Executive Summary

i. Although China’s economy is undergoing a rapid restructuring, characterized in general terms by a growing reliance upon market forces, the prices of many natural resources still tend to be unrelated to the true economic, social and environmental costs resulting from their production and consumption. Generally, prices of key resources such as land, energy, and water, and charges for using the natural environment for the disposal of waste material are extremely low and some times zero. Socially damaging in the long term, such a pricing policy results in wasteful and economically inefficient as well as environmentally unsound production and consumption patterns.

ii. Allowing prices to be determined by the free interplay of supply and demand is one possible means of achieving a more efficient economy, but it is by no means likely to be sufficient. Markets fail in many ways, some of them being particularly relevant for the environment. Perhaps the most common example is the presence of externalities, such as the uncompensated damage caused to downstream water users by discharges of industrial or municipal wastes into a river. Another is the possible divergence between market and social values of resources that may be exhausted at some date in the future.

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iii. Adjustment of market prices to reflect social costs requires government intervention. This may take a number of forms, including taxes levied on polluters and on logging or mining operations, as well as charges for the consumption of energy or water. Whatever the mechanism actually used, the same set of principles should be used in estimating the true cost to society of using the natural resource in question, and in deriving the appropriate pricing rules. In practice however, whereas market failure may indicate the need for compensatory action on the part of government, there are many cases in which government policy actually exacerbates the original problem. Governments frequently provide perverse incentives which -typically inadvertently - actually encourage both economically inefficient and environmentally damaging behavior. For example, energy and water consumption, and mining and logging concessions are frequently subsidized in both industrial and developing countries. Environmental problems therefore result both from market failure as well as from policy failure.

iv. In light of the above, the Working Group on Resource Accounting and Pricing Policy has been established to conduct research on current natural resource pricing in China, and to recommend policy reforms which meet the multiple objectives of economic efficiency, social equity, and sustainability. In the first instance, three key natural resources, namely water, coal, and forest products, have been selected for in-depth study. These resources have been selected, not only because they are themselves important, but also because, between them, they cover a wide range of the conceptual and empirical issues encountered in applying the methodology for the general case.

v. Case studies for the three resources are being conducted in two stages. The first stage is to estimate the true cost to society of producing, supplying, and/or consuming the resource concerned. This cost may be defined more precisely as the marginal opportunity cost (MOC), which includes not simply the costs of production (MPC), but also the costs of resource depletion, known as “user costs” (M UC), as well as uncompensated damage created elsewhere, notably in the form of environmental degradation (MEC). In the case of tradeable commodities such
as coal or timber, MOC would equal the world market price if the latter exceeds \((MPC=MUC=MEC)\). In such a case, the commodity should be imported rather than produced domestically; on the other hand, if the marginal cost of producing the resource domestically is less than world market price, the resource should be used to satisfy domestic demand, and any surplus exported.

vi. In general, prices should equal MOC if resources are to be used when and where they are valued most highly. However, in practice, there can be expected to be many obstacles, of a economic, technical, social, and, not least, a political nature, to the introduction of such a pricing policy. The second part of the case studies therefore address obstacles to the introduction of an MOC-based price, and propose a strategy for bringing about policy reform without major disruptions. This is particularly important in China, in which policy reform in any sector cannot be introduced efficiently in the absence of complementary reforms in other sectors.

vii. Although the case studies have yet to be completed, several conclusions can already be drawn from them, and appropriate recommendations made. First, they demonstrate that, despite data limitations, it is feasible to provide estimates of MOC that are operationally useful. Indeed, MOC is shown to be significantly different - and typically higher - than conventional measures of cost, Although estimates will always be approximate, the magnitude of the difference between MOC and conventional measures of cost suggests that we can have a good deal of confidence as to the direction that price reform should take.

viii. The studies clearly demonstrate the importance of location specific estimates. In the case of water, there are large regional variations in the availability and cost of water, MOC pricing, in which regional variations would be reflected, would tend to encourage large water-using industries to shift to where water supplies are cheapest. In the case of both timber and coal, the studies show that variations in quality, as well as the extent to which a given location is exploited, have major cost implications, with greater inaccessibility tending to off set other cost advantages.

ix. Useful recommendations emerge from the studies with regard to trade implications. A distinction is made between resources that are usually not tradeable, such as water, and those which are, such as certain qualities of coal and types of timber. The coal and timber studies both illustrate the conditions under which China should produce and export, and where it should import. During the current transition period, transportation and other constraints may be obstacles to an optimal trade policy, but the calculations should provide some guidance for a longer term strategy.

tax. The studies also show that there is large scope for price reform in China that can satisfy social and economic, as well as environmental objectives. That is, there are many "no regrets" opportunities. As the market mechanism starts to work more efficiently, such opportunities will become fewer. However, during the transition period, moving from an administered system in which natural resources are in many cases priced at even less than financial cost, price reform, by discouraging wasteful use of resources, will yield economic, financial, social and environmental benefits.

xi. Obstacles to immediate implementation of an ideal pricing policy are apparent in each of the cases. Common to all of them is the Problem that price reform in any sector of the economy may not be justified - or indeed may be unworkable - if non-optimal conditions, including inadequate pricing, prevail elsewhere. This is illustrated in the case of water where farmers would not respond in an economically efficient manner to MOC pricing because the prices they receive for their own outputs are subject to controls. In the case of coal, a constraint to optimal pricing may be non-optimal pricing for a competitor such as natural gas, or a complement, such as transportation. For all three sectors, industrial users may not react in an optimal way to pricing based upon the full costs of supply if they face other constraints, such as inadequate access to credit, or have to meet unprofitable mandated production quotas.

xii. It should also be noted that the need for parallel reforms do not only apply to strictly economic policies; a wide variety of institutional and legal reforms are also required to create the conditions under which price reform can be effective. In practice, therefore, a gradual - and interdisciplinary - approach may be required, with reforms in any one of the sectors being adjusted as necessary to reflect overall trends in market liberalization in China. Such a policy might involve gradual - and possibly pre-announced - increases in utility charges, prices of natural resources, or pollution fees.

xiii. The studies are relevant in considering the case for reforming the system of national accounts. Conventionally, resource depletion and environmental protection measures tend to be handled inadequately in national income accounts, but reform will require a better understanding of the environmental costs and benefits of sector level activities than currently exists. However, uncertainties with respect to valuation, and to linkages between physical and economic variables probably mean that integration of environment into national income accounts will not be appropriate. On the other hand, development of a parallel system of satellite accounts should certainly be a priority. Such accounts should
emphasize those environmental indicators that are crucial for economic planning, and be designed to provide "early warning" guidance where environmental degradation may threaten economic development objectives.

xiv. Estimation of the MOC of utilizing key resources in China constitutes a necessary building block for developing economic policies which take adequate account of the environment, creating a more relevant system of national accounts being but one element of this process. The pricing studies provide some of the parameters required if environmental accounting is to be a relevant policy tool, but more importantly, they are also required if environmental considerations are to be usefully integrated into macroeconomic modelling. The present exercise can therefore be seen as the first in a series of steps to improve the way in which the environment becomes integrated into economic policy making. Knowledge of the MOC, as a benchmark by which the subsequent policy reform measures should be judged, is therefore of critical importance.

A. Introduction

1. China is currently experiencing rapid economic growth and massive structural change in its economy, fueled in part by a rapid shift from an administered system to one which is becoming increasingly reliant upon market forces. Despite the rapidity of change, the prices of natural resources still tend to be unrelated to the true economic, social and environmental costs resulting from their production and consumption. Generally, prices of key natural resources such as land, energy, and water, and charges for using the natural environment for the disposal of waste material are extremely low and sometimes zero. Socially damaging in the long term, such a pricing policy results in wasteful and economically inefficient as well as environmentally unsound production and consumption patterns.

2. Allowing prices to be determined by the free interplay of supply and demand is one possible means of achieving a more efficient economy, but it is by no means sufficient to sustain it. Market failure may be exhibited in various ways, some of which are particularly relevant for the environment. One of these is the presence of externalities, such as the uncompensated damage caused to downstream water users by discharges of industrial or municipal wastes into a river. Another is the possible divergence between market and social values of resources that may be exhausted at some date in the future.

3. Adjustment of market prices to reflect social costs requires government intervention. This may take a number of forms, including taxes levied on polluters and on logging or mining operations, as well as charges for the consumption of energy or water. Whatever the mechanism actually used, the same set of principles should be used in estimating the true cost to society of using the natural resource in question, and in deriving the appropriate pricing rules. In practice however, whereas market failure may indicate the need for compensatory action on the part of government, the reverse often occurs. Governments frequently provide perverse incentives which - typically inadvertently - actually encourage environmentally damaging behavior. For example, energy and water consumption, and mining and logging concessions are frequently subsidized in both industrial and developing countries. Environmental problems therefore result both from market failure as well as from policy failure.

4. Given this background, the Working Group on Resource Accounting and pricing Policies has been established to conduct research on current natural resource pricing in China, and to recommend policy reforms which meet the multiple objectives of economic efficiency, social equity, and sustainability. In the first instance, three key natural resources, namely water, coal, and forest products, have been selected for in-depth study. These resources have been selected, not only because they are themselves important, but also because, between them, they cover a wide range of the conceptual and empirical issues encountered in applying the methodology for the general case.

5. The case studies are being conducted in two stages. The first stage is to estimate the true cost to society of producing, supplying, and/or consuming the resources concerned. This cost would, ideally, be the price that should be charged if resources are to be used when and where they are valued most highly. However, in practice, there can be expected to be many obstacles, of a economic, technical, social, and, not least, a political nature, to the introduction of such a pricing policy. The aim of the second part of the analysis is therefore to address obstacles to the introduction of the ideal price and to propose a strategy for bringing about policy reform without major disruptions. This is particularly important in China, in which policy reform in any sector cannot be introduced efficiently in the absence of complementary reforms in other sectors.

B. Resource Pricing Methodology

6. An important benchmark by which pricing policies may be judged is the contribution those policies make toward economic efficiency. An efficient policy may be defined roughly as one which maximizes the net benefits accruing to a country or community from a given course of action, with no consideration paid to the way in which those benefits are distributed throughout the population. (Income transfers may then be used to achieve the society's distributional objectives.) A proposition stemming from this definition is that the price of any service or commodity...
should be equated to the cost of producing an additional unit of it, or in other words, to its marginal or incremental cost. If consumers are willing to pay a price that exceeds marginal cost, it means that they place a value on additional consumption that is at least as great as the cost to the rest of society of producing it, and output and consumption should therefore be expanded when system capacity is reached. If, on the other hand, the market clearing price is less than marginal cost, it can be inferred that there is oversupply of the commodity, the cost of additional output exceeding the benefits.

7. Whether or not a policy is thought to contribute toward economic efficiency will depend upon the community whose benefits the analyst is interested in maximizing. Having determined the relevant target group, the marginal cost calculation requires a distinction to be made between purely accounting costs and the true (or economic) costs incurred by that group. Accounting costs, which might include repayment of past loans, might simply represent a transfer of income within the community. The marginal cost approach is essentially forward-looking; it only considers actual resource use, and ignores "sunk costs", for they represent no net loss, or opportunity cost, to society as a whole. On the other hand, the resources employed in the construction and operation of a particular project represent, at the time of employment, real costs in terms of opportunities forgone elsewhere.

8. In fact, the concept of opportunity cost is of central importance, and there are several ways in which adjustments to market prices should be made where they diverge from opportunity costs. An example is where wage rates, due perhaps to social policy, exceed the productivity of labor. If labor used in a particular project would otherwise be unemployed, the opportunity cost - also known as the shadow price - would be close to zero. Similarly, the opportunity cost of consuming a resource such as timber, coal or oil, that could otherwise be exported, is the revenue that could be obtained by exporting it. Where necessary, shadow prices for foreign exchange and capital should also be used, and adjustment made for transfer items, such as indirect taxes and subsidies.

-9. Another implication of the emphasis upon opportunity costs is that for resource allocation purposes, cost estimates should be expressed in constant prices (i.e. those prevailing in the base year). Nominal prices, which reflect the rate of inflation, should only be considered at the implementation stage, in determining the impact of alternative pricing strategies on the financial performance of the agency concerned. It follows that discount rates used to determine the present worth equivalent of alternative cost streams should also reflect the real opportunity cost of capital to the Chinese economy. To reflect the uncertainties involved, the three case studies provide cost estimates at various discount rates ranging between 5% and 15%

C. The concept of MOC

10. In a perfectly functioning market system, prices would approximate marginal cost, i.e. the true cost to society of producing an additional unit of output. In practice, market distortions drive a wedge between prices and social opportunity costs by, for instance, ignoring environmental costs. Explicit government intervention to correct for market failure may be in the form of public operation or regulation of services such as water supply, or specific interventions to remedy the consequences of market failure, such as the use of pollution taxes or regulations. As noted, in such circumstances, marginal costs should be estimated and used as a basis for pricing in order to encourage efficient use of the service or commodity concerned.

11. We now look more closely at the concept of marginal cost, and define it more precisely as marginal opportunity cost (MOC). This concept implies that the costs of consuming resources are in effect the benefits that would otherwise have been achieved from alternative use of the resources employed. In practice, MOC may usefully be defined to include three distinct elements, namely,

marginal production (or private) cost (MPC);
marginal user (or depletion) cost (MUC); and
marginal external cost (of which a major element will be environmental damage) (MEC).

MOC is the sum of the three elements, i.e.

\[ \text{MOC} = (\text{MPC} + \text{MUC} + \text{MEC}) \]

12. Marginal Production Cost. This includes the costs directly incurred by the agency concerned. For example, in the case of water supply, MPC consists of those investment and operating costs that are a function of water consumption. These include the cost of dams, water supply
intakes, transmission mains and treatment works, and some distribution costs. In the case of certain resources such as coal or forests, MPC is defined here to include both the cost of exploitation or extraction of the resource as well as the cost of transportation to the point of export or domestic consumption. This distinction becomes particularly important where different agencies or companies have responsibility for production and transportation.

13. As in the case of the other elements of MOC, production costs should be defined in economic terms. Overall costs to society as a whole should be determined. The financial costs of the enterprise should therefore be adjusted to compensate for general market distortions, with shadow pricing being used as necessary. Costs should also be adjusted if inputs (labor, capital or energy) used are subsidized by the government. To obtain the true MPC, an amount equal to the subsidy should be added. If taxes are included in private production cost, they should be deducted since they do not represent a real cost, but only a transfer item.

14. Marginal User cost. consumption of non-renewable resources may eventually require a substitute to be found for them at some future date. For example, consuming a tonne of coal now means that there will be one tonne less at some future date. The lost benefits due to future use forgone are known as the user cost, or depletion premium. In practice, estimation of MUC may often be difficult, as it may involve prediction of events many years hence. (This approach to the estimation of MUC is referred to as the "dynamic algorithm"). It will be shown below that there is sometimes ambiguity in definitions. For example, in certain cases, MUC is conceptually similar to MPC. The distinction is however required when irreversible effects take place; even when they do not, the distinction is useful for pricing and planning purposes. It should also be noted that depletion costs exist because of market imperfections. However if property rights are clearly defined, and if social and private discount rates coincide, MUC will be fully taken into account by the resource user. Thus where there is free trade, the difference between domestic costs of production and the world market price may under certain assumptions be an adequate approximation to MUC. (This approach is referred to as the "static algorithm").

15. Marginal External Cost. Externalities may arise at the production and transportation stage (MEC1) and/or consumption stage (MEC2), and they may be either positive or negative. Many of the most important external costs are environmental in nature, and these are the main focus of the MEC calculation in the case studies. For example, coal mining and logging are likely to damage local ecosystems; water projects are also likely to do so, but may also generate flood control benefits. Water consumption might yield health benefits, not simply to the actual users, but also to others. On the other hand, discharges of wastewater create negative externalities. It is important to note that to the extent that environmental damages are recovered by government, for example, through the use of pollution taxes or regulations, MEC (or at least part of it) will already be incorporated in MPC. Other external effects may not be categorized as environmental; for example, overpumping of groundwater may impose additional costs on the water authority, which will then become a component of MPC. The presence of market failure, which gives rise to the need to estimate environmental damages in the first place, is itself a reason why innovative methods must often be devised to impute reasonable values for MEC. Generally, however, the approaches used to evaluate MEC fall into three categories, namely, the direct market approach; the surrogate market approach; and contingent Valuation.

16. Tradeables. Where the resource concerned (such as coal or timber, or in rare instances, water) is tradeable in international markets, MOC may be defined more broadly as follows:

\[ \text{MOC} = (\text{MPC} + \text{MUC} + \text{MEC}) \]

or the border price, whichever is the greater.

17. For example, as long as the marginal cost of producing the resource domestically (MPC+MUC+MEC1) is less than the f.o.b. export price, the resource should be used to satisfy domestic demand (at the border price), and any surplus exported. Domestic prices should equal the export price (adjusted for the difference between the domestic transportation cost of exports and transportation cost related to domestic consumption), because the true cost (opportunity cost) of domestic consumption is the amount that a foreign buyer would be willing to pay for it. Where there is free trade, MUC is roughly the difference between the world price and the sum of MPC and MEC. Efficient pricing can be facilitated by the imposition of environmental taxes based upon MEC and royalties equated to MUC.

18. On the other hand, output quantities for which (MPC+MUC+MEC1) is greater than the c.i.f. import price should not be produced domestically at all, but imported instead. If for some reason the government does not wish to be dependent upon a foreign supplier, and insists upon domestic production, the local price should in this case be (MPC + MUC + MEC1) plus some means of assigning responsibility for MEC2, as outlined in the previous paragraph. As a long term policy, domestic production for which MOC is greater than c.i.f. import prices is untenable.
under free trade conditions; it can only be effected through production subsidies or import tariffs which reintroduce a wedge between private and social opportunity costs.

19. In addition to the foregoing, whether using domestically produced or imported coal, domestic consumers should bear the costs of any consumption externalities (MEC2). This may be achieved by several mechanisms already in place in China, including the pollution levy system and regulatory methods, or by somewhat blunter instruments, such as the inclusion of MEC2 in the price of coal.

20. Application of MOC pricing as described above is in practice confronted by a number of problems. A number of conceptual issues arise in the actual estimation of MOC, while implementation also faces a series of conceptual and practical obstacles. The remainder of this paper illustrates these issues with regard to municipal water supply, coal, and forest resources. The research is still on-going, and final quantitative results from the case studies still have to be determined. Although each case study contains a comprehensive treatment of MOC estimation and implementation strategies, they differ in the emphasis given to various aspects. This is reflected in the present paper; for example, the water case study emphasizes the MPC calculation, while the coal and forest case studies devote more attention to MUC and MEC. The coal and forest studies also give much consideration to trade implications of MOC pricing.

D. Conclusions and Recommendations

21. Although the case studies have yet to be completed, several conclusions can already be drawn from them, and appropriate recommendations made. first, they demonstrate that, despite data limitations, it is feasible to provide estimates of MOC that are operationally useful. Indeed, MOC is shown to be significantly different - and typically higher - than conventional measures of cost. The importance of the different components of MOC varies from case to case, with, for example MOC being dominant for water supply, MPC and MEC2 being dominant for most coal resources; and MUC and MEC1 being most important for timber production. Although estimates will always be approximate, the magnitude of the difference between MOC and strictly financial measures of expenditure suggests that we can have a good deal of confidence as to the direction that price reform should take.

22. The studies clearly demonstrate the importance of location-specific estimates. In the case of water, there are large regional variations in the availability and cost of water with, roughly, the north of China being water-short and the south water-abundant. Comparison of pricing policies for Beijing and Shanghai is instructive-Given the objective of achieving efficient (non-wasteful) use of water, future water demand estimates and least cost investment programs should be ascertained. Water prices should then be set equal to MOC. However, in the case of Beijing, where water is in short supply and expensive, prices for non-agricultural use are probably less than between one sixth and one tenth of what they should be (with agricultural use being almost free of charge). There are potentially huge savings to be achieved from price reform. In Shanghai on the other hand, where costs are low and not rising rapidly, prices roughly approximate the economic cost of supply. MOC pricing, in which regional variations would be reflected, would tend to encourage large water-using industries to shift to where water supplies are cheapest. Improved pricing would also encourage careful consideration of the regional water demands of agriculture, and the scope for meeting future food requirements by means of less water-intensive land use in water-scarce regions. Even in the Shanghai region, water supply costs are rising, in large part due to increased pollution of water sources. The strategy for achieving a cost-effective water supply programme will therefore include charges and regulations levied on industrial and other sources of water pollution.

23. With regard to coal, the Da Tong mining operation is used as an illustrative example, but a number of general principles and recommendations emerge from the analysis. It is recognized that there have in the past few years been substantial increases in energy prices in China, and that our information is out of date. However, based upon 1991 data, coal was significantly underpriced, being only about 70 percent of the production, environmental, and depletion costs involved in its production, and only third of the international price, which in many cases is the true cost to the economy of coal production and consumption. MPC is the dominant element of the MOC of coal in China, and MPC is rising despite improvements in technology as less and less accessible sources become exploited. On the other hand, in view of the abundance of coal reserves in China, depletion costs are insignificant. An important part of the needed price reform was, and continues to be, to adjust freight rates so that they more accurately reflect the costs of transporting coal from different locations. Much also needs to be done to ensure that the environmental costs of coal consumption are factored into coal pricing either by blunt instruments such as sulfur tax or in the form of emission taxes. Various recommendations follow from the analysis regarding establishment of profit-oriented firms for coal exploration, and creation of a regulatory framework which encourages a competitive structure for the coal mining industry.

24. Useful recommendations emerge from the studies with regard to trade implications. A distinction is made between resources that are
usually not tradeable, such as water, and those which are, such as certain qualities of coal and types of timber. The coal and timber studies both illustrate the conditions under which China should produce and export, i.e. where border prices are greater than (MPC+MUC+MEC); and where it should import, i.e. where the reverse is the case. During the transition period, transportation and other constraints may be obstacles to an optimal trade policy, but the calculations should provide some guidance for a longer term strategy.

25. Particular attention is paid to this topic in the forestry study, in which Baishan City forest area, Jilin Province, is used as an illustrative example. More data on the Chinese forestry situation has still to be made available, the lack of the required information necessitating, to some extent, rough approximations including the use of international evidence. However, a number of general observations and recommendations can made, including the importance of environmental costs, the growing significance over time of depletion costs, and the fall over time in marginal production costs. The latter is explained by a reduction over time in timber output; overcutting is currently well in excess of a sustainable rate. Domestic costs of timber production will become higher and higher relative to world market prices, and growing reliance upon imports will be required. The study shows that the correct combination of domestic production and imports requires price reform for timber in China which can be achieved by means of royalties and environmental taxes.

26. In general the studies confirm that there is large scope for price reform in China that can satisfy social and economic, as well as environmental objectives. That is, there are many "no regrets" opportunities. As the market mechanism starts to work more efficiently, such opportunities will become fewer, but during the present transition period, moving from an administered system in which natural resources are in many cases priced at even less than financial cost, price reform, by discouraging wasteful use of resources, will yield economic, financial, social and environmental benefits.

27. In each of the case studies, however, obstacles to immediate price reform are apparent. These take several forms, one of which is a pervasive problem: price reform in any sector of the economy may not be justified - or indeed may be unworkable - if non-optimal conditions, including inadequate pricing, prevail elsewhere. This is illustrated in the case of water where farmers would not respond in an economically efficient manner to MOC pricing because the prices they receive for their own outputs are subject to controls. In the case of coal, a constraint to optimal pricing may be non-optimal pricing for a competitor such as natural gas, or a complement, such as transportation. For all three sectors, industrial users may not react in an optimal way to pricing based upon the full costs of supply if they face other constraints, such as inadequate access to credit, or have to meet unprofitable mandated production quotas. The argument that price reform is inflationary should be critically assessed; clearly, prices that are systematically below supply costs encourage wasteful and excessive use, which itself contributes to inflationary pressure.

28. It should also be noted that the need for parallel reforms do not only apply to strictly economic policies; a wide variety of institutional and legal reforms are also required to create the conditions under which price reform can be effective. In practice, therefore, a gradual - and interdisciplinary - approach may be required, with reforms in any one of the sectors being adjusted as necessary to reflect overall trends in market liberalization in China. Such a policy might involve gradual - and possibly pre-announced - increases in utility charges, prices of natural resources, or pollution fees.

29. While generic lessons emerge from the three case studies currently underway, the work to date also shows that the details of MOC pricing and issues of implementation vary considerably from case to case. A number of case studies, addressing a variety of other natural resources are therefore planned. Another topic to be addressed shortly is that of urban transportation. Following the same general principles set out above, the MOC of various forms of urban transport in China will be addressed. Prima facie, the traffic problems already being encountered in large Chinese cities (cost of constructing new roads, traffic congestion and pollution) suggest that implementation of a MOC-based pricing system in this area is of high priority.

30. These studies are relevant in considering the case for reforming the system of national accounts. Conventionally, resource depletion and environmental protection measures tend to be handled inadequately in national income accounts, but reform will require a better understanding of the environmental costs and benefits of sector level activities than currently exists. However, uncertainties with respect to valuation, and to linkages between physical and economic variables probably mean that integration of environment into national income accounts will not be appropriate. On the other hand, development of a parallel system of satellite accounts should certainly be a priority. Such accounts should emphasize those environmental indicators that are crucial for economic planning, and be designed to provide "early warning" guidance where environmental degradation may threaten economic development objectives.
31. Estimation of the MOC of utilizing key resources in China constitutes a necessary building block for developing economic policies which take adequate account of the environment, creating a more relevant system of national accounts being but one element of this process. The pricing studies provide some of the parameters required if environmental accounting is to be a relevant policy tool, but more importantly, they are also required if environmental considerations are to be usefully integrated into macroeconomic modelling. The present exercise can therefore be seen as the first in a series of steps to improve the way in which the environment becomes integrated into economic policy making. Knowledge of the MOC, as a benchmark by which the subsequent policy reform measures should be judged, is therefore of critical importance.