A few isolated successes have been reported with solar photo-voltaic systems for use in pumping, lighting, community TV and other special applications, primarily in remote locations which are too expensive to wire up to the national grid.

Since many bulk applications of energy (such as cooking, water heating and space warming) need only a low grade energy source, it makes good sense to make solar thermal devices available to households on a large scale. Some countries have had some success with improved cookstoves, solar water heaters and other similar devices, but the usual experience is that the market for these dries up when the government subsidies introduced to popularize them are withdrawn.

Next to power production and transportation, the sector that uses the most amount of energy is construction, both because of the energy embodied in the building materials and for lighting, heating and cooling buildings. Since current manufacturing practices in most developing countries are quite inefficient, vast energy savings can be achieved in the manufacture and delivery of building materials. In addition, major energy savings can be achieved through the use of solar passive systems for heating and cooling buildings. Apart from the few isolated architectural experiments, not much has been achieved in this area.

Biomass is another form of solar energy conversion, the one that is the most common in developing countries. Large quantities of biomass are burnt for cooking and heating and a small amount is converted to methane gas by an anaerobic digestion or producer gas by pyrolysis. This area offers great benefits and needs to be promoted actively.

Many countries and regions have meteorological conditions that favour the use of wind energy and mini-hydro, two technologies of great promise. Unfortunately, the economics of commercially available designs in these areas is not yet sufficiently attractive to scale up this technology.

STEPS TOWARDS AN ENERGY TRANSITION

The first step in initiating the energy transition is to introduce technologies and systems that are less wasteful of energy. Many such solutions already exist and are technically and economically quite simple and straightforward to introduce. Measures to conserve energy range from technical interventions to reduce frictional losses (First Law of Thermodynamics), all the way to matching the quality of energy to the types of use to which it is put (Second Law efficiencies). Much of the technology needed to achieve this step is already available but policies and fiscal incentives will be needed to accelerate the process.

The second step is reduce our dependence on fossil fuels and nuclear energy, use of which are the major causes of today's threats to sustainability: both as resources and as sinks for the waste products. It would appear obvious that we have now to switch to other, more accessible, more benign and more sustainable forms of energy: energy that, if used wisely and carefully, does not get exhausted: renewable energy. While renewable energy is not without its environmental problems, it does offer numerous advantages over fossil fuels. The greater use of renewable energy will require quite fundamental changes in fiscal and technological policies, pricing systems, subsidies, procurement procedures, and other factors. It will also require significant investments in R&D, marketing systems and infrastructure involving actors in government, corporations and the research community.

The third step, with deeper societal impact and more difficult to introduce, is to redesign production systems, infrastructures, habitats and other institutional frameworks to make them more energy conserving. Huge savings of energy are possible by transforming industrial processes, designing cities and transportation systems and substituting communication for physical movement. However, these involve massive investments in infrastructure and in creating new patterns of living and work. They require the involvement of large institutions, including governments, construction agencies and all sectors of society.

And the fourth step, with the deepest and longest lasting impact is changes in lifestyles, in the concepts of consumption and production, and in the understanding of individual and social purpose. Given the market and other forces at work, such a transition will not be easy to achieve and will involve all actors in society from the individual and the community, through the institutions of learning and faith to the machineries of global governance.

## INTERVENTIONS FOR SUSTAINABLE ENERGY

- Real energy savings can only come from rational energy policies that not only promote energy efficient and renewable energy based technologies, but also introduce energy pricing based on real resource cost. To

achieve this, various taxes and fiscal measures are available and are well known.

- The most important action required is to remove the “perverse” subsidies with which governments and international agencies support the use of unsustainable energy systems. A recent study of the Earth Council and the International Institute of Sustainable Development shows that in the field of energy alone, these subsidies total close to 500 Billion dollars. In the face of such price distortions, it is difficult for any competing technology, such as renewable energy, ever to take off.
- Governments, with the encouragement of international investors, should actively seek to develop decentralized solutions to the energy needs of rural or remote communities. Local power production based on local, renewable energy sources offers great promise and should be explored much more actively than in the past.
- Governments and international agencies should greatly increase the R&D funds available for innovations in both renewable technologies and the delivery systems needed to make them available on a large scale
- Public procurement at the local, national and global level is a powerful instrument to promote and bring down the cost of new technologies such as renewable energy and governments, international agencies and others should use this instrument much more effectively for improving the availability of sustainable energy technologies.
- Promotion of sustainable energy solutions must be done within the broader context of generating sustainable livelihoods on a large scale.