WOOD ENERGY NEWS

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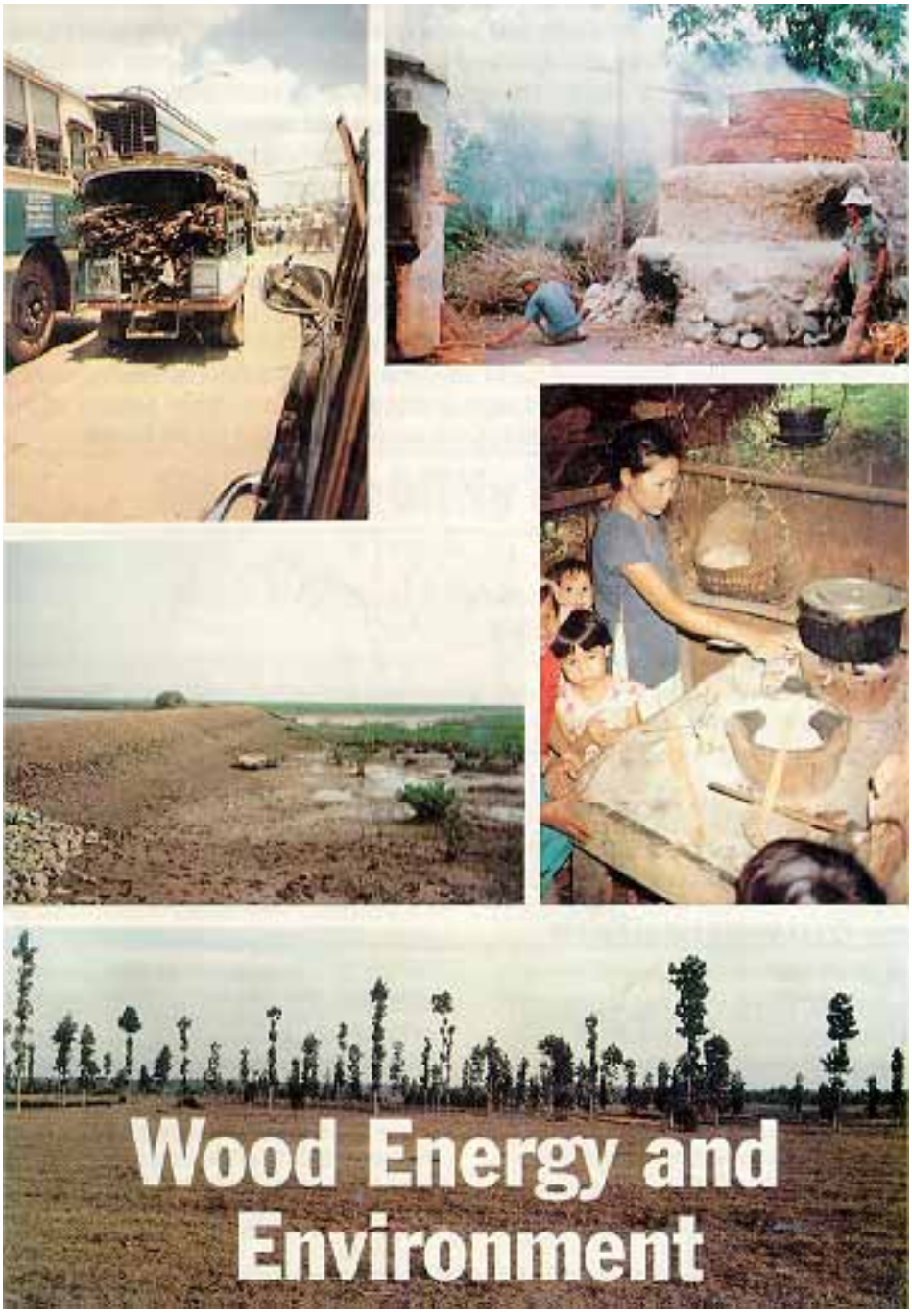

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Project Information

The Regional Wood Energy Development Programme in Asia (RWEDP) aims to assist 15 developing countries in establishing and strengthening their capabilities to assess wood energy situations, plan wood energy development strategies and implement wood energy supply and utilization programmes. The programme promotes the integration of wood energy in the planning and implementation of national energy and forestry programmes.

Wood Energy News

The programme's newsletter, *Wood Energy News*, which is published on a regular basis, addresses a wide variety of wood energy issues, such as woodfuel resources, woodfuel flows, wood energy planning and policies and wood energy technologies. Its purpose is to share information on wood energy with its subscribers. Suggestions, reactions or contributions are more than welcome, and don't forget to share your own experiences.

Those wishing to obtain *Wood Energy News* can write to the RWEDP secretariat at:

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Publications

Editorial

In Asia the potential supply of woodfuels is more than adequate for meeting the ever increasing demand on a sustainable basis. RWEDP has estimated that this situation will remain at least until the year 2010. At the same time, lack of accessibility and fair distribution are major constraints to 'woodfuel security' for millions of people. Moreover, many of those who do have access to woodfuels, do not avail themselves of technologies to use them in a convenient and efficient way. Neither fossil fuels nor renewable energy options other than biomass provide alternatives for the bulk of Asia's domestic energy needs.

At the end of three years of operations of the present phase of RWEDP, delegates from the 16 member countries gathered in Bangkok to review the past achievements and discuss priorities for further activities in the programme. Main policy issues for wood energy resource development, conservation, and energy planning were discussed. It was most encouraging to observe that the participants in the meeting were determined to continue their efforts in wood energy development and spoke a common language. The importance of sustaining the ongoing efforts, especially for the period beyond termination of RWEDP was firmly stated.

Part of the discussions was directed to implications of woodfuel use for the global atmosphere. More than two billion woodfuel users live in Asia, which happens to be by far the largest number in any continent. Therefore, trends in Asia have major implications for the global environment in terms of greenhouse gas emissions. The current practice of using woodfuel saves enormous amounts of carbon which would otherwise be released into the atmosphere from alternative fossil fuel use.

The picture of the woman on the front cover of this issue of Wood Energy News symbolises how much the woodfuel users in Asia save in terms of CO_2 abatement costs for all those who have so far not come much further than talking about greenhouse hazards. It can safely be stated that her contribution is as yet hardly appreciated by the many people who are much more affluent than she is.

Front page: Environmental aspects of wood energy are diverse.

Programme Focal Points

Bangladesh:	Chief Conservator of Forests, Forest Dept, Min. of Environment and Forest; Industry and Energy Dev., Planning Commission, Min. of Planning.
Bhutan:	Dir, Dept of Power, Min. of Trade; Joint Secretary, Forest Services Division, Min. of Agriculture.
Cambodia:	Chief Community Forestry Division, Reforestation Office, Dept. of Forests and Wildlife
China:	DG, Dept of International Cooperation, Min. of Forestry; Dp. Dir INFORTRACE.
India:	Inspector General of Forests, Min. of Environment and Forests; Secr., Min. of Non-Conventional Energy Sources.
Indonesia:	DG of Electricity and Energy Devt; Dir of Regreening and Social Forestry, Min. of Forestry.
Laos:	DG, Dept of Forestry, Min. of Agriculture and Forestry.
Malaysia:	DG, Forest Research Institute; DG, Economic Planning Unit, PM's Dept.
Maldives:	Dep. Director, Agricultural Services, Min. of Fisheries and Agriculture
Myanmar:	DG, Forest Dept; DG, Energy Planning Dept, Min. of Energy
Nepal:	DG, Forest Dept; Executive Secretary, Water and Energy Commission Secretariat
Pakistan:	Inspector General of Forests, Min. of Env., Local Govt and Rural Devt.; Chairman, Pakistan Council of Appropriate Tech.; Chief, Energy Wing, Planning and Devt. Divison
Philippines	Secretary, Dept of Energy; Secretary, Dept of Environment and Natural Res.
Sri Lanka:	Conservator of Forests, Forest Dept; Sec., Min. of Irrigation, Power & Energy.
Thailand:	DG, Royal Forest Dept; DG, Dept of Energy Development and Promotion.
Vietnam:	Director, Forest Sciences Institute; Dep. Dir., Institute of Energy, Min. of Energy

Wood Energy and Environment: Overview of Issues

W.S. Hulscher

When investigating the environmental aspects of energy from wood and other biomass, it is necessary to take into account both supply and utilisation practices. In the current issue of Wood Energy News we limit ourselves to physical and biological environment, leaving aside the human and social aspects. Amongst the environmental aspects of wood energy supply are the multiple influences of trees and forests [paper Bhattarai, page 17]; considerations about the sustainability of wood resources [paper Hall, page 3] and linkages, if any, between deforestation and wood energy with a view to carbon management [paper Openshaw, page 5]. Multiple functions and sustainability of land use also matter for crop residues as an energy source [paper Clancy, page 10]. On the energy utilisation side major concerns are on global climate change [paper Shukla, page 7]; and local and regional pollution effects. It is noticed that environmental implications of wood and biomass energy can be both positive and negative, and that any evaluation will have to be within the perspective of alternative options.

Effects, policies, analyses, tools, management and options are all within our range of interest. Contributions on environmental policies are from ESCAP [paper Sudarsono, page 13] and UNDP [paper Dankers, page 12]. It can be observed that environmental policies are becoming more articulate, but also that enforcement of the laws gains weight in some countries in Asia. This is illustrated in the paper on legal aspects [paper Pennington, page 15]. Furthermore, we notice that some up to date information is still to be communicated to WWF and IUCN [paper Hulscher, page 15]. Environmental impact assessment methods [paper Remigio, page 19] can play an important role in energy decision making, and a highly flexible energy planning tool is available in the form of the LEAP software and database [paper Von Hippel, page 21]. The option of dendrothermal power generation is briefly discussed as an example [paper Koppejan, page 20], and some observations from the private sector on residue use for fuel are communicated [paper Chomcharn, page 19].

One issue of Wood Energy News can only present a small selection of the many environmental aspects of wood energy. There are a lot more site-specific supply issues in different ecological areas, like coastal zones (mangrove forests), mountain areas, etc., as well as adverse environmental effects of not-utilising residues from logging and saw mills in forests. Other relevant subjects left out, for instance, are regional and local (outdoor and indoor) pollution effects, inherent clean technologies, clean-up technologies, as well as national policies and law enforcement in RWEDP member-countries, and institutional and economic aspects, including the challenges of how to internalise externalities in production and use. Some of these subjects may be taken up in future issues of Wood Energy News.

Sustainability of Biomass Energy Supplies

D. 0. Hall

Biomass forever? How long can biomass energy use remain a viable energy source, or is it even sustainable now? This is a crucial question since biomass is still the biggest supplier of energy in the developing world (about 38% of total energy) and, as was highlighted in the last issue of WEN (Vol. 1 1, no. 2, p. 5) in RWEDP countries, biomass energy consumption has been increasing in all countries of the region over the last ten years. It is difficult to determine whether biomass use per capita is increasing or not since the data is generally not available and/ or is ineffectively collected. Thus decisions on energy provision and the environmental consequences of the excessive removal of biomass cannot be effectively made. Anecdotal and other evidence suggests that much biomass still comes from fuelwood derived from deforestation and the clearing of land for agriculture, although twigs, small branches, and all types of residues are still probably the main source of usually constitute the largest user group.There are many agro-industry users of biomass in addition to conventional industry and institutions in both rural and urban areas. Such users can often exert considerable pressure on biomass supplies over long distances and thus influence the sustainability of both forestry and agriculture over extensive areas. There are a number of issues which must be considered when determining the sustainability of biomass supplies.

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- Land clearing for agriculture is not necessarily an irreversible process as far as biomass energy supplies are concerned. After the initial supply of biomass from the cleared vegetation, various types of biomass can be harvested from the fields such as residues from the crops and planted trees (e.g. coconuts). The farmer can determine whether to use the land to supply both food and fuel, for instance, or whether to use the land exclusively for crop production with the residues used as biomass energy.

- Land can be used for biomass energy production on a long term basis, e.g. various types of short rotation plantations. There are many examples around the world where this is occurring. For example, from my

experience I can cite large charcoal from-eucalyptus plantations in Brazil and on a smaller scale in Rwanda; a small mixed-species plantation in Karnatoka, South India, which provides feedstock for a village gasifier for electricity generation; extensive forests in Sweden which supply combined heat and power generation plants from small up to large sizes e.g. 60 MW; and a sugarcane plantation in Zimbabwe which produces fuel alcohol and electricity besides sugar. Many more success stories can be quoted where biomass energy is produced sustainably on a long term and economic basis.

- The use of residues from agriculture and forestry as a source of biomass energy is a-contentious issue since excessive removal of residues from the land can deplete the soil of much needed organic matter. Ideally, a certain percentage of the residues from an area of land should be left to maintain soil fertility. In addition, any ash generation in the combustion of the biomass should be returned to the land. How much of the residues should remain on the land is an open question but a figure of 25% is often used although there is very little evidence to support this - it is obviously avital area of practical research which is much needed on a local basis.

- The use of agrochernical inputs such as fertilisers and various types of pesticides must obviously be considered. Ideally, in order to be completely self sustaining, biomass energy should be produced with no external inputs. However, on an energy output/input ratio basis it is very clear that woody and herbaceous energy crops are most beneficial e.g. the ratio is about 6-8 : 1 for alcohol from sugarcane and 15-30 : 1 for heat and electricity from trees. Thus it pays to add N fertiliser, especially since the energy benefits far outweigh the energy inputs due to the process of photosynthesis capturing solar energy and storing it in the plant. Naturally the application of fertilisers and pesticides (only required where natural pest management does not work) must be done on a maximum response - minimum application basis to ensure no short or long term pollution effects arise.

A recent study on the provision of biomass energy for rural areas of India highlights the opportunities for and the problems of providing modern energy services. It was shown that there is sufficient unused land (especially degraded and/or non-food producing community lands) in India to grow biomass sustainably for conversion into heat and power using, forinstance, gasifiers. Land required for food production was shown to be available until the middle of the next century given increases in yields which are already underway. Thus entrepreneurial opportunities exist for individuals, firms and communities to provide biomass-based energy services to villages, towns and small scale industries, thereby providing both jobs and income in the communities. With the easing of monopolies and regulations in energy industries in India we are already see-ing biomass energy expanding es-pecially, for instance, in the sugarcane and rice industries. Sustainably harvested and grown biomass is becoming recognised as an important energy source.

The benefits of sustainably produced biomass energy have recently been acknowledged in two major international studies. The first is by the Shell Petroleum Company which completed a scenario analysis of what might be the major new sources of energy after 2O2O, when renewable energies have gradually lowered their costs along a learning curve and become fully competitive with conventional fuels. After 2020 with their business-as-usual scenario, biomass, solar, and wind along with some geothermal become the major new suppliers of energy. In their conservation scenario where less new energy is needed, biomass becomes the major supplier with only small roles for other renewables. Shell are currently under-taking a small number of demonstration projects focused on testing the commercial potential of biomass - growing trees for heat and power. The products of modernised biomass supply liquid fuels and electricity in an efficient system of growth and downstream conversion. In order for this to become feasible international and national investment will be required. Thus biomass energy schemes will need to have good and predictable yields provided by selected species and clones and backed up with good forestry practices. The biomass will need to be converted efficiently (e.g. co-firing and later gasifier/gas turbines) and cost effectively to energy products which have an economic demand for incountry use and/or for export. Profits will need to be made for the investors and importantly for the local communities who must benefit from permanent jobs, financial opportunities, and improvement in their general standard of living. Of course, this will not be a good investment in money, human or environmental terms unless the biomass is sustainably produced in the short and long term.

The second study is the recently completed IPCC (intergovernmental Panel on Climate Change) Report which examined in great detail the various options for reversing the emissions and accumulation of CO 2 in the atmosphere. Substituting fossil fuel with biomass produced from forests, plantations and agricultural lands was shown to be a serious option for many parts of the world including Asia, Africa and Latin America. Interestingly, it was also proposed that producing biomass as a substitute for fossil fuels would be an economic way of reducing CO 2 emissions compared to many other options thus supporting earlier work in 1990/91. As with the Shell study, the IPCC work always assumes that the biomass is sustainably produced, provides local benefits (both social and environmental), and produces financial benefits to the community and country.

We return to the opening question - will biomass be forever? My opinion is that the world will never get away completely from biomass energy. It has too many potential advantages (while recognising its problems) such as being widely available, locally produced, affordable or free, storable, environmentally beneficial, and can produce solid, liquid and gaseous fuels. However, in order for biomass to continue ‘forever’

it must be sustainably produced as a modern fuel feedstock with positive environmental and socio-economic benefits.

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Deforestation, Wood Energy and Land Rehabilitation

K Openshaw

According to the most recent FAO figures, tropical deforestation is occurring at the rate of between 15 million and 20 million hectares per year, that is 1 ha. every two seconds. By the time you have finished this article, say in about 8 minutes, another 250 hectares of forests will have been cleared! This defores-tation is reducing the habitat for a multitude of plants and animals, some of which have yet to be recorded, and causing some species to become extinct.

Deforestation is also adding to the accumulation of carbon in the atmosphere. The store of carbon, in these cleared areas of forests and soils, adds approximately 1,500 million tonnes of carbon (C.) to the carbon in the atmosphere. This is about 15% of the gross additions, the other 85% mainly coming from the burning of fossil fuels, with a little from rice cultivation and domestic animal management.

It is this addition of atmospheric carbon that is the principal trigger for global warming. For RWEDP and other tropical countries, global warming could result in serious consequences, from loss of productive land through sea level rises and desertification, erratic rainfall and more violent climatic conditions causing crop failure and escalated erosion to increased temperature affecting the ability of crops to flower and seed properly, thus diminishing the yield of food crops such as rice.

Cutting wood forfuelwood and charcoal production has been cited as a major cause of deforestation, with felling trees for sawlogs and peeler logs as another reason. Thus in some countries such as India and Thailand, a ban has been placed on logging in natural indigenous forests and in other countries, eg. Vietnam, the export of logs is prohibited, all in the cause to halt deforestation. Yet generally, the cutting of trees for wood production results in little if any deforestation. Over-cutting can and does result in the depletion of the tree capital, but even a clear felled area, if left, usually regenerates and some species of trees recolonise the area, from suckers and seeds or existing undergrowth.

However, in the minds of the general population, the cutting of trees, especially from natural forests, is deforestation, not harvesting, but the gathering of crops such as rice is harvesting not de-farming! This could be a matter of temporal perception, for rice can be harvested at least once a year, whereas trees as far

Sustainability of biomass esources

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more permanent fixtures and, once felled, the recovery process is much longer. Nonetheless, each is a harvesting process, because both are renewable and with good management should go on producing indefinitely.

In tropical countries as a whole, the annual growth of wood, from trees inside and outside the forest, is about three times the consumption of wood products. In other words, much more wood could be used than at present, without eating into the tree capital. Unfortunately, much of this "excess" wood is in remote areas and at present it is uneconomic to use, but generally, there is some potential to expand the use of wood. This is not to say that in areas of high population concentrations, especially those near cities, overcutting is not occurring; it usually is, but with appropriate initiatives and policy, this can and is being corrected.

What then is causing deforestation? It has been stated several times before, especially in thisjournal, but itshould be repeated until the message is clearly understood by the decision makers and the general population. It is a change of land use that is the major cause of deforestation. The principal reason is expanding the land under arable agriculture, both permanent and temporary, but extending cattle farming and urbanisation are other factors.

In addition, some mangrove areas have been destroyed to convert them to shrimp farms etc. Over the past 30 years the population of RWEDP member countries has doubled; it is in response to this that the area of agricultural and urban land has expanded to meet some of the growing demands for food and housing space.

Even if everybody stopped using wood products, deforestation would still continue, unless the demands for food and space from an expanding and wealthier population are met by other means. Increasing unit agricultural production is one obvious way and the 'green revolution' has certainly helped in this respect. Rice productivity per hectare has doubled since the late 1970's due to increased areas under irrigation, better fertiliser application and improved vari-eties of rice. It is this, rather than the ban on logging in India that has slowed the rate of deforestation dramatically. This green revolution has also led to the abandonment of some marginal/degraded agricultural land in many RWEDP member countries, especially in India and China.

However, the green revolution has not extended to all crops or all types of farmers, particularly poor and/or subsistence farmers, especially those practising shifting cultivation. Again, predicted global warming, as a result of increases in greenhouse gasses, may somewhat offset the gains of the green revolution. Recent studies at IRRI, (the international rice research institute), has shown that temperature increases adversely affect rice grain production.

Rather than viewing the use of wood as a cause of deforestation and one of the reasons for global warming, the management of existing tree resources, the planting of trees and above all the expanded use of wood, especially wood energy, could be a major strategy to slow down and eventually reverse the production of excess GHG's. Theuse of trees should not be regarded as a problem, but as a solution to sustainable economic growth. After all, in the long run, truly sustainable growth can only be achieved by using renewable energy. Biomass is by far the most important renewable energy today and with good management, correct policy and financial incentives, its paramount position can be maintained.

Each year, a net 30,000 million tons of atmospheric carbon are fixed by plants and every year most of this is returned to the atmosphere, through decay or wild fires etc., without being used: if you don't use it you lose it! This renewable carbon is about four times the amount of carbon burnt each year in nonrenewable fossil fuels. Thus, there is the potential to substitute sustainable (and GHG neutral) carbon fuels for non-sustainable (and GHG warming) C. fuels.

Most of the yearly growth of plants is in annuals or in the leaves of woody biomass. At present only about 20% is in the form of woody biomass. But there is a store of carbon in trees of about 250, 000 million tons, of which two-thirds is above ground, and in forest soils of about 350,000 million t.C. It is quite feasible to shift much more of the annual production of plant material into woody biomass, thus increasing the store of organic carbon in wood/ forest soils and eventually increase the annual off take of organic carbon in the form of woody material.

Trees can be used as a store of organic carbon, thus offsetting some of the emissions from fossil fuels, (the conservation option). But by far the most advantageous use of trees is to use them both as a store and as a factory to produce renewable carbon base fuel or fibre, (the productive option). Outside the forest, trees can be used to assist in other productive functions, especially to assist with agricultural productivity. This could be one way for the poor and subsistence farmers, to stabilise or increase the yield of agricultural crops using natural nitrogen and other fertilisers from tree leaves incorporated into the soil. This could also be an alternative to shifting cultivation practices, which if it was successfully adopted, could save a substantial amount of secondary forest being felled each year to provide land for arable crops.

A mature, 200 year old, forest should have about 150 tonnes of organic carbon in the wood and an additional 100 tonnes of C. in the forest soil, (cornpared to arable agricultural soils).There will be some production of (fuel) wood from fallen branches and dead trees. This could amount to another 200 t.C. over the lifetime of the forest. Thus the total store and production of organic carbon over the 200 years is about 450 tonnes. On the other hand, a 'fuelwood/ pole 'forest on a 20 year rotation, should have a store of only about 65 t. C. in the wood plus an additional 25 t.C. in the soil. However, over a 200 year period, it will have produced about 900 t.C. that could be used as fuel or fibre! Thus the combined store and produce over the cycle amounts to 990 t.C., more than double that of the conservation forest. This is a compelling reason forgoing for

the storage/prod uction option, if there is a market for the wood product.

Thus, degraded forest areas and abandoned land, if it is economically worth while, could be candidates fortree planting initiatives to meet future demands for wood products and to substitute for fossil fuels or construction material, such as cement or steel in metal furniture and windows, requiring a relatively large input of fossil fuels.

Again, the agroforestry option, while not increasing the store of carbon very much, could add about 1 0 t.C. per hectare compared to arable agriculture. In some experimental plots, nitrogen fixing trees have doubled the output of maize to 3 t. per ha. and provided up to 3 tonnes of stick wood per ha., (about 1 t.C.). This could enable a subsistence farmer to become self-sufficient in food and fuel, and save about 0.5 ha. of forest being cut down each year by a shifting cultivation farmer; this would save about 30 tons of C., (per 0.5 ha.) which wiill be burnt in situ or decompose. The saved forest could then be used more productively.

In conclusion, with growing population and prosperity in RWEDP member countries, more energy and other goods and services will be required. At present, there is no cheap substitute for carbon based energy, thus it will be a dominant fuel source for many decades to come. However, to mitigate against the effects of global warming and to promote sustainable growth, energy has to be used more efficiently. But above all much more renewable carbon based energy has to be used. Wood is one of the most convenient forms of renewable carbon based energy and is used by over half the world's population as a cooking fuel. With judicious planning and improved management, considerably more wood based energy could be used. The myth than using wood is causing deforestation should be dispelled once and for all. Most wood, like any other crop, is harvested. Also the fact that wood has been used for energy purposes since time immemorial, should not condemn it, rather it should highlight its versatility. Trees can be grown near to where they are required, they can assist in other forms of production and they are a store of carbon. Wood is GHG neutral when burnt and it can be turned into convenient, solid, liquid and gaseous energy forms or used as a feedstock for electricity generation. It is a renewable fuel of the past, present and the future!

ALGAS is the Asia Least Cost Greenhouse Gas Study, coveting 9 of the RWEDP member countries as well as Mongolia and the two Koreas. It is a UNDP Financed, ADB administered pro-ject with Alternative Energy Development Inc. (AED) as the prime contractor. The principal aims of the project are to undertake an inventory of GHG sources and sinks and to develop a strategy to control and eventually reduces emissions andlor increase sinks of GHGs.

Wood Energy and Global Climate Change

P.R. Shukla

Biomass has been used as fuel since millennia. Until the mid-19th century, biomass dominated the global energy consumption. Although the share of biomass has declined steadily over a century, it still contributes 14% of the world energy and 35% energy in developing countries (Hall, 1991). Wood fuels remain the most prominent biomass energy source. Only 11 percent forests are managed for goods and services (WRI, 1990; Winjum et al, 1992). In recent years, serious environmental concerns like global climate change, acid rain and the deterioration in local air quality from the use of fossil fuels have revived the interest in biomass energy as a renewable, sustainable and environmentally benign energy source.

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In developing nations, substantial biomass use in coming decades is anticipated to continue in the rural and traditional sectors in wake of the persistent short supply of commercial fuels to meet the ever growing needs of the economy. Most biomass used in developing countries is collected or homegrown by the households. It is used very inefficiently in traditional stoves with 10% conversion efficiency. Or-ganized production of wood fuels (through commercial or co-operative sector) and modernized conversion has potential to make wood fuels a competitive com-mercial fuel vis-a-vis the fossil fuels. Besides, decentralized biomass energy plantations have benefits like promoting rural industries, rural employment generation and curbing urban migration. Besides, energy plantations can become means to restore deforested and degraded lands in tropical and subtropical regions.

In some industrialized nations, biomass has remained a competitive energy source. USA and Sweden obtain 4% and 13% of their energy respectively from biomass (Hall et al, 1992). Countries like Sweden, who have decided to phase out nuclear plants and reduce fossil fuel energies in the next century, have plans to dramatically use of increase biomass energy.

Anthropogenic Carbon Emissions

CO2 emissions from fossil energy consumption in 1990 are estimated to be about 6 (plus or minus 0.5) PgC (IPCC WGII), 1996). Following are some important statistics related to carbon emissions (IPCC, 1990): i) average estimates of carbon emissions from human activities suggests that during 1850 to 1986, 195 PgC was released by fossil fuel burning and 117 PgC by deforestation an land use change, ii) average annual emission of carbon during 1980's decade are estimated to be 5.4 PgC emissions from fossil fuels and 1.6 PgC from deforestation and land use change, iii) concentration of at-

mospheric CO2 increased from 288 ppmv (parts per million volume) to 348 ppmv during 1980 to 1990, iv) carbon emissions contributed 55% to the change in radiative forcing during this period.

Wood, Forests and Climate Change: The Nexus

Wood constitutes both the sink and source of atmospheric CO2. Carbon is absorbed by trees through photo-synthesis, and is emitted while burning either by natural or anthropogenic causes, or through decomposition. World's forests cover 3.4 billion hectares of land, about a fourth of earth's surface (FAO, 1995). These forests store 340 peta grams carbon (PgC or billion tonnes of carbon) in vegetation and 620 PgC in soil.

Composition of global carbon emission suggests that emissions from land use change have continued to rise and nearly equal a quarter of fossil fuel emissions (Houghton, 1996). The average annual deforestation in 1980's decade in the tropics alone was 15.4 million hectares and this accounted for 75% of the net additions of 1.6 PgC to the carbon flux from all land use changes. Eliminating deforestation thus can reduce the carbon emission equivalent to 1.2 PgC annually. Evidently, decreasing the rate of deforestation is one very effective carbon mitigation option.

Forest affect the climate system from local upto continental scales by influencing ground temperatures, evaporization, surface roughness, albedo, cloud formation and precipitation (IPCC (WGII), 1996). On the other hand, climate change is also likely to have large and generally diverse impacts on the forests and forest ecosystems. Sustained increase of as little as 1 degree celsius in mean annual temperature can be sufficient to cause changes in the growth and regeneration capacity of many trees. Climate change shall also change the habitat of many tree species and can affect biodiversity. For instance, warming may positively affect the growth of many trees, but can also be beneficial to pests and other biotic agents that affect forest health. This may put cold adapted species to competitive disadvantage.

Wood Fuel and the Environment

Globally, carbon emissions released from the combustion of wood fuels is equivalent to 0.5 PgC (Houghton, 1996). Eighty percent of wood fuel use is in tropical regions. If sustainably grown, the wood-fuels are essentially carbon neutral. Attributing an eighth of global de-forestation to wood fuel, the contribution to the global warming of the direct CO2 emissions from wood fuel use is estimated to be 2 percent (Ahuja, 1990). Besides net carbon emissions from deforestation, the products of incomplete combustion of wood are a cause of considerable environmental concern. Wood fuel burning on traditional stoves causes emissions of pollutants such as carbon monoxide, methane, nitrogen oxides, benzene, formaldehyde, benzo(a)pyrene, aro-matics and re-spirable particulate matter. Primary concern of these pollutants is due to their health impacts (Smith, 1987). Annually biomass burning is estimated to emits 22 million tons of methane and 0.2 million tons of nitrous oxides (IPCC (WGII), 1996). These emissions have significant implications for climate change due to their considerably high global warming potential compared to CO2 (IPCC, 1990).

Carbon Sequestration

Fossil fuels continue to emit large quantities of carbon. Stabilization of atmospheric CO2 will require either a large reduction in fossil emissions or sequestration of excess carbon by managing the forests. Deforestation has far exceeded afforestation (ratio of 8.5:1) in tropics during 1980's (Houghton, 1996). The new plantations however are increasing rapidly. It is estimated that globally about 100 PgC (similar to the amount of carbon re-leased over the last century) can be sequestered over a next century by a significant increase in the area (between 345 to 1000 million hectares) of forests (Houghton, 1996). Largest suitable areas for afforestation are in tropics. Here, the growing population pressure may create a food versus fuel conflict unless the af-forestation areas are carefully chosen from already deforested and degraded lands.

Wood Management for C Conservation and Sequestration

Forest and wood management options for C conservation and sequestration can potentially make forests the net sinks of carbon. Some prominent options are: i) controlling deforestation (including from causes like fire and pests), ii) enhancing storage of carbon by reforestation and afforestation, iii) increased combustion efficiency of wood fuels, iv) substitution of wood fuels for fossil fuels and of wood products for other materials, and, v) in-

Carbon Sequestration in Pakistan

Recent developments in Pakistan's environmental policy with regard to carbon sequestration have been communicated to RWEDP by Dr. K. M. Siddiqui, Director General of the Pakistan Forest Institute (PFI). As the country is preparing for a major expansion of thermal power generation capacity in the coming years (3-4,000 MW, mainly oil and gas fuelled). It has been decided that for each MW to be installed, 10 hectare of new trees are to be planted as part of the initial investment. The wood may be harvested in due course for timber, woodfuel or other, but will have to be replanted to maintain the sequestration function. The scheme will contribute to the new forest plantation target of planting 600,000 ha of trees on forest land set by the Ministry of Environment and Urban Development, which now also guides and oversees forest policies. Establishing forest's plantation has been made mandatory for a number of private sector organisations, including banks, and is to become part of their regular operations. Th new developments amplify exiting trends in Pakistan, where many PFI forestry graduates are being employed in the private sector.

creasing carbon stock within existing forests.

Wood products currently hold 25 PgC (Grayson, 1994) and this amount is possible to be increased by a factor of more than two by substitution of other materials by wood. Carbon sequestered in global annual wood production is currently estimated at 1 PgC (IPCC (WGIII), 1996). A most promising long-term solution to energy and carbon emission problem is the replacement of fossil fuels by sustainably produced wood fuels. Estimates suggest that production of biomass for energy (including wood and energy crops) has potential to offset fossil fuel emissions by 1-4 PgC annually by the middle of next century (Sampson et al, 1993). Wood for fossil fuel substitution reduces carbon emission permanently, while afforestation with-draws carbon from the atmosphere only for a few decades. Wood management practices thus offer most promising future carbon mitigation options.

Asian Forests and Carbon Mitigation

Due to deforestation and degradation in tropical regions, Asian forests are net emitters of atmospheric CO2 (Dixon et al, 1994). Considerable potential for C conservation and sequestration exist in Asian forests by appropriate forest management practices. Studies suggest that by the year 2050, 24 PgC can be conserved or sequestered on the 214 million hectares (Mha) of forest land (133 Mha plantations and agroforests, 33.5 Mha for slowed tropical deforestation and 48 Mha for natural and assisted regeneration of tropical forests) on the available land in Asia which is about a third of the mitigation potential form world's forests (Brown, 1996). Initially, the carbon saving comes primarily from slowing of deforestation and regeneration. From year 2020 onwards, more sequestration would be from plantations and agroforests.

Costs of C Conservation and Sequestration

The Framework Convention on Climate Change recommends that the policies and measures to deal with climate change should be cost effective so as to ensure global benefits at the lowest possible cost (UNEP\WMO, 1992). Wood and forest related policies offer several low cost options for the mitigation of carbon emission. Carbon sequestration costs affected by varied factors including the assumptions regarding data, costing methods and ecosystem components. The marginal cost of carbon sequestration are estimated to increase moderately with the level of sequestration till the carbon storage level of 70 PgC and climb rapidly thereafter for higher levels of carbon sequestration (Dixon et. al, 1991). Estimates (Richards et al, 1993) suggest that the carbon sequestration upto about 50 PgC can be achieved over 160 years through forest plantation by a total cost of 250 billion US dollars. Global C that can be conserved and sequestered between 1995-2050 and the related costs are shown in Table 1.

Table 1: Global C that could be sequestered and conserved and related costs between 1995-2050

Latitudinal Zone	Measure	C sequestered/ conserved[1](PgC)	Cost[2] (US$/Mg C)	Total Cost (Billion US$)
High	Forestation	2.4	8	17
Mid	Forestation	11.8	6	60
	Agroforestry	0.7	5	3
Low	Forestation	16.4	7	97
	Regeneration	11.5 - 28.7	2	
	Slowing deforestation	10.8 - 20.8	2	44 - 97[3]
	Total	60 - 87	3.7 - 4.6	247 - 302

Source: Brown, Sathaye, Cannell and Kauppi (1996)
Notes:
1 Includes above- and below-ground vegetation, soil and letter C
2 Establishment or first cost (undiscounted). Average of estimates reported in the literature. Most estimates do not include land, infrastructure, protective fencing, education and training costs
3 For slowing deforestation and regeneration combined.

Conclusion

There is a strong nexus between the wood energy and the climate change. Wood management offer vital options for mitigation of greenhouse gas emissions. Currently, the wood fuels use is predominant in developing countries. Here, wood fuels are usually homegrown and collected by the family labour, and only scantly traded. Wood energy use is very inefficient. Energy efficiency of traditional wood stoves remain below 10%. If sustainably grown, wood energy is carbon neutral. Wood fuels grown commercially and used with modern combustion technology can be com-petitive with the fossil fuels. Management of wood and forests furnish low cost and high potential carbon mitigation options. Future development of wood energy and forest policies are therefore vital to the cost effective global climate change regime. Conversely, the climate change also have significant impacts on forests and forest ecosystems. Wood energy, forests and climate change are vitally linked. The following shall be some vital wood related policies in the context of global climate change: i) commercial wood fuel production, ii) sustainable wood growing practices, iii) conversion of wood into readily usable energy forms (such as liquid or gas), iv) modernized wood combustion technologies, and, v) C conservation and sequestration through wood and forest management practices. These policies suit not only the needs of managing the climate change but are also consistent with the global sus-tainable economic development.

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Environmental Impacts of Diverting Crop Residues to Fuel Use

J. Clancy

Shortage of fuel wood has lead many rural people to switch to using agricultural residues as an alternative energy source. However this has not always been met with universal acclaim due to the role of residues as fertilisers. Although crop residues and animal manure as a nutrient source has been superseded by inorganic fertilizers in most intensive farming systems, they continue to be the main source of crop nutrient replacement in most developing countries. There has developed wide spread assumption that the removal of all crop residues from the fields must therefore be prevented since this will be detrimental to crop productivity. This is a gross simplification on several fronts.

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Traditional farmers already remove field residues for several sound agricultural reasons. Firstly, not all crop residues make good compost since they decompose very slowly, for example, jute sticks. Different crop residue composting abilities are well recognized. Some residues are burnt on the fields to prevent disease transmission from one season's crop to the next, for example, cotton stalks. Where the planting of a crop closely follows the harvesting of another, burning of stalks and other residues may be carried out for quick clearance. Removal of residues also makes sowing the following crop easier.

Organic material returns carbon, nitrogen and other trace nutrients to the soil. The material needs to be broken down in order to be accessible to the following crop. The carbon is contained in several different forms within the organic ma-terial, which break down at different rates. The rate of decomposition is dependent upon soil temperature and to some extent soil moisture. The material also breaks down quicker if, rather than remaining on the surface, it is incorporated into the soil where the

micro-organisms have better access. A portion of this material (the humus) is exceptionally difficult to break down and it releases the nutrients very slowly, sometimes remaining in the soil for hundreds of years. It is unlikely that ceasing to apply crop residues to a soil will have immediate implication for carbon availability but the nutrients, especially in poor soils, are more likely to be affected. Plant residues are the major source of nutrients. If straw is removed from the field then 90% of the total nutrient uptake of the crop may be removed. However, if the straw is burnt on the field, then the losses of potassium and calcium are reduced, although the nitrogen and phosphorous are lost in the smoke. The ash, however, can block surface pore spaces and prevent water absorption.

Indoor pollution is a major problem or women and children

The micro-organisms present in the soil also affect the availability of nutrients to plants. The nutrients are released by the decomposition of organic matter, and are absorbed first by micro-organisms, which can often cause a short-term nitrogen deficiency for plants. The nutrients are re-released as the micro-organisms die and can then be absorbed by plants. The relative rates of these two processes are important for nutrient availability and so the timing of fertilizer application is important. Soil temperature and moisture content are important controlling factors. The available data on yields, especially on long term effects, and their rate of reduction if the application of organic manure ceases relates mainly to temperate crops. Since temperature is a factor, a difference between temperate and tropical crops can be anticipated.

It is possible to identify the types of soil that are most likely to be at risk of environmental degradation by the removal of residues. Soils with a clay content and poor cation exchange capacity need organic matter to help bind magnesium, potassium, ammonia etc. Sandy soils require organic matter to help retain water and improve the tillage. In well balanced loams removing organic matter may have much less impact.

It is also a simplistic assumption that all organic fertilizers are beneficial to the soil they are applied to Organic fertilizers, depending upon the source, are generally dilute nutrient sources and large quantities have to be applied to show any beneficial results. In traditional farming systems this means the use of labor intensive methods, which are time consuming and may compete with other activities. Crop residues and animal manure, compared to inorganic fertili-sers, are low in nutrients and are high in carbon. The quality of animal manure varies a lot, depending upon the size, age and condition of the animal. The manure of tropical animals usually has a higher carbon to nitrogen ratio than for temperate animals, which means that the nitrogen release is slower. Since nitrogen is important for cell, and hence plant, growth this has an impact on productivity. There is also competition from the soil micro-organisms for the available nitrogen which again slows crop growth.

The use of crop residues is not the only "organic" means of ensuring soil fertility. Crop rotation, using nitrogen fixing plants and a fallow period, is an alternative technique and is as old as settled agriculture. Many nitrogen fixing plants, such as beans and legumes, are staple crops in many developing countries.

The response of crops to organic manure is extremely varied, some crops show dramatic increases, whilst others show little effect. What is apparent is that the effect on the crop depends upon the type of soil and the preparation and method of application of the manure. Wet land agricultural systems tend to rely less for nutrients on organic matter recycling than of rain fed systems. The nutrients in the former are supplied either by silt or flood/irrigation water. Uplands agricul ture is probably at greatest risk from the non-recycling of organic matter.

Probably of much greater significance than nutrient supply is the effect of residue removal on erosion both from the wind and water. Plant cover reduces the amount of water reaching the soil and so reduces the erosion impact. The residues also retain moisture and so prevent run off. The water velocity is also reduced and so the compaction is reduced, which would prevent the water being absorbed by the roots. If the residues lie on the surface they will also help to reduce the kinetic energy of the wind and therefore, erosion. Plant cover also helps to create a stable microclimate close to the surface, especially with respect to humidity control and temperature. Wide fluctuations in these parameters can damage seedlings and soil micro-organisms, reducing the need for herbicides etc. However, this is may

not always be negative since fluctuations will also kill weed seeds and detrimental micro-organisms. In areas subject to frost, surface exposure is important during winter months to allow it to freeze and thaw, breaking up the soil lumps, giving a soil that is easier to work.

Again certain areas are more prone to erosion. These can be readily identified as steeply sloping hillsides, and areas prone to violent rainstorms and/or high winds. However, other preventative methods, such as terracing, also provide good erosion control.

In summary, the effects of residues removal are not straight forward. Correct decisions are hampered by the lack of appropriate data, especially for tropical soils. Effects are site specific, but it is possible to identify the sites that are likely to show the most im-mediate negative impacts of residue removal. It is in these areas that steps should definitely be taken to prevent residue removal from the soil. Clearly any project that undertakes to remove crop residues from the field should be carried out in close cooperation with the local agricultural services to minimise the risk of environmental damage.

UNDP Intiative for Sustaintable Energy (UNISE)

A. Dankers

The following is a report on UNDP's strategic approach to providing energy services to contribute to achieving the goal of Sustainable Human Development.

During the UNCED Conference in June 1992 in Rio de Janeiro, Brazil, the international community made commit-ments to advance the concept of sustainable development and its application. Agenda 21 became one of the documents to be followed and implemented to enhance sustainable development. The United Nations Development Programme (UNDP) was accorded in Agenda 21 a specific mandate to assist developing countries on building capacity to implement sustainable development policies.

In Agenda 21, chapter 9, it was agreed that current patterns of production and utilisation of energy cannot be sustained, and consequently two main directions were identified in which a more sustainable energy system could evolve i) toward more efficient production, transmission, distribution, and end-use of energy and ii) toward greater reliance on renewable energy sources and technologies. Of course both approaches are related.

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UNDP and Energy

UNDP, with its strong commitment towards Sustainable Human Development, regards energy as an instrument for socio-economic development. Although energy is not explicit in any of UNDP's four priority areas; i) poverty elimination, ii) job creation, iii) the advancement of women and iv) environmental protection and regeneration it cuts across all these areas. Energy is not an end in itself, but rather the means to achieve the goals of Sustainable Human Development. Considering the above, UNDP has increased its attention to sustainable energy.

In August 1994, the Sustainable Energy and Environment Division (SEED) was formed within UNDP, consolidating the formerly existing environmental units plus the addition of a new unit: the Energy and Atmosphere Programme (EAP). SEED's mandate is to support UNDP's efforts in addressing environmental concerns, decision-making processes, capacity building, but above all assisting UNDP Country Field Offices to design, plan and implement activities in these fields. The main thematic areas within SEED are water, forestry, agriculture and energy. Furthermore UNDP's engage-ment with the environmental Funds; GEF and Capacity 21, set up specifi-cally to enable the implementation of the Rio-commitments, are (co-)admini-stered by SEED. Similar is true for UNSO and the Montreal Protocol, except for the fact that these Funds already existed before the UNCED Conference.

Energy and Atmosphere Programme

SEED's EAP activities all fit within the UNDP's Initiative for Sustainable Energy (UNISE) is a strategic approach designed with the objective to ge-nerate and implement sustainable energy programmes and projects in all UNDP programme countries to advance the 4 priorities of UNDP (see above). The document was distributed in June 1996 among UNDP's Programme Country Field Offices, and country consultations have begun to investi-gate where and how sustainable energy issues can be addressed in the country specific UNDP activities.

UNISE's main components can be summarised as; i) mobilising support for indigenous capacity building, ii) improving the policy environment, iii) 'leapfrogging' to new technologies and approaches and iv) supporting the developmentof national energy action programmes.

The Energy Account, managed by EAP, is a financing mechanism through which sustainable energy projects, that are fully in line with UNISE as mentioned above, are financed and implemented with technical assistance from EAP. The major contributors to the energy Account are the Netherlands, Japan and the OPEC Fund for International Development. For example Financing Energy Services for Small Scale Energy Users (FINESSE)-related activities are funded by the Energy Account.

Furthermore is EAP involved with the joint UNDP/World Bank Energy Sector Management Programme (ESMAP) and with UNDP's support to the World Bank Asia Alternative Energy Unit (ASTAE).

Biomass Energy

Although not earlier given a high priority, biomass energy is identified in UNISE as one of the areas to be addressed under the implementation of UNISE. Especially the characteristics of wood energy in a large number of countries in Asia; up to half of national energy needs provided by wood energy, wood energy consumption in absolute terms is still increasing, a large population (up to 10%) of the rural population are engaged in wood-energy related activities as the main source of their income and the potential the modern biomass energy sector offers in terms of employment and benign environmental development are very much in line with UNDP's four priority areas as mentioned earlier.

Current use of wood energy for mostly cooking and heating is inefficient and grown in an unsustainable manner. Also the potential of biomass energy to be used on a large scale to sustainably provide industrial heat, shaft power and to generate electricity, liquid and gaseous fuels is far from fully exploited in the Asian region. Making use of available modern technology to convert biomass energy and applying modern (social) forestry management systems could be the path to follow for a sustainable and economically interesting development of the biomass energy sector.

Through the UNDP's Programme Country Field Offices, with technical backstopping from EAP, project proposals for biomass energy programmes and projects can be generated, after which funding, either from UNDP's own financial resources or through external financing, can be actively looked for. In order to formulate and implement biomass energy programmes, a country needs its own cadre of professionals who understand both the elements of sustainable bio-mass energy and the country's uni-que situation. The FAO/Regional Wood Energy Development Programme has been instrumental in building up this pool of biomass energy professionals in the region for the past decade. These professionals could now be involved in the process of formulation and implementation of UNDP supported biomass energy projects in the Asian region.

Next steps.....

Most UNDP Country Field Offices in the Asian region are at moment in the process of designing their programme for the coming three years. UNDP programme Resources to implement these pro-grammes either come from UNDP-core resources (so called TRAC 1 and TRAC 2) or from Trust Funds (eg. GEF) or through bilateral funding. Therefore timing is excellent for the inclusion of pro-grammes and projects that contribute to the development of the biomass energy sector in the Asian region. For further information the UNDP Field Office in each respective country in the Asian region can be contacted, referring to UNDP's Initiative for Sustainable Energy (UNISE).

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W.S. Hulscher, FAO-RWEDP in Asia, 'Mis-conceptions about

The Regional Environment Dimension in Energy Policy and Planning

Budi Sudarsono

Since the 1987 Brundtland Report and the 1992 United Nations Conference on Environment and Development (UNCED) or the "Earth Summit" in Brazil, increasing attention has been paid to environmental concerns of energy production and consumption. Chief among these are: i) Global warming and climated change due to accumulation of greenhouse gases, ii) Acid rain and deposition of pollutants, including transboundary air pollution, iii) Siting of all types of power plants, including hydro and nuclear power plants, iv) Air pollution in large cities and Indoor air pollution (from household cooking).

The common wisdom in energy is that sustainable energy development means, first and foremost, the integration of environment into energy policy and planning. Second, it is generally accepted that ultimately mankind will have only two sources of energy to rely upon: nuclear and solar energy. Third, given the requirements of both the industrialized and the developing countries in the near-term and the medium-term future, the depletion of hydrocarbons would occur within the next 50 years or so, and of coal within the subsequent 100 years or so. Fourth, the paths of energy transition already present themselves: increase in efficiency (which would prolong the depletion of fossil fuels) and fuel switching to nuclear energy and renewables.

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National efforts to address Energy-Environment issues

One of the "lessons" learned by developing countries was that Japan had

achieved sustained periods of economic growth while at the same time had to endure considerable environmental pollution as a conswquence of industrialization. European countries, too, experienced pollution as a result of industrialization. This at one time the developing countries' strategy for economic development was: to grow (and pollute) and to clean-up later.

A recommended strategy was to grow and at the same time to address environmental concerns. However many developing countries are not yet in a position to incorporate environmental protection equipment in their energy production facilites. The purchasing power of the consumer is still low and energy is still subsidized. But this in turn leads to wasteful and inefficient use of energy. Therefore developing countries need to enhance the efficiency of their management of the energy sector.

Energy related environmental issues at the national level are:

- air pollution in large cities: the number of mega-cities is increasing due to urbanization and population grow-th. Rapid industialization further exacerbates the deterioration of air quality. Integration of multi-sectioral policies is needed to address the problem, involving the various autho-rities dealing with health, city planning, industry (including construc-tion), transport, energy, and environment.

- siting of power plants, specially hydro-powor and nuclear power plants: Action is requred on acase by case basis. Standards need to be established and enforced on all emissions from power plants. For hydro-power plants EIAs are requred to assure the public on possible environmental impacts addressing questions on biodiversity and transfer of human settlements. Public acceptance need to be secured for nuclear power plants.

- household air pollution through use of biomass for cooking: More efficient cooking stoves need to be promoted, and wherever possible alternative clean fuels should be provided. At one time analysts thought that deforestation was caused by household use of furlwood; but the main culprits are conversion of forests to agriculture and culprits are conversion of forests to agriculture and other uses, and use of furelwood for insustrial activity.

Regional level activities

There has been little realization of regional energy collaboration in Asia and the Pacific, even though the region is fairly well endowed with energy resources. The reserve-production ratios of oil, natural gas and coal for the region as a whole are, respectively, 17, 53 and 171. The reasons could be partly because of (I) the relatively low level of energy consumption and (ii) the large distances invloved: the area of Asia Pacific could accommodate at least three times the area of Europe, which is full of both natural gas popeline networks and electrical power grids. These two factors make such networks and grids uneconomic in Asia. However, the potential is there, because of availability of resources, and, thanks to the rapid increase in energy demand, it will not be long before networks and grids similar to those in Europe would be built. Some already exist, e.g. in Central Asia.

A number of regional cooperation activities on environmental issues is be-ing actively pursued and ESCAP is ac-tive in this area. Several subregions of Asia and the Pacific collaborate on implementation of environmental programmes, e.g. South Pacific Regional Environment Programme (SPREP), ASEAN Senior Officials on Environment (ASOEN), and South Asia Cooperative Environment Programme (SACEP). ESCAP also acts as the secretariat of the Regional Inter-Agency Committee for Asia and the Pacific, and specifically the Sub-Committee of Environment and Development.

Global agreements and their implementation

With regard to global concerns, there wete in AGENDA 21 recommendations on programmes of mitigation of greenhouse gas emissions through the promotion of energy conservation and the enhancement of energy efficiency. These were termed "no regrets" policies, i.e. whether or not there would be global warming they were economically viable and desirable policies as they were cost-effective and energy savings would be achieved.

Another important outcome of UNCED was the United Nations Framework Convention on Clomate Change (UNFCCC), which is now in force. Two Conferences of the Paties (COPs), to discuss and to achieve agreements on modalites of implementation, have been held so far (the second in July 1996) and the third is planned for 1997. Progress has been slow.

A number of industrialized countries have initiated what has been termed "joint - implementation projects" or "activities implemented jointly" (AIJ).

All Asian developing countries, however, still requre increasing amounts of energy, and the state of technology does not allow for fuel switching away from fossil fuels.

UNDP attempt to address the energy-environment interface: the launching of PACE-E

In the past, energy resouve constraints had been perceived as likely major constraints in global development. The oil crises of 1973-1979, however, have stimulated extensive oil developmemts, such that nowadays resource constraints have been almost forgotten. These remain important for the very long term, but in the short and near term the costraints seen by many developing countries lie in providing the supplies to meet the rapid demand for energy and electricity, in mobilizing the requred financing, and in ensuring the provision of environmental protection measures.

Management of the energy sector remain largely energy type oriented, with each of the implementing agencies or operating companies remaining largely separate. In many countries several ministries oversee the energy sector, although in some a measure of coordination is effected at the highest level of government. It is essential that coordina-

tion is implemented, to ensure economic efficiency, to pursue an optimal path (say, least cost) of energy sector development, to adopt equitable pricing policies, and to adcertain the desired mix of energy types appropriate to the country's resource endowments and stage of economic and technological developement, All these to be ac-complished while protecting the environment, with a veiw to pursue a sustainable development path.

The problem in energy sector management is how to achieve the desired results, while at the same time satisfying all concerned parties. All environmental impact of energy systems at the three levels: global (CO_2), regional/subregional (acidrain), and national/local (urban pollution, power plant sites, and household cooking) should be ad-dressed. Technological solutions are available or could be developed to mitigate all these impacts.

To this end, studies need to be undertaken constantly (as the economy develops, a restructuring, and indeed a transformation, contunuously occurs) concerning the country's future pro-spective developments of the energy sector, i.e. energy demand and supply, including of course all energy types and electricity. Computer modelling exercises are needed to assist in these studies, since the energy system is complex. Models such as RES, ME-DEE-S, LEAP, EFOM, MARKAL, WASP and ENPEP are being used. Alternative strategies could be studied and the costs/benefits of each could be assessed.

Clean and safe technologies?

The UNDP launched the Programme for Asian Cooperation on Energy and the Environment (PACE-E) in 1993. ESCAP is actively engaged as executing agency in assisting member countries in this important area.

PACE-E is modelled after its predecessor: the Regional Energy Development Programme or REDP. The six components of RWEDP have been retained, but have been given new names: Energy-Environment Planning (EEP), Coal Development and Utilization (CDU), Natural Gas and Petroleum Development (NG&PD), Rural Energy and Environment Development (REED), Conservation and Efficiency (C&E), and Electric Power System Manage-ment (EPSM).

As of January 1996 PACE-E was executed smoothly, with a total of 21 activities executed by ESCAP including eight (on CDU) implemented by the Joint Coal Board of Australia. The total number of participants exceeded 460 (including 212 in CDU activities).

Unfortunately the UNDP experienced funding constraints in 1995 and support for ESCAP execution of PACE-E has since been greatly reduced. It is now very likely that PACE-E as originally formulated and launched by UNDP in 1993 will not be completed.

Note: The opinions expressed in this article are those of the author`s and do not necessarily reflect those of the UN.

Forests for Life: The WWF/UCN Forest Policy Book

W.S. Hulscher

VWVF and IUCN are widely appreciated as authorative sources of independent information with a corresponding impact on policy makers and the general public. In February 1996 both organisations jointly published the WWF/IUCN forest policy book 'Forest For Life' which is reviewed on page 23. However, I have a few observations to add as I am quite unhappy with the part of the document that deals with fuelwood.

WWF/IUCN review the immediate causes of forest loss and degradation (page 16 of the book) and identify fuelwood collection as one of the major causes on a par with agriculture related issues. WWF/IUCN explain the fuelwood issue with references to four sources only, three of which are Earthscan documents published in 1984, and 1988, Obviously, for a policy book published in 1996 these sources are rather old, if not very old. Moreover, the Earthscan documents focussed on Africa only. The fourth reference dates from 1991 (which cannot be considered recent either), and deals with Central America only. Admittedly, there ferences are close to classics, though from a bygone decade. Do VWVF and IUCN really think these documents suffice to support their current views on fuelwood for a worldwide forestry policy?

What about Asia? Asia has 24% of the forest cover in the South (WRI 19961997). More importantly, WWF/IUCN rightly state that for around 2 billion people in the South fuelwood

and charcoal are the primary energy sources. Actually, by far the largest part of this number lives in South and South-East Asia (including China), which alone account for 2 billion people in the named category, according to my estimates.

I should like to draw the attention of WWF and IUCN to the FAO Regional Wood Energy Development Programme in Asia (RWEDP), which is funded by the Netherlands Government. The programme runs from 1984 to 1999 and has published numerous studies and documents which are up to date and encompass by far the largest fuelwood using population in the world. I quote a few findings from RWEDP on Asia:

- Two thirds of all fuelwood does not originate from forests
- Fuelwood collection normally does not destroy forests
- There is no justification to group land conversion and fuelwood collection as a related cause of deforestation
- In only a very few areas (for certain, there are a few) is fuelwood use a more important cause of forest degradation than logging or the conversion of forest land into agricultural and other land.

WWF/IUCN may or may not be convinced by findings from the FAO alone. Therefore, I also refer to the book by N.H. Ravindranath and D.O. Hall on 'Biomass, Energy, and Environment -A Developing Country Perspective from India', published in 1995 by Oxford University Press. The authors analyse many of the common misconceptions about the presumed nexus between fuelwood and deforestation. They conclude, and I quote from Chapter 3, 'All the available evidence shows that the rural fuelwood requirement does not seem to lead to deforestation.' In fact, similar findings have already been reported by a series of World bank/UNDP ESMAP studies of the early nineties on The Philippines, Pakistan, Indonesia, Vietnam, etc.

It is hoped that VMF/IUCN will soon update their forest policy book with the empirical evidences of the 1990's!

Balancing Economic Development and Environmental Laws

M. Pennington

Awareness and growing concern for the environment is spreading across the globe, while rapid industrialisation and high growth rates are being experienced by economies in South-East Asia. As a result of the economic boom which translates to increasing energy demands in various industries, South-East Asian governments are stepping up their drive to improve their environmental man-agement systems. The aim of their actions is to address the negative externalities (e.g. air & water pollution) brought about by the increased pressure on the region's environment and natural resources.

Malaysial's Now Directions in Energy-Environment

Amidst its sustained high economic growth of 8% per year since 1987, Malaysia has accorded the environment a priority in its development strategies (second to Singapore). National envi-ronmental policy in the country has been given great emphasis since the 3rd Malaysia Plan (1976-1980), with the 61 Malaysia Plan stressing the link between environment and economic development. The Department of Environment' has adopted three strategies to achieve the national environmental objectives being laid out by the plans: pollution control & prevention, the integration of environ-mental factors in project planning & implementation, and environmental inputs into resource and regional development planning.

Fuel feeding system of the Nordfab boiler

The Environmental Quality Act (EQA), 1974 was enforced for the prevention, abatement, control of pollution and enhancement of the environment. In 1987 and 1988, respectively, the Environmental Impact Assessment Order and the Environmental Quality Order (Prescribed Activities) were added to further improve the Act. Power generation activities are considered in the Order as prescribed activities. Power plants are expected to conform to national objectives as well as environmental laws and regulations. Under the EQA, industrial activities are required to obtain a number of approvalS2 from the Director General of Environmental Quality prior to project implementation, and will subsequently be subject to the provisions of the Act. Mechanisms to sustain the EQA are a mixture of the regulatory type (such as court prosecutions & stop work orders) and market-based instruments (such as incentives, spot fines and effluent fees).

To date, a number of cases involving industrial firms have been brought to courts for various offences under the EQA. The Act was revised in 1995 to pave the way for stricter regulations and stiffer penalties after worsening conditions were experienced in various

Mr. M. Pennington, Project Manager, EC-ASEAN COGEN Programme, AIT, Thailand.

parts of the country. By far, the wood industry is seen as one of the main polluting offenders. Around one-third of the factories within the wood industry do not comply with clean air regulations through the practice of open-burning and poor incineration of wastes. Timber firms were also identified to be the main culprits in the indiscriminate discharging of solid wastes and effluents into rivers. As the second largest timber-exporting country in the world (next to Indonesia), a bulk of 12 million tonnes of logging residues and wood processing wastes have to be disposed every year. Ways and means to utilise and/or properly dispose of these biomass residues must be introduced.

Wood Industry: The Case of Bekok Kiln Drying and Moulding3

The management of Bekok Kiln Drying and Moulding Sdn. Bhd., a wood-based company in Gernas, Negeri Sembilan, Malaysia, has chosen to utilise their wood residues (sawdust, wood shavings & off-cuts) to generate heat produced from steam for their kiln-drying operations. Initially, heat was produced with the company's old locomotive boilers. Notifications from the Department of Environment that smoke emissions were far above the pollution limits prompted Steven Chew, Managing Director of Bekok Kiln Drying and Moulding, to investigate the market for efficient and environmental friendly boiler equipment.

"I was particularly impressed when I first saw a boiler supplied by Nordfab (Nordfab A/S of Denmark). Due to the efficiency of the system, the pay-back period is very short. Besides, I can now utilise my own wood wastes, "says Mr. Chew. "I am proud of being a pioneer in implementing this environmental friendly combustion equipment, and I can only encourage the other small and medium size wood industries to adopt the same kind of technology," he concludes.

"Our product is particularly well adapted to the South-East Asian markets," comments Allen Ng, Managing Director of Nordfab (Malaysia) Sdn. Bhd., a joint-venture company with Nordfab A/S of Denmark. "There are still a lot of small wood industries in the region who need clean and efficient technologies to enable them to cover their energy requirements using their residues as fuel. Most of them, however, cannot afford imported equipment," continues Mr. Ng. "Thanks to our joint-venture with Nordfab A/S, we are in a position to offer equipment which meets the European standards in terms of quality, efficiency and smoke emissions, but at a local ASEAN price", adds Aaron Lee, General Manager, Nordfab (Malaysia).

Profitable

Indeed, the decision by Bekok Kiln Drying and Moulding to turn wood waste into energy is proving to be economical, profitable and environment-friendly. Through its foresight, the company has brought itself into the stream of the country's T11 Malaysia Plan (1 996-2000) which directs measures towards sustainable development and continuous diversification of energy sources. Policies for the utilisation of renewable energy sources (e.g. biomass) are now being seriously considered due to their low pollution potential.

Notes:

1. Main enforcement/regulatory agency for environment in Malaysia; decentralised structure with 12 regional offices.
2. Includes the Environmental Impact Assessment reports for prescribed activities, site suitability evaluation for non-prescribed activities, written permission to construct, etc.
3. The biomass energy plant at Bekok Kiln Drying and Moulding Sdn. Bhd. has received technical and financial assistance within the Full Scale Demonstration Projects scheme of the EC-ASEAN COGEN Programme. The EC-ASEAN COGEN Programme is an economic cooperation pro-gramme between the European Commission (EC) and the Association of South-East Asian Nations (ASEAN). The aim of the programme is to accelerate the implementation of proven technologies generating heat andlor power from wood and agro-industrial residues through partnerships between European and South-East Asian companies. For further information about the EC-A SEAN COGEN Programme, contact Michael Pennington, Project Manager, EC-ASEAN COGEN Programme, Asian Institute of Technology, Outreach Building 30 1/1, P.O. Box 4, Khlong Luang, Pathum-thani 12120 Thailand. Fax: 662-524-5396, Email: cogen@ait.ac.th.

Multiple Environmental Functions of Trees and Forests

T. Bhattarai

People familiar with the numerous subjects covered in forestry training curricula are aware of the term'forest influences'which deals with the influence of forests on the environment and vice versa, primarily climate, soil, and water. The combined effect of these influences is reflected in the specific settings in a particular geographic area or the local environment. Forest influences include all components of the environment, i.e. biological, physical, social, economic, etc. A tree as a single living being will have only a limited effect whereas forests, which are communities of di-verse vegetation actively interacting with various components of the local ecosystem, always have substantial effects on the environment, either directly or indirectly. Table 2 identifies the mul-tiple influences of trees and forests on the environment, some as direct environmental functions and others as the effect of forest and tree product utilisation.

Table 2: Multiple Influences of Trees and Forests

Influences	Significant environmental effect				
	Soil	**Air**	**Water**	**Biological**	**Others**
A. Direct environmental function					
1. Soil and water conservation	Nutrient cycle] Soil moisture Soil stabilisation	Carbon sequestration	Maintenance of hydrological cycle/ run-off control Water quality	Catchment area habitat improvement Biodiversity conservation	Socio-economic (enhanced/sustained land productivity) Promotion of sustainable land use practices
2. Range restoration and improvement	Soil cover Soil erosion control		Maintenance of hydrological cycle/ run-off control Water quality	Habitat improvement	Socio-economic (income/employment) Promotion of sustainable land use practices
3. Ecological improvement	Humus/soil nutrient condition	Climatic and microclimatic influences	Water quality	Genetic resources conservation/biodiversity preservation	Socio-economic improvement (income and employment from eco-tourism) Promotion of sustainable land use practices Promotion future use potentials of environmental resources
4. Habitat conservation				Wildlife habitat Fish habitat Habitat of other flora and fauna Biodiversity	Socio-economic (reduced crop yield, risk from predators; enhanced supply of traditionally used forest products, income and employment, etc.) Promotes sustainable land use
B: Effect of trees and forest products utilisation					
5. Forest based industries	Soil pollution Soil erosion	Air pollution	Water pollution Flash floods	Deforestation/habitat distruction due to over use Biodiversity conservation due to sustainable management and utilisation of natural forests and plantations	Socio-economic (employment, balance of payment, national income, etc.) Health hazard from toxic chemicals and waste disposal
6. Woodfuel use	Soil nutrient absorption/recycling	Pollution (emission of particulates, carcinogens and greenhouse gases) CO_2 neutral if produced sustainably	Soil moisture absorption/run/off control	Deforestation/habitat distruction/ biodiversity loss (if used unsustainably) Monoculture energy plantations Sustainably managed and used natural forests and tree plantations could contribute to reforestation/ biodiversity conservation	Socio-economic (employment, income distress source of income, etc.) Promotion of sustainable land use practices Environmental preservation
7. Agroforestry practices	Soil conservation (wind and water erosion) Soil nutrient loss/ degradation (due to incorrect vegetation, erosion, leaching)	Carbon storage	Water flow regulation Mining of available moisture in soil	Conservation of genetic resource Contribution in Habitat/biodiversity conservation through reduced pressure in national forests Reforestation of deforested areas/improvement of biodiversity in degraded sites (creation of new habitat)	Socio-economic (multiple products for subsistence, income; employment and foreign currency earnings, from export of tree-based cash crops, etc.)

Woodfuel Markets and Environment in Thailand: Experience of a Wood Processing Plant

A Chomcharn

A Division of Sun Patatech Co., is located in Bangpa-in District, Ayudhaya Province, some 40 km north of Bangkok, The plant manufactures 3-ply wooden parquet flooring for export market. The plant uses a large quantity of rubber wood and imported specie from USA & EU (oak, maple, ash, beech, cherry, etc), in the order of 50,000 ft^3 or 1,400 m^3 per month or more. With an average product net yield of about 60% by volume, the plant currently generates some 20,000 ft^3 or 1,000 metric tons of wood residue per month, on an average.

Contracts for residue collection are made with private collectors to harvest wood residues from the plant. As a result, a minimum of 6 commercial trucks frequent the plant daily to collect the residues, 5-6 days/week. Of these 3 trucks are used to clear the wood shavings and saw/sander dusts from the silo, and the other 3 truks collect the solid residues (slats, trimmings, rejected blanks, etc.) from the waste yard. The contracted price presently paid by the collectors is US$ 85-90 per truck load (ca, 6-7 tons by weight) for the wood shavings and dusts and US$ 60 per truck load for the solid residues. The lower price for solid residues is due to the fact that much more time is required to manually collect the wood waste at the yard, loading on the truck and unloading at the user sites. While the particulated residues are practically fully removed by the trucks most of the time, still remain difficult to the collector to take all the solid residues away. This has often lead to accumulation of the residues.

The plant is currently contemplating dealing with accumulated solid wastes through chipping/crushing. However, because of high capital investment cost on the primary equipment and subsystems for handling and processing such variable sized and shapes of these residues, the experiment is presently restrained. These wastes, once chipped into normal particle sizes can be readily sold for wood-fired boilers, as well as for particle/fiber board mills.

It was learned recently that a substantial portion of the plant solid residues is being used for charcoal making (thicker slabes, rejected boards and end trimmings). These selected residues are transported to a charcoal processing center North of Pattaya City, Chonburi, some 100 km from the plant. The lumped charcoal produced both from rubber wood and imported hardwoods, as withnessed and tested, are of excellent quality for cooking. This small-scale operation by a contractor, is said to have created about 20 jobs for workers involving in the residue collection, truck transport and charcoal processing.

From the environment point of view, wood residue utilization should be looked upon as a blessing, since not only a higher degree of wood utilization has been achieved but also the carbon cycle from wood is better managed this way than an uncontrolled burning or leaving it to decompose. (The decomposition which forms methane gas has several times higher global warming effect than CO_2). Further unlike fuel oil, wood residues do not contribute to emissions of SO_2 in the atmosphere. However, to be able to use these wood residues' fuel properly, an efficient wood-fired furnace and boiler, equipped with a combustion control and an exhaust scrubbing system should be sought. The technology for small/mini boiler and wood-fired furnace system has so far been under explored or underdeveloped.

Dr. A. Chomcharn, Executive Vice President, Sun Paratech Co., Ltd., Bangkok, Thailand

Environmental Impact Assesment for Wood Energy Projects

A.A. Remigio

The main objective of environmental assessment in wood energy development is to provide planners, decision makers and other stakeholders with more appropriate and more detailed information regarding the impacts of decisions. Relevant impacts regard the long-term viability and sustainability of the quantity as well as quality of both the natural resource base and its environmental assets.

Environmental Impact Assessment (EIA) in the context of wood energy planning is a formal environmental planning and management study process to identify, predict, evaluate, communicate and interpret the impacts of a proposed wood energy project on the socio-economic and bio-geophysical environment as well as on man's health and wellbeing. Accordingly, an EIA focuses, preferably during the early stages of the wood energy project planning cycle, on addressing and tackling the significant environmental issues, problems, conflicts or possible natural resource constraints that may affect the viability of the wood energy project. EIA should also try to identify ways of minimising environmental problems and enhancing the project's positive environmental impacts. The out-come

Dr. Amador A. Remigio, SERD - Asian Institute of Technology, Bangkok, Thailand

Wasting residues unnecessarily adds carbon to the atmosphere

of such environmental assessment activities in the wood energy sector can then be documented in the form of environmental impact statements, environmental reviews, environmental evaluations and environmental reports pertaining to wood energy production, conversion and utilisation.

In order to preclude negative externalities (in the form of substantial social and environmental costs) from outweighing the benefits arising from wood energy production, conversion and utilisation, it is expected that the application of environmental impact assessment at the various planning and management levels of the wood energy planning and management cycle will result in the incorporation of both natural resource and environmental considerations in wood energy production, conversion and utili-sation, and the adoption as well as implementation of the requisite environ-mental management measures and safeguards. Thus, it is strongly recommended that for each stage of project planning for wood energy production, conversion and utilisation, there should be a corresponding environmental planning component. Because project planning usually has a pre-feasibility and feasibility study phase, the environmental aspects of wood energy production, conversion and utilisation will have to be addressed in both phases. The linkage of the conduct of environ-mental impact assessment to the undertaking of the pre-feasibility and feasibility study phases in project planning for wood energy production, conversion and utilisation, will ensure that the efforts of both the EIA team and the pre-feasibility and feasibility study team will be complementary in terms of findings and recommendations. Coordi-nation and exchange of information will save time, money and efforts.

The output of an environmental assess-ment for wood energy planning does assist in clarifying both the trade-offs that exist within and between wood energy production and use and the concerns regarding the ecological status of the natural resource base and its associated environmental quality aspects. Environmental assessment is, therefore, an important method of evaluating the environmental soundness of wood energy development options and, in most situations, it should augment and complement the usual technical feasibility and cost-benefit studies. More specifically, an EIA aims to address the following fundamental questions relating to the impact of the wood energy project on the environment:

- What are the expected environmental changes (both positive and negative) that will result from the project?
- What will be the scale, extent and magnitude of these environmental changes?
- Are these environmental changes significant from the standpoint of maintaining ecosystem integrity and the improvement of the quality of life?
- What steps can be undertaken to minimise adverse environmental changes while enhancing positive impacts stemming from the project?
- How can the various stakeholders (e.g., planners, decision makers, local communities, environmental NGOs, etc.) be informed and mobilised in relation to what needs to be done as a result of the environmental impact assessment?

Dendropower and the Environment

J. Koppejan

Large scale wood based electricity generation is often mentioned as an effective means for greenhouse gas abatement, as it could replace fossil fuel fired power plants. However, wood combustion itself offers approximately zero net CO_2 em-issions only if as much wood is being grown as is being burned.

Moreover, environmental impacts of dendropower are not restricted to the positive one of avoiding CO_2 emission during combustion. A proper environmental impact assessment (EIA) should include the whole cycle of woodfuel production, processing, transportation and conversion together with establish-ment and operation of the facility. This should then be compared with the alternatives. The extent of the impact should not only be determined for CO 2 abatement but also on more local impacts varying from

black smoke particles, settling down and causing discomfort to people living in the vicinity of the plant to reduction of the nitrogen load on trees, water and soil and the extraction of minerals from the soil by removing trees from forests. Wood contains much less sulphur than coal, but the toxic polycyclic aromatic hydrocarbons, heavy metals or aldehydes it sometimes contains might be a concern in some cases.

Depending on the extent of the environmental impacts, the priorities given to each one of them and the resources available, measures can be taken in order to effectively minimise the adverse impacts and maximise the positive effects. For example, exhaust gas can be roughly cleaned using a simple and in expensive bag filter, while a much more expensive electrostatic precipitator also removes finer dust particles. Environ-mental legislation and subsidies put in place by governments can be instru-mental in equally dividing the benefits amongst the various stakeholders.

Conventional fertiliser spreaders can be used to distribute granulated wood ash as a fertiliser over plantations

LEAP Environmental Module & Data Base: Evaluating Environmental Impacts of Energy scenarios

D. Von Hippel

LEAP is an integrated software tool for the development and evaluation of energy scenarios. LEAP, developed by the Stockholm Environment Institute Boston Center (SEI-B), includes an En-vironmental Module and an Environmental Data Base (EDB). These programs, working together and with the other parts of LEAP, are used by energy planners to evaluate the environmental impacts of energy development scenarios. The EDB, developed with funding from LINEP and SEI, is designed to enable easy access to energy-related environmental loadings data from around the world. The EDB includes data for technologies as diverse as three stone cooking fires, ethanol production facilities, and utility-scale coal-fired power plants. In the environment program, planners choose which technologies in the EDB co-rrespond to technologies in use in their country, or enter their own environmental data. Once the links are made, LEAP can compute the direct environmental impacts of a given scenario, as well as the differences in impacts between any pair of scenarios. The outputs of the environmental module include data on direct pollutant emissions and impacts in the following categories:

- Air pollutant emissions, including pollutants important for both indoor and local air quality (nitrogen oxides, carbon monoxide, and particulate matter, for example); pollutants of regional concern (such as nitrogen and sulfur oxides, or acid gases; and emissions of greenhouse gases such as carbon dioxide, methane. and nitrous oxide.
- Water pollutant emissions such as nitrates, phosphates, chlorides, metals, and suspended solids.
- Solid wastes, such as coal ash from industrial boilers, mining and oil-extraction wastes.
- Direct health and safety impacts, such as coal mining deaths and injuries.

The Environmental Module allows a wide variety of different reporting formats, so planners can custom-tailor the form of reports to suit their requirements. These options include a choice of which scenario years and emissions to show; a choice of output units; the option of focusing on impacts from a single energy sector, subsector, or end use, or on a particular energy transformation process; graphics options; and the ability to export the reports generated by LEAP to spread sheet and word

Mr. D. von Hippel, Stockholm Environmental Institute, Boston, U.S.A.

processing programs. It is also possible to assign monetary values to specific pollutant emissions, and thus incorporate the consideration of environmental impacts into cost-benefit analysis using the LEAP Environment and Evaluation programs.

The outputs of the Environmental Module of LEAP can be used directly to inform policy makers, or can be used as the input to models of specific environmental processes. Estimates of direct emissions and impacts, for example, can be used in country energy plans to help evaluate the suitability of different types of energy policy, including wood energy policies. A scenario that featured expanded use of wood fuels might show a reduction in greenhouse- and acid-gas emissions relative to a business-as-usual scenario including higher use of fossil fuels. Similarly, planners can evaluate the pollutant reductions expected from disseminating more efficient wood stoves. The pollutant loadings results from the Environmental Module can also be used in models of environmental processes such as the transport of air pollutants or the dispersal of water pollutants to evaluate whether an indicated rate of emissions poses an environmental threat.

The types of input data needed to use the Environmental Module of LEAP are those data needed to perform analyses of energy scenarios with LEAP, plus whatever local information on en-vironmental impacts is available. Information needed to create and evaluate energy scenarios in LEAP includes information on use of energy by fuel and by sector, on the transformations of energy forms (for example, fuelwood into charcoal), and on the inventory and yield of wood. It is important to remember that LEAP can be used to generate scenarios for a geographic region of any size, or for all or only part of an energy system. Planners specifically interested in wood energy can, for example, focus principally on forest-derived fuels or on the domestic sector. I n addition to energy data, the planner must also have a sense of the types of devices (for example, the types of charcoal kilns and wood stoves) in use in the area under study, so that appropriate links can be made with data in EDB. It is also desirable to have environmental data, for example air pollutant emission factors, that have been measured in the area understudy. These data, when available, can be added to the EDB by the user. In the frequent instances when country-specific environmental data are not available, appropriate international data from EDB can be used.

Familiarisation with LEAP is part of the training workshops organised by RWEDP. Currently RWEDP is making arrangements to make LEAP software and documentation available to Focal Points in member countries. Readers interested in learning more about environ mental analysis using LEAP and the EDB are encouraged to obtain a recent SEI-B document A Guide to Environ-mental Analysis for Energy Planners, prepared by Michael Latzarusand David Von Hippel. SEI-B can be contacted directly at Stockholm Environment Institute, Boston Center, Tellus Institute, 1 1 Arlington Street, Boston MA 02116, USA.

Publications

The Charcoal Dilemma: Finding a Sustainable Solution for Brazilian Industry

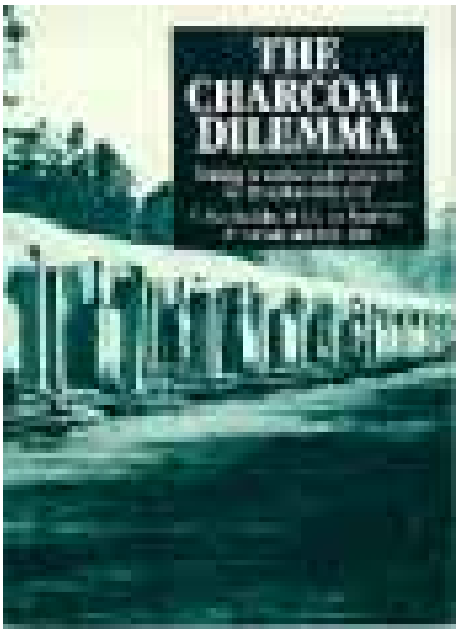
Brazil is the world's largest producer and consumer of industrial charcoal, but the charcoal-basedpig-iron and steel industry is at a crossroads. It faces serious socioeconomic, environmental and financial pressures to change and innovate - a painful adjustment to falling demand, over capacity, greater competition with coke, and stricter environmental control.

The majorissue is whether Brazil should us echeap, imported coke which causes pollution both locally and globally, or should continue, or even expand, charcoal production which is the more acceptable option from a social and environmental perspective.

There are important lessons to be learned from this Brazilian experience, from fo-rest management to industrial produc-tion and use of charcoal. Brazil's experiences are of interest to many other charcoal-producing countdes, particularly as an example of natural resource use and management, given its many socioeconomic and environmen-tal ramifications.

This book examines the history of charcoal production and its chief industrial applications in Brazil: pig-iron and steel making. It compares charcoal with coke as a thermal and reducing agent, and it considers the main charcoal production areas, raw materials, sustainable forestry and plantation practices, charcoal-making technology, production costs, use of by-products and socio-economic factors, and examines future prospects. It argues for economic and environmental sus-tainability as the means to ensure the future of the charcoal and charcoal-based pig-iron and steel industry.

This book is published by Intermediate Technology Publications, 103/105 Southampton Row, LondonWC1 B4HH, UK, ISBN 1 85339 322 3.



Forest For Life: The WWF/IUCN Forest Policy Book

This short book is a publication of the WWF-UK, with joint copy right of WWF International and IUCN, February 1996. The introduction states that forests, despite their large scale conversion to agriculture, rangelands and desert, still cover 35 per cent of the world's land area. The quality of the remaining forests, which is the store house for a vast quantity of biodiversity (i.e., species, genetic material, and ecological processes, all inclusive) and provide numerous products and services to the human society, is being rapidly depleted in recent years. And human activity has been labeled as the root cause of continuing forest degradation. The net area loss of tropical forests have been matched with the loss in quality of many temperate and boreal forests. Loss of forest quality is also presented as an issue in the tropical region. Therefore, both WWF and IUCN, by recognizing the critical importance of halting and reversing the cycle of forest destruction in the world, have assigned specific priorities to forest conservation. The former made forests as one of its three important biomes (the other two being oceans and freshwater ecosystems), and the latter is involved in a comprehensive array of forest initiatives and projects .

In this context, the book summarizes a joint position of both the agencies, in terms of forest problems and appropriate responses. It presents the problem of deforestation and loss of forest quality in different continents by the aid of multi-colored maps, identifies hotspots at the country and/or continent level, together with their annual rate of deforestation. It categorically states that loss of forest quality is equally important also from social and environmental point of view. And, among main causes of deforesta-tion and forest quality loss, badly manag-ed industrial forestry operations; pollution damage; induced pests and diseases; fuelwood collection; over-grazing; recre-ational pressures; and changes in fire incidence have been included in its listed. The book includes numerous attractive pictures, sketches, list of related publications from WWF and IUCN, a glossary, notes and references, etc.

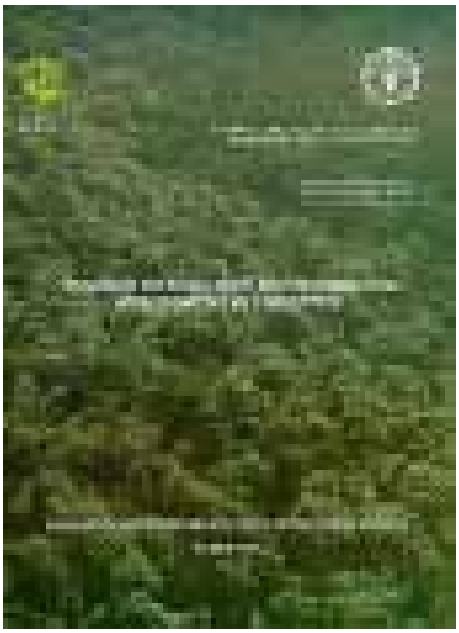
Among underlying causes of forest loss and degradation are included the issue of consumption, international debt, trade and development pressure, poverty, population, land tenure, and social (including gender) relations. These issues represent the diverse situations/positions of the countries that belong to the developing as well as developed world. The book tries to identify further, the immediate causes of forest quality loss and degradation, which directly contribute to the loss of bio-diversity on an un-precedented scale. And in its list includes four main causes: (a) pressure from human settlement including agriculture, fuelwood collection, etc. (b) operations of the timber trade, logging and inten-sification of forest management (c) the impact of other industrial sectors, such as agribusiness, mineral mining, etc. (d) atmospheric pollution. Certainly, if fuel-wood collection in a fragile ecosystem and/or the unsustainable use of existing forests for woodfuel production for in-dustries/ commercial activities and urban households and institutions given free rein deforestation and forest quality loss could easily result. But most recent studies reveal that fuelwood collection by a vast majority of the rural population for household use in most developing coun-tries can not be blamed as a root cause of deforestation or forest quality loss. Please refer to page 15 for more details.

This book is published by WWF Internation, Avenue du Mont-Blanc, CH-1196 Gland, Switzerland, Tel: +41 22 364 91 11, Fax: +41 22 364 42 38

Training Manual for Environmental Assessment in Forestry

The Food and Agriculture Organisation (FAO) of the United Nations, Bangkok under its regional project 'Forestry Planning and Policy Assistance in Asia and the Pacific'(GCP/RAS/139/JPN), published this document in May 1996, as Field Document 8/1996. The manual was written by Duncan Knowler and Jon Lovett of the Department of Environ-mental Economics and Environmental Manage-ment, University of York, Heslington, U.K.

The manual categorically points out the deficiencies in environmental manage-ment at the threshold of the 21st century, from its original rationale of controlling waste and toxic residues for the shake of protecting human health to its new priority of avoiding the exhaustion of Earth's natural resources and destroying the life-support systems, and its guest for environmentally sustainable develop-ment. The aim of this manual is to help forestry organisations institutionalise environmental assessment practices while pursuing activities in the forestry sector. The manual has been published with support from the Danish Coopera-tion for Environment and Development (DANCED).



In the background to environmental assessment in forestry, three important areas of concern are identified, namely ecology, biodiversity, and the policy and institutional context of the countries in Asia. It presents an overview of the detailed step by step process of environmental assessment applicable in the forestry sector. The basic concepts of screening and preliminary environ-mental assessment in forestry are explained, and the application of a detailed environmental assessment is highlighted in relation to its application in forest protection activities, natural forest management, logging and forest conservation, plantation forests, forest industries, and forest policies, together with the concept of mitigation and monitoring.

Economic analysis and environmental assessment are presented from both financial and economic perspectives, with illustrations of various economic appraisal approaches and their pitfalls. The importance of social issues in environmental assessment in forestry is also recognised and a technique for social assessment is introduced. Besides listing a number of relevant publications on the subject as sources of information and for further reading, it also provides sample checklists of the World Bank, some valuation techniques for environmental as-sessment of forest projects used by the International In-stitute for Environment and Development (IIED) and a matrix of benefit estimation techniques by environmental sector in four sets of appendices. For valuing Asian forests, a number of case studies have been presented: Thailand and Sri Lanka for forests protection; Indonesia and Fiji for natural forest management; the Philippines and Indonesia for logging and forest conservation; and Nepal for plantation forestry and afforestation.

This manual is published by Forestry Planning and Policy Assistance in Asia and the Pacific Region (GCP/RAS/1 37/ JPN), FAO/RAP, Bangkok, Thailand.

News and Notes

International Allelopathy Society

In response to our brief note on "Allelopathy", in the March 1996 issue of the Wood Energy Newsletter, Vol. 11 No. 1, the Department of Agronomy, College of Agriculture, of the CCS Haryana Agricultural University, has acknowledged us for highlighting this important issue of agricultural research. We have also been informed that since 1990 the alleopathy scientists has established Indian Society of Allelopathy and organized two conferences to-date. The third conference is planned in 1997. we are also pleased to announce that in 1994 an International Allelopathy Society (IAS) has been established with its headquarters in USA. The IAS has a plan to hold its first international conference in September 1996.

Individuals/institutions interested to learn more about publications and activities in this important area could write to Prof. S. S. Narwal at the Haryana Agricultural University, Hisar - 125 004, Haryana, India.

1996 2od Regional Training Programme on Wood Energy Planning

The 2nd Regional Training Prograrnm on Wood Energy Planning was implemented in cooperation with the Asian institute of Technology(AIT), in particular its Energy Planning Central Consultant Team (EPCCT), from 27 August to 13 September 1996 at Rangsit, Thailand. The course drew 36 participants from 16 countries, whereas some 20 experts from the region contributed to the preparation and/or conduct of the programme. The Course focussed on Data Collection, Assessment and Analysis for Wood Energy Planning, and Integrating Wood Energy in Decentralised Energy Planning.

In spite of the rapid economic growth and development of the countries in the region and the transformation of their socioeconomic structures, wood and other biomass fuels continue to be a major energy source. In fact, although the share of wood and biomass fuels in the energy mix is decreasing, the absolute values of wood and biomass fuel consumption are still increasing in all RWEDP member countries. This calls for broad-based wood energy strategies, policies and programmes. Formulating wood energy development programmes requires an integrated analysis of supply and demand for wood energy. Defining policies and strategies requires the incorporation of wood energy assessment and analysis in energy planning and in other relevant sec-toral planning such as in forestry and agriculture. This can be a difficult task for many countries.

It has been observed that data and information needed for the formulation of wood energy policies and strategies are not yet sufficient in most countries. Many countries avail of inadequate capacities to collect, organise and analyse wood energy data. Furthermore, even if wood energy data exist, few countries are capable of using such data to formulate policies, plan strategies, and identify projects and interventions for a broad-based wood energy development programme. Hence, there is a need to develop the skills of staff in wood energy planning institutions. The first step is to strengthen capabilities to generate, organise and assess wood energy data. Then, expertise to analyse and define wood energy policies and strategies using those data should be developed. Finally, abilities to identify and formulate projects and other forms of interventions based on stated wood energy policies and strategies should also be developed. The training programme in wood energy planning was designed to meet these objectives.

This was the second training programme on wood energy planning or-

ganised by RWEDP, and there will be three more in the coming years. The regional training programmes will becom plemented with national training programmes in order to further disseminate wood energy planning skills to more people within the countries. RWEDP will provide technical and financial support for one national training programme for ten of its member countries during the project period. After five regional and ten national training programmes, RWEDP expects to have helped to develop a critical mass of planners and policy analysts in the region who are aware of the potentials of wood energy, are capable of incorporating wood energy concerns into energy and other relevant sectoral planning and policy formulation, and are initiating activities in wood energy assessment and analysis in their own countries.

Contents of the training programme

The training programme consists of two courses. The first course is 'Data Collection, Assessment and Analysis for Wood Energy Planning'. It has the following two modules:

- 'Data Base for Wood Energy Development', which addresses topics on wood energy data collection and organisation; and

- 'Assessment and Analysis of Wood Energy for Energy Planning', which addresses the integration of wood energy into macro-level energy planning to be able to analyse and define broad-based wood energy policies and strategies.

The second course is 'Integrating Wood Energy in Decentralised Energy Planning'. It also consists of two modules as follows:

- 'Integrating Wood Energy in Area Based Decentralised Planning', which covers the application of decentra-lised planning approaches for identification and evaluation of wood energy projects and interventions; and

Asia has numerous industries based on biomass fuels

- 'Wood Energy Project Formulation and Implementation', which discusses the elements to be considered in formulating and implementing wood energy projects and interventions.

Participants' follow-up activities

Two participants from each of the 15 RWEDP member countries as well as Cambodia attended the training programme. They represented staff from agencies involved in wood energy programmes such as energy and forestry agencies. They are in a position to integrate and institutionalise wood energy concerns into relevant planning exercises in their agency, and can pass on the knowledge and skills to colleagues and junior staff. Participants were requested to bring background material on their national energy situation, wood energy statistics, recent reports on wood energy studies, and so on. This information was used in exercises and homework. During the training programme, the participants were encouraged and guided to identify which follow-up activities can be initiated in their respective countries, that will lead to the strengthening of national capabilities for wood energy planning. The first activity the participants may undertake is organising themselves into a Working Group together with the participants in the previous (1995) training programme, and others. This Working Group could be sanctioned by the RWEDP Focal Points and initiate the following activities:

- identify current energy and other planning activities (e.g. in forestry, agriculture, rural development, etc.) which are related to wood energy planning;

- assess what capabilities their country is lacking for wood energy planning;

- formulate an action plan for integrating wood energy into energy planning; and

- prepare a national training programme on wood energy planning.

A full report on the training programme will be available at RWEDP in due course.

Competition For Forward Thinkers!

What technological advances will have the greatest impact on forestry in Asia and the Pacific between now and 2010? What are the trends and prospects for plantation development in the coming years? Will deforestation finally be brought to a halt? Will consumers demand certification of forest products? What forest management systems will prevail in the next 15 years? What is the outlook for protected areas and endangered wildlife species? How will Asia-Pacific forest industries change over the next 15 years? How will the Uruguay Round Agreements of GATT affect forestry in Asia and the Pacific? What are the prospects for community-based forest management? What major policy changes will influence forestry in the coming years? How will forestry institutions change? What role will environmental groups play in shaping forest policy in the year 2010?

These are just a few of the thousands of questions forward-looking foresters are asking as we approach the next century. What insights do you have about the future of forestry in the region? How clear is your "crystal ball"?

The FAO Regional Office for Asia and the Pacific is sponsoring a competition for individuals with insights into the direction of forests and forestry in the Asia-Pacific region over the next 15 years. Interested individuals are invited to submit original papers describing the outlook and likely scenarios for any aspect of forestry in the Asia-Pacific region between now and the year 2010.

The competition is being organized in support of the ongoing Asia-Pacific Forestry Sector Outlook Study endorsed by the 16th Session of the Asia-Pacific Forestry Commission. The regional outlook study is being conducted to provide decision makers with current information, forecasts, projections, and insights into the potential directions forestry may take in the next 15 years. The study is a cooperative effort of governments, industry, NGOs, universities, and various international organizations in Asia and the Pacific.

The following guidelines apply to the competition:

- Papers may deal with any subject area of forests and forestry, but must fully describe the implications and importance of the subject topic for the Asia-Pacific region.
- Papers should clearly and logically describe the outlook and likely scenarios related to the selected topic between now and the year 2010.
- Authors are encouraged, but not required, to propose solutions to problems described in papers.
- All papers must be typed in English, and must not exceed 20 pages, including supporting tables, figures, etc.
- All papers must be the original work of the author(s) entering the competition. Secondary data and information presented in the papers must be appropriated credited to the original sources.
- The name, address, and telephone number (and fax or e-mail, if applicable) of each author must be clearly printed on the first page of each entry.
- No FAO staff, or family members of staff, or individuals currently working under special service agreements, author's contracts, or other contractual arrangements with FAO are eligible to enter the competition.
- Entries should be mailed to: Regional Forestry Officer, Attn: Outlook Contest, FAO Regional Office for Asia and the Pacific, 39 Phra Atit Road, Bangkok 10200, Thailand.
- All entries must be received by 31 October 1996.

Entries will be judged on the following: 1) analytical strength upon which outlook and scenarios are built; 2) clarity and logic used in presenting the outlook and scenarios described in the paper; and 3) originality and freshness used in approaching the subject topic.

The following prizes will be awarded:

First Prize: US$ 500 Second Prize: US$ 300 Third Prize: US$ 200

Winning papers will be published in future issues of Forest News of Tigerpaper.

Events

Event, Description (info)	Date and Venue
Agroforestry for Sustainable Development The course covers basic principles, approaches/policies, methods, techniques in agroforestry and the design, implementation, monitoring and evaluation of agroforestry project. It includes enhancement of wood fuel productivity in agroforestry systems (Los Banos).	15 Oct–9 Dec 1996 Los Banos, The Philippines
Forestry Project Planning and Management The course covers concepts of integrated forestry/land use management; wood production; analysis of project proposals; planning methodologies; policy formulation and evaluation; project development; and methodology for project impact assessment and project benefit monitoring systems, donor sourcing and coordination with funding institutions (Los Banos)	5 Nov–16 Nov 1996 Los Banos, The Philippines
Integrated Forestry Planning - Community Needs and Sustainable Management Core topics to be covered in this course will include: 1) Project identification and design; 2) Issues in sustainable forest management and land restoration; 3) Computers in forestry planning and management; 4) Community forestry, participatory development and extension techniques; 5) Management of forestry projects; and 6) Monitoring and evaluation (ANUTECH).	11 Nov–20 Dec 1996 Canberra, Australia
Forest-Based Industries and the Environment The course tackles various environmental problems attendant to the utilisation of wood to meet man's requirements for modern forest products including fuelwood. Participants will gain a better understanding of the consequences of waste and pollution generated and how these could be abated. The course will provide participants with strategies and tools to address wastes and pollution problems in the forest-based industries. The field trips and laboratory exercises will provide them with adequate experience in the scientific approach to managing, mitigating and/or solving the wastes and pollution problems that arise from forest products manufacturing operations and woodfuel consumption (Los Banos).	12 Nov–19 Dec 1996 Los Banos, The Philippines
Food Industry Technology and Energy Applications The main objectives of this conference are to provide a forum for participants from Thailand, ASEAN and other countries to discuss and share their experiences in various as-	13–15 Nov 1996 Bangkok, Thailand

ANUTECH: Forestry & Environment Division, ANUTECH Pty Ltd, GPO Box 4, Canberra ACT 2601, Australia, ☎ 616249-4713/5881, 🖹 +616-249-5875/257-1433, 💻 David.Breft@aplemail.anu.edu.au

KMITT: Prof. Dr. Somchart Soponronnarit, International Conference on Food Industry Technology and Energy Applications, c/o School of Energy Applications, King Mongkut's Institute of Technology Thonburi, Bangrmod, Rasburana, Bangkok 10140**,** Thailand, ☎ +66-2-4270162, 🖹+66-2-4279062/4279633.

Los Banos: The Director, Institute of Forest Conservation, College of Forestry, U.P. Los Banos, P.O. Box 434, 4031 College, Laguna Philippines, ☎ +63-94-2268/3340/2736, 🖹 +63-94-3340/3206, 💻 trv@mudspring.uplb.edu.ph.

Readers' Contributions

Readers may have noticed that recent issues of Wood Energy News focussed on special themes. So far the themes have been: (1) gender and wood energy; (2) modern wood energy; (3) wood energy planning; (4) wood energy resources; (5) wood energy data; and (6) wood energy environment. The next issue will focus on gender, wood energy and health. We welcome suggestions, contributions and reactions from our readers, which may or may not be linked to the current theme.

Residues for fuel or fertilizer? The optimal balance must be researched.