UNITED NATIONS UNIVERSITY

Foreign Ministry of Japan

Environment Ministry of Japan

Global Legislators Organization for a Balanced Environment

World Summit for Sustainable Development

International Eminent Persons Meeting on

Inter-linkages

Strategies for bridging problems and solutions to work towards sustainable development

Sustainable Development Framework

Strategies for Development

Yoginder K. Alagh

United Nations University Centre
3-4 September 2001

Sustainable Development Framework

Strategies for Development

Yoginder K. Alagh

Introduction

The Institute of Advanced Study of the United Nations University is conducting studies on sustainable development frameworks for large countries, in a long term perspective.

(See Fu-Chen Lo and T. Palinivel, 1999). A study for China is complete. (See Fu-Chen Lo and Yu-qing Xing,1999). The India study is a sequel (See Y.K.Alagh,2000). Indonesia (Iwan, 2000) and possibly other countries are to follow. We show that these studies, done in some depth, bring out the unsustainable path that existing growth processes or Business As Usual Scenarios (BAU) spell out . Taking into account fairly liberal technological assumptions, carrying capacities give up. While the analysis is at the country level, the global implications are obvious, given the size of the countries involved and the rate at which they are growing.

Somewhat coincidentally, the policy aspect of these studies bring out the "interlinkage" issues in a compelling manner. Most of the pressing constraints on long term growth ("sustainable growth " ?), are organisational, technological and incentive and disincentive systems of an internal kind, requiring action at the local, regional, national and global levels. RIO and Agenda 21 had given a road map. Experience suggests that strategies of helping those who help themselves are exceptions rather than the rule. The replicability question is not a matter of exhortations. It simply wouldnt gather momentum on a global scale that way. It is a matter of studying experience and setting down operating rules of functioning of markets and systems such that economies move on preferred paths. It is the argument of this paper that sufficient insights have been gained to put virtuous cycles on explosive growth paths. The interconnected organisational and economic reform systems are, however, as yet not laid down and this in fact is the interlinkage question. The paper illustrates this with three problematiques; the land and water question, the issue of sustainable nonagricultural growth and the integration of new technologies with widespread growth. In each case experience based best practices are discussed, but the emphasis is on the results that follow, in terms of rules of replicability, in terms of organisational mechanisms, and economic incentive and disincentive systems. The nature of market and community initiatives of a sharply focussed kind that follow and the pricing and financing rules that emerge are our main objective.

Methodology

We build on the UNU/IAS country perspective studies and other related work. After describing the nature of challenges that arise, this note addresses selected issues on technology, investment and policy strategies for widespread growth of a kind which builds in poverty reduction, in the sense of significantly reducing food, energy and related income/employment gaps, in low income countries in the Asia-Pacific region. The methodology it follows is bifocal. It takes three case studies of success, the first agricultural growth in fragile agro-ecological regions, the second artisan based industrialisation linked with regional and global markets and the third a recent experiment at wiring villages with information technology to source knowledge in the growth process. The technology, income, food, and energy outcomes are described. At the second level, however our interest is in the organisational structures, human and related resource development strategies, market frameworks, incentive and disincentive mechanisms and pricing and macro requirements, for widespread replication, arising from these case studies.

The approach that we have is that micro and macro policies have to be harmonised for widespread growth of the poverty reducing kind to take place. This is discussed extensively, but not practised enough. The power of decentralised markets to facilitate such growth on a larger scale has to be enmeshed in strategic policy initiatives to energise it, as also resolve the inevitable problems that arise. Our broader perspectives are, for example discussed in Robert Wade's well cited paper on East Asia's economic success (World Politics, 1992), which interestingly begins and ends with a quote on strategic intervention, from a paper, in the ADB's Asian Development Review (Y. K. Alagh, 1989). Later in a contribution from Carnegie

Mellon, John M. Stopford, (Carnegie Bosch Institute Working Paper, 1997) has repeated the same quote, in order to emphasize that instead of sectoral intervention (picking out winners ?), the need now is a dynamic perspective on labour skills, innovation and developing the market places of the future. For broad based growth of the kind discussed in this paper we would add, policies for the development of markets, financing, information and communication infrastructure.

It is useful to begin the details of this exercise with the kind of problemetiques the sustainable development framework studies bring out. The " Business As Usual Scenarios " bring out unsustainable outcomes, which have obvious global outcomes, given the size of the countries involved (China. India, Indonesia). A summary look at some of the preliminary outcomes of the India study illustrate.

Projections for the Year 2020

POPULATION	*1330 million*
URBAN POPULATION	*Low : 465 million; High : 590 million*
SLUM POPULATION	*Low : 85 million; High : 130 million*
SOLID WASTE DISPOSAL	*100 to 110 million tonnes*
DEMAND FOR COAL FOR POWER GENERATION	*Low : 817 million tonnes; High : 2016 million tonnes*
CROPPING INTENSITY	*More than 1.5*
NET AREA SOWN	*Constant at 141 million hectares since the nineties*
IRRIGATION INTENSITY	*Around 1.75*
WATER SHORTAGE	*Around 10% to 25% between the years 2020/50*
NOISE LEVELS	*Twice the norms in trend forecast*
AIR POLLUTION	*Two to two and a half times the norms in trend forecast*

Source: Y.K.Alagh, UNU/IAS, 2000.

It has been argued that "The sharp breaks in many indicators and unmanageable problematiques emerging in major environmental concern areas is self-evident. Solid waste disposal levels of more than 100 million tonnes, slum population of around 100 million persons, acute water shortages and air and noise pollution of a severe kind, all manifest themselves. The serious environmental implications of burning poor quality coal are apparent underlining the critical energy situation in the country. The glaring magnitudes indicate the long-haul for improving the living standards in the country. This also brings into sharp focus the hazards of following an unbridled consumerist path both at the global and national levels." (Y.K.Alagh, UNU/IAS, 2000)

As far as linkages are concerned, two examples illustrate. The first is the two way relationship between transport and energy in India as shown above. In a business as usual scenario (BAU) , coal demand rises to 2 billion tonnes . Energy and transport are strongly interlinked . Coal for power generation is a significant part of bulk transport movements. Import of oil and gas and pithead vs. demand oriented locations of power stations determine transport need. In a BAU Indian coal demand is 2 billion tonnes. In an efficiency scenario, it is 0.8 billion tonnes. Demand management, energy efficiency, optimal location of energy generation facilities and transport policies, lead to this outcome. Indian power grade coal is plentiful, but of poor quality and so the environmental consequences of linkage policies are high.

South Asia is generally emerging as a energy hot spot in most global models and the energy/transport nexus is at the heart of the problem. and so the environmental consequences of linkage policies are high. Studies bring out that imported fuels will be around two thirds of the total by 2020, which is unfeasible. (See Schwank, Toker and North in Audinet, Shukla and Grare, ed., 2000; also in the same volume, Foreword by Alagh). Energy demand grows two and a half times in an Efficiency scenario and three and a quarter times in the BAU . Renewables like photovoltaics and wind power are pushed to the maximum in the efficiency scenario, but the overall share of renewable energy remains constant, since forest based non-commercial energy for households is substituted by nuclear, solar and hydel power. Two thirds of a much larger energy base being fed by imported fuel becomes unsustainable from the trade viewpoint.

The relationship between sustainability and development strategies can be highlighted by transport and urbanisation strategies. The projections show that if urbanisation strategies are of a decentralised kind, slum population is a fifth lower than if million plus cities grow faster. Slums and use of scarce land resources for urbanisation are related with the pattern of urbanisation through space. More generally we have discussed the relationship between decentralised communitty based development and sustainable non-renewable resource use elsewhere (Y. K. Alagh, in UNCED, 1991).

In the perspective being discussed, the so-called 'sub-optimal' policy alternatives for example, preference to input subsidies over output subsidies may need to be experimented with, given the fragmented nature of markets. Under the conditions being described Baumol and Oates have worked out that "optimal" policies require that the subsidy ("Tax") should be at the point of generation of the externality rather than at the point of benefit or effect of the externality (Baumol and Oates, 1988, Ch. 3,4). Pricing issues in this context are discussed later. Having said this, however, two guidelines are important and may be stated firmly. Generally markets are efficient methods of getting across to producers and consumers of services and goods and other things remaining the same, should be used as the preferred form of delivery of inputs or output collection and processing. Second, development of markets and communication and processing infrastructure , particularly in rural areas must get high priority for reform. In fact, the heart of institutional reform is to evolve a policy regime which uses fiscal and investment packages which unleash the power of properly functioning markets for generating higher incomes and employment and wherever necessary, use direct intervention methods also.

Land and Man

The India Study being discussed covers the agiculture, water, land and agroclimatic features, forests, human resource development and urbanisation sectors. The present discussion is based on the following papers :

1. Robin Mukherjee, Manabendhu Chattopadhyay and Chiranjib Neogi, Productivity, Human Development and Basic Needs in India, Calcutta, Indian Statistical Institute, 2001.
2. V. Ratna Reddy, Land Degradation in India, Hyderabad, Centre for Economic and Social Studies, 2001.
3. Kanchan Chopra and Bishwanath Golder , Sustainable Development Framework for India: The Case of Water Resources, Delhi, Institute of Economic Growth, 2001.
4. S.R. Hashim, S.P. Kashyap and S.N.Joshi, Agriculture and Rural Development, Ahmedabad, Sardar Patel Institute of Economic and Social Research, 2001.
5. Yoginder K. Alagh, Sustainable Development of Indian Forests, Ahmedabad, Sardar Patel Institute of Economic Research, 2001.
6. K.S.Thapar, J.N. Maggo, R.C.Jhamtani, A.S. Sachdeva, and Yoginder K.Alagh Sustainable Development of Urbanisation in India, Delhi, Asian Institute of Transport Develoment.

In addition work on agro-climatic planning and policies (Y.K. Alagh,1989, 1991), technical preparation for the RIO Conference (Y.K.Alagh,1991) and relavent policy studies have been used. (for example, National Commission for Water Perspectives, 1999).

In earlier work we had shown that according to Planning Commission estimates population figures are expected to go up from 856 million in 1991/92 to 938 million in 1996/97, showing an annual average growth rate of 1.8% (Table below). If the growth

rate remained around 2%, this figure would go up to 955 million. (See Alagh, 1995 and Kumar, Saxena, Alagh and Mitra, 2000) According to indications then we had argued that the actual figure would be in between these two figures since the death rate had fallen below even the 2000 target, but the birth rate was below target, hence population growth would be around 1.9%. If the population growth rate further declined, as postulated by the Planning Commission in the second

LAND AND WATER RESOURCES IN PERSPECTIVE

Sl No	Variable	1991/2	1996/7	2001/2	2006/7
1.	Population (millions)				
	a. Planning Commission•	856	938	1016∂	1099
	b. UN (Unrevised)	874∂	955	1042	1130∂
2.	Net Area Sown (mn. hec.)				
	a. Planning Commission estimate	140	141	141	141
	b. Revised		141	141	141
3.	Gross area sown (mn. hec.)				
	a. Planning Commission estimate	182	191	197	203
	b. Revised	183	191	197	205
4.	Gross Irrigated Area (mn. hec.)				
	a. Planning Commission estimate	76	89	102	114
	b. Revised	64	78	92	107
5.	Cropping Intensity				
	a. Planning Commission estimate	1.30	1.35	1.40	1.44
	b. Revised	1.30	1.35	1.40	1.45
6.	Gross Irrigated Area as % of Gross Area Sown				
	a. Planning Commission estimate	41.5	46.9	51.7	56.1
	b. Revised	35.0	41	46	51

Source: Perspective Planning Division, Planning Commission FAO, Agriculture Towards 2010, Rome.

Revised projections are tentative and are by the author.

Note: ∂ Interpolated or extrapolated from implied trends.

- Planning Commission estimates will be revised for Tenth Plan.

half of the last decade of the last century, the estimated population would be around 1016 million in 2000/01 and in any case will be below the rate of around 2% as estimated by the earlier UN projections, of around 1042 million in that year. These developments have now been taken into account by the UN and the 1998 revised population projections of the UN estimate India's population in 2000/01 at 101.37 million. As of March 2001, the Census estimate of the population is 102.7 million persons. If India was able to achieve a population growth rate of around 1.6% in the decade 2000/01 to 2010/2011, its population would reach 1171 million, if the Planning Commission projections were used as a base. Even if this target was exceeded the figure would be less than 1224 million as estimated by the UN earlier. The revised UN projections are now 115.22 million. For the year 2020/21, the UN projections are now 127.22 million. These projections have not incorporated the details of the 2001 census. The Registrar-General's Working Group on Population Projections set up conventionally by the Planning Commission, will

have to firm up these alternative conjectural projections, in terms of underlying fertility, mortality and expected life span behaviour, by age-group and rural-urban categories. The details of recent population projections and changes in them have been outlined to show that there is a level of tentativeness about the available population projections and the detailed country level projections are necessary. For large countries, attention to detail is necessary, since differences can have substantial impact as we have seen and this in turn can influence substantive issues and judgements

The other major category needing examination in this kind of perspective is the land or resource base of the economy. The Planning Commission has correctly projected that the net area sown or arable land of the country will remain constant at 141 million hectares. Growth in net area sown at around 1% annual in the early period of planning fell to around 0.6% and then to 0.3% in subsequent decades and is now not growing at all. It is reasonable to assume that the geographical area of the country or the extensive land frontier for exploitation has reached its limits. This is an important issue, the implications of which are not being realised with the urgency they deserve, since at a basic level resource constraints of a more severe kind faced by certain East Asian economies are now being approached in India. Organisations, communities, households and individuals will have to grasp this fact and live with it.

The intensive frontier for land use, however, remains. It has been known for example that cropping intensity depends on irrigation. Thus gross cropped area or harvested area has been shown in the past to be strongly determined statistically, in an econometric sense, by net irrigated area and irrigation intensity. Irrigation permits the possibility of multiple cropping by bringing additional land under cultivation and the same land to be used more than once. Also the application of new technologies in the past was related to assured water supply. The new technology, on account of its photo insensitivity properties, permits shorter duration crops, which also is associated with increase in cropping intensity. (For details of this relationship in agricultural planning and policy models, see Alagh, ESCAP, 1983). The use of this relationship has been used in Indian agricultural policy and plan models, since the mid-Seventies when the first agricultural sub-model of Indian planning was formulated for grain self reliance (See Alagh, et. al., Planning Commission, 1979). The parameters used in different plans were as follows;

Sr. No.	Plan	Additional Irrigation Utilisation (mn. hec.)	Additional Cropped Area (mn. hec.)	Elasticity of GCA w.r.t. GIA
0	1	2	3	4
1	Fifth	9.11	6.04	0.20
2.	Sixth	13.80	11.74	0.26
3.	Seventh(O)	10.90	10.00	0.31
4.	Seventh®	9.50	7.60	0.24

In the Nineties as we noted arable area has stopped growing and so the land constraint is far more severe. Growth will now have to be sourced from double cropping and yields.

This fundamental relationship can be used to project the intensive resource base of the economy. Table 1 shows that by the end of the decade India would have used up most of its balance water reserves, with the irrigated area reaching around 114 million hectares by 2010. (See Alagh, 1995, p. 395 and above table). The projections for 2020 are a requirement of irrigation of 122 million hectares for irrigation (K. Chopra and B. Golder, Table 2.6)

The projections assume a vastly improved performance on the land and water management frontiers. It needs to be remembered that the balance ground water reserves are now more limited. A very dramatic effort will be needed to harvest and carefully use the available water. Otherwise, the projected increase in cropping intensity will simply not take place. Cropping intensity increased from around 1.18 at the beginning of the Seventies to around 1.3 in the early

Nineties. In the next two decades, this effort needs to be considerably strengthened, so that cropping intensity can increase from 1.3 to 1.5. Harvesting of rainwater, recycling water from agricultural drainage systems, more judicious use of water for cropping, will all be required. Non-agricultural use of water will have to be far more economical. The detailed exercise done for this study requires that in the sustainable scenario 35.83 BCM of water are saved by conjunctive use of surface and groundwater and 142 BCM through harvesting of runoff. (Chopra and Golder, Table 2.6)

The analysis strongly suggests simultaneous action on surface water development, both large and small projects, ground water and conjunctive use and efficiency in water use. Recent interesting work includes sensitivity of estimated resource flows of water available with integration of surface flows with local small storage projects. Alagh (2000) has reported an augmentation to the extent of 14 % of estimated water availability as follows:

Tank Storage in Shedhi System

Year	No. of Tanks Deepened (progressive)	New Capacity Creation MCM	Range of Deepening (m)
Season 1993/94	150	3.5 (6.0 to 9.9)	1 to 6
By June 1994 (7.9 to 13.9)	254	6.0	0.25 to 9.3

14 % additional water cannot be considered trivial in a water short context. It is interesting tht the Shedhi Branch of the Mahi system was planned on the basis that there are no tanks in the system.

Another way of looking at the severe land constraint is to see that a net area sown per person will go down from around 0.17 hectare to around 0.10 hectares. Gross area sown per person currently around 0.2 hectares will even, if cropping intensity increases very rapidly, go down to around 0.15 - 0.18 hectares.

It has been shown elsewhere that limited co-operation in water use has been successful in many watershed projects in resolving the land constraint. The same is true of lower level surface irrigation systems. Community involvement is also important for judicious management of aquifier systems and ground water use. In many cases, land management questions are equally important and are inextricably linked with water management, for example, land shaping in hill slopes and on farm investment in irrigation commands.

Consistent agricultural growth over a period has led to decline in rural poverty levels in the areas where such growth takes place. The so called Green Revolution areas are a case in point. Agricultural growth of 3.5% annual plus for two decades or so invariably led to critical elimination of hunger and significant declines in poverty levels. But such growth took place in areas with good soils and assured rainfall or irrigation supplies. FAO studies showed that the elasticity of cropping intensively w.r.t. irrigation was around 0.3 and so assured water supply was land augmenting and of land productivity w.r.t. irrigation was above 0.5. (See Agriculture Towards 2010) As the Japanese economist Y. Hayami, has shown (1981) this kind of growth raised the demand for labour, employment went up and poverty levels declined. The model of atomistic peasant agriculture worked here. The benefits of state supported agricultural research could reach the farmer, provided land rights were established. Input and output disposal markets, worked since irrigation technology and market support were very much, a part of this strategy, it worked in selected areas.

Policy work in India, for example worked around it. (See Alagh, 1988, 1989,1990 and Planning Commission, 1989) In the early eighties the critics called this the favored crop, favored region model. Another critic described the planning of this strategy as limited and linear thinking. The problem was in areas where these initial favourable conditions did not exist. They were bypassed in the growth process. In India, in the first phase of the Green Revolution, in a fifth of the districts, growth was negative and in another two fifths it couldn't keep up with population growth levels. In Sahelian Africa, many countries in the rest of Africa and in some countries in Latin America, the situation was worse and continued to remain so. The prime issue of institutional development and policy is to reverse this process. With all the advances made in an understanding of both the organization of agriculture, technology and resource management, persistence of mass poverty and hunger, is a striking contrast to claims of universal progress.
An interesting aspect of these problems is its relationship with environmental problems. These are "fragile eco regions". They are the arid and semi arid regions described in the FAO-UNESCO agro economic atlas of the World. (See Alexandratos, 1993) They are the hill slopes with declining tree cover and rainfall causing soil erosion. They are the coastal areas with mangroves disappearing. They are the saline lands and the problematic soils. These are, as in the plateaux and arid regions in India ,areas in which through time, communities had established a balance between carrying capacity and human need. There was poverty, but also time honored practices of sustaining the fragile resource base with activities, technologies and customs which had evolved through centuries of experimentation and adaption. In the last century, dramatic reductions in mortality and resource demands from outside had rudely shaken the carrying capacity balance of such areas.

Very little organized work is available on successful models under these conditions. In the late eighties, in India an attempt was made to build up a set of best practice cases, which had worked. I had summarized them in work done for starting an agro-climatic policy exercise in India and in a book written for WIDER. (Alagh, 1991) The cases had some common characteristics. The economic rates of return to investment were high – 18% plus on the investment made. Substantial food and energy deficits of the rural communities studied were met (Table 1). The technology consisted of a land and water development followed by the introduction of appropriate "cropping" sequences. On the hill slope it was watershed development, contour building, gully plugging, work along the ridge contours. In coastal areas, it was acquitter management. In saline water logged soils, soil amendments and drainage. Vegetation cover was a part of the strategy. Appropriate tree cover for consolidating soil and either tree crops or the "recommended" crops, followed the land and water development strategy. Generally a low yielding cereal was substituted by a two-crop sequence or tree cover either of which helped to consolidate the soil further.

From the replicability angle three were some interesting features. Leadership at the community level was important in all these cases. Generally the leadership group had some science background. The leaders were from NGO or social work organizations, retired army personnel, civil servants and in one case a farmer. The technology for the land and water development part was generally available in the institutions in the region, although some adaptions were made locally, for example, in the saline water logged soil reclamation project. In each of the cases the major work was at the community level. Individual landholders had to cooperate for well-defined purposes. In fragile agroecological regimes; limited cooperation is a precondition for land and water development strategies to succeed. If one farmer stays out, the contour bunds of the others will be washed out in the next monsoon. The atomistic model alone cannot work here. The success stories inevitably involved a period of basic education and group consciousness.

The economics of these efforts led to interesting questions. While these projects had high internal rates of returns on the investments made, they ran financial losses. Generally markets were weak in fragile regions, output prices were lower than border prices and input prices like soil amendments or water pumps higher. Also in the initial phases land productivity levels are lower and improve as the effort proceeds with the organic composition of the soil. Sometimes low value productivity crops are needed to improve soil composition. While generating employment or improving access to food and energy, such activities need initial subsidies. Ignacy Sachs suggested that these be funded as "front up costs", in his summary paper for the Hague Conference. (Maurice Strong described the "two seminal meetings on environment and

development … Founex in 1971 and the Hague in 1991.") In this paper prepared for the Rio Conference and extensively reprinted Sachs asks for.

> "a welcome shift from crop oriented policies to production systems oriented ones, with special emphasis for the needs of small farmers" Sachs pointed out that "Alagh (1991) gives many examples of watershed development projects with a short payback period. The techniques for such projects are well known and their impact at the level of the community would be very favourable. Yet they need public funding for the front up costs. Alagh argues in favour of an agro-climatic planning in terms of alternative agricultural and farming systems in order to overcome the shortcomings of a favoured crop-region approach."

This was integrated in Agenda 21 and the Rio Conference. The effort by community level agencies is now such that in countries like India the approach is no longer at a pilot level, but is the beginning of a movement. The literature on case studies I had initiated has been flatteringly duplicated and recently a table I had presented of eight cases has been replicated for over fifty efforts. (K. Chopra and G. Kadekodi, 1992)More important, the largest supported NGO in the land and water field by the EEC (Sadguru in Panchmahals) and another a group supported by a German programme (WOTER in Ahmednagar) had put under tree cover 1,24,316 acres, as verified by independent evaluations. This is just a little less than the tree cover lost in India in the years 90/95. The EEC supported group, the advisory committee of which I chair, has recently completed a training programme for Sahelian tribal leaders supported by NORAD and the Agha Khan Foundation.

The requirements however are not in hundreds of thousand, but millions of hectares. Government support for such programmes in India has just about kept constant. International support has gone down. This was a period of "economic reform." Why do we find it difficult to help those who help themselves even in the core areas of local and global concern? As preparations of the Kyoto meetings showed, in relation to Rio targets, we are well behind in the interrelated areas of land, water and energy.

Local, National and Global Rules

The problem of imposing a hard budget constraint at the local level and helping those who help themselves, is a difficult one to address. Another way of setting the problem, is to harness the great vitality of decentralised markets in replicating widespread rural growth, with in the core areas of local and global concern? Some of the lessons which follow are as follows;

1. Financial institutions have to design structures such that community collateral is possible for viable projects. Self help financing groups are only one such group. Land and water development groups, local infrastructure projects, in road or communication sectors, (Alagh, 2000), productionising products developed in R&D institutions, training for production with improved techniques, market development schemes developed by local and community groups would be other examples (ADB, 2000) ;
2. Lending through a weather or project cycle would be necessary. The Indian National Agricultural Bank started a scheme of this kind in 1991 as a part of an agro-economic regionalisation strategy started by the author, gave it up in 1993 and is again starting it now (See Reserve Bank of India, 2000 for details) ;
3. Developing policy "champions" for sorting out administrative, financial and procedural issues at local, regional and national levels, when problems arise with these kind of development strategies. It is reasonably certain that problems are going to arise in development experiments which are off the beaten track. The question then is, is there somebody in the policy decision making structure who will sort out the problem. ADB reports in a detailed study of farmer managed irrigation systems, that the failure cases were those where such support did not exist. Failure here is defined as performance levels in water delivery lower than by government agencies (ADB, 2000).
4. The kind of problems discussed in the last para, partly arise because the existing legal and administrative systems and financial rules are structured for formal organisations in the public or

private corporate sector. So are global financial institutions. These newer kinds of institutions with strategic mixtures of organisational styles, coops and corporates, NGO's and government, NGO's and coops do not have a level playing field for them. For example a loss making subsidised electricity system can underprice a renewables group and drive it out of the market. The long term problem is reform in the sense that subsidies and protection given to established groups have to be withdrawn. In the short run the protection given to each group must be the same.

5. The structure or incentive and disincentive systems for this kind of growth, should begin with a taxonomy of complimentarities of policy rules at different levels of policy making like no level can spend more resources than they have access to. But resources, which are short or binding constraints at national or global levels, are elastic at local levels. However their mobilisation requires policy changes at higher levels. For example, it is easy to buy a tax free bond of the New York civic bodies, but very little attention has been paid to markets for local bodies bond paper in developing countries and the fiscal reform that has to precede them (See Vaidya ,1998, for a description of an exceptional effort in Ahmedabad and the difficulties faced) .
6. The last three problems essentially work out that the reform process has to be fairly deep rooted for widespread land and water based poverty reducing growth processes to take place.

The kind of growth discussed meshes well with higher output, income, employment and trade levels. Improved management of water leads to crop diversification. The typical sequence is a poor yielding mono inferier cereal economy, succeded by a high yield cereal and a commercial crop, or tree crops. In the Indian case, exchange rate reform led to higher growth of agricultural exports, before the East Asian crisis cut down demand in the fastest expanding markets (See Alagh, in UN, ESCAP, 1995, pp. 225-36), and recent evidence is that the districts sourcing non-traditional exports have gone through a phase of land and water development sequences. (Alagh, 1999)

Artisan Based Development

Serious research during the last decade and a half has shown fairly conclusively that that the tremendous opportunities that are available with the new technology requires groups and systems which can manage its interdisciplinary nature, since applications cut across areas like biotechnology, communications and computerisation. If the preconditions are available it spreads very fast, both through space and sectors of the economy and society. But if the infrastructure is not there, both physical and human, vast areas will be left out, including some in the developed World. There is also the need of quick response. As Ricardo Petrella of the EEC's FAST Group pointed out each generation of innovations is building on the corpses of earlier ones. (Petrella, 1992) State and parastatal agencies find it difficult to perform in this framework.

Major think tanks working on the character of the Neo – Fordist technological revolution, like the FAST Group of the EEC, the flexible industrial specialisation networks and others have emphasized that it is compatible strongly with networking and decentralisation. As the Science and Technology Minister of India, I had convened for UNESCO a Prepcom meeting at Bangalore for the World Science Conference at Budapest and the Bangalore Declaration strongly reiterated that spread of technology was an institutional and not just a technology issue. Small flexible groups responding to need work. Again the need for partnerships, of community initiatives to back those who work is obvious.

The Industrial Districts literature in the OECD countries gives many examples of this kind of growth. The original Piore-Sable case of fashion garments in Emiglia Romana was flatteringly replicated for leather goods in Lyons, furniture in Denmark, sports goods and gold jewellary in Valencia and the literature on standardisation and lean production falls in this category. (F. Sengenberger, 1992 and F. Pyke, 1992).

These kinds of developments were not supposed to have much relavence in poor countries. But recent work shows that artisan based responses to national and global markets can be powerful sources of growth and in any case are not an insignificant part of exports from them. As much as a third of India's engineering exports are attributed to them. A recent case study of a small town of Trichengodu in a dry and backward region of India showed how sattelitte dish antennas and garments for global markets and truck body building, for the domestic regional market became a powerful source of growth, with almost a doubling of industrial employment and a two and a half hundred million dollar increase in output. A large part of

India's diamond cutting comes from the town of Surat which was less than half a million population when the expansion started and is now around three million(Table 2). India is the largest exporter of diamonds in the World.

The success studies here involve training and improvement of inherited community based artisan skills. The organisational pattern is generally based on fierce competition between small firms, with considerable mobility between self employment and wage labour. However the communitties (in India castes) also engaged in training and skill enhancement, access to larger markets through traditional networks, and technology enhancement, both of production and markets/communication. A Surat, diamond cutters study (S.P. Kashyap and R.S. Tiwari, 1985) found the following ;

1. an organisational structure of distribution, processing and markets, strongly based on trust, with the roughs (passas, as they are called), and polished diamonds changing hands without any written documentation;
2. constant upgradation of technology on the production side, with hand polishing giving way to semi-automatic tools;
3. intense competition and mobility in the lowest polishing formations;
4. community (caste) based training efforts of a decentralised nature, going on in each Taluka (sub-District town) centre in Gujarat.

Similar charateristics have been recorded in the Thrichengodu case (Table3) (Houllier, Bener And Kennedy, 1994) and the gold thread industry (R. Desai, 1995).

S.P. Kashyap (World Development, 1992, ILO, 1998) found that a strong centralised promotion policy with product identification, financing, protection and technology support, does not work. Here the strategy is to help those who help themselves, by access to support of local efforts at market information access, working finance, standards setting, skill enhancement and family welfare and worker health measures. The employment and poverty reduction results of such development are dramatic. In Gujarat's case poverty levels have gone down from around 38% in 1972 to 18% in 1997. High in migration into Surat has been noted.

Much the same kind of approaches are necessary in diverse fields like education, health, urban problems, and the larger debate on industrial restructuring policies. (See Lance Taylor's description of these structures in his rocky road to reform).

Information Technology

While the leading role of information technology in India's trade and local growth process has been documented, the role of such technologies playing a leading role in rural growth are not there. We discuss, preliminary impressions of two such cases in a dry region of India. They refer to two cooperatives, one at Warna and the other at Pravara, again in the rain shadow region of Maharashtra in Western India.

The Pravara Sugar Cooperative is the first one in India. It diversified from efficient production of cane and white sugar into bagasse based electricity, high value added chemicals and alcohol. In the eighties with a shortage of water, it encouraged diversification into dairying, horticulture, ice cream and went into perhaps, the first case of drip technology in line crops.

By the early nineties it was spending around Rs. 500 million on education and health, with a wide range of institutions. In 1993, a group of eminent cooperators and educationists brought out a Rural Education Policy Draft, which operationalised for India, a strategy for the use of knowledge as a source of growth. It envisaged a borrowing strategy for the best skills available for training at a global level and ultimately generation of local world class knowledge.

By 2001, internet was completely integrated in the educational and infrastructure bodies, like the cooperative bank. There was also a strong local training and service industry in this rural area, with a major contribution from women entrepreneurs. This part of the sector is either privately financed or from cross subsidies from basically profit making entities. Farmers from the 55 villages of the cooperative have access to internet in local language in the production/service sectors.

In this century Pravara begins the more difficult process - internet based human resource development at the village level itself. This is more difficult. The technology package developed needs an investment of about a quarter of hundred rupees per village. The model insists on a one third contribution by user charges or village contributions. The process is still working itself out.

In a period in which the region and the cooperative sugar sector was not doing too well, the Pravara cooperative has kept up a strong economic performance level. It has always fought for reform. Abolition of controls, cooperatives free from buruecratic control and now corporatisation of producer associations, have all been advocated and lobbied for.

The WARNA case is similair initially, but its information technology experiment is different. It begins in 1998, with a strong impetus from Delhi, after the setting up A National Task Force on Information Technology. The central facilities with the infrastucture groups, the training institutions and at the village level were set up simultaneously. The costs have been obviously high.

The process is still working itself out. It is too early to compare and evaluate.

Pravara has also submitted for recognition at Delhi a project for setting up a degree granting Information Technology Institute, with an initial corpus, but will be self financing. This would technically support the HRD/ Production/ Infrastructure institutions, and also study and reengineer the village level systems on a real time basis. It is lobbying hard to get the proposal approved.

Pricing Rules

The argument of this paper is that there is an intimate connection between micro-economics and macro-economics. It is not that supply and demand elasticities or effective rates of protection or theories of market clearance have no relevance. These concepts have to be related to sustainable development policy objectives and priorities, rather than being applied in an uncritical framework. In a recent review, Jomo, K.S. has underlined the relavence of an approach which has a sector/ space context to policy in the post East Asian meltdown context, for the succesful countries like Singapur and South Korea. (Jomo, K.S., 2000). The argument that market or as it is called " full cost pricing " if applied will solve all sustainability problems is not maintainable.

There are five objectives a successful pricing and economic policy of sustainable development should follow :

(i) a sector must be constantly striving for energy efficiency;
(ii) a sector must be striving for material efficiency, including recycling of wastes, cogeneration of power, etc.;
(iii) costs of non-renewable resources must be fully reflected in industrial/urban processes;
(iv) policies should be economical in the sense of using the minimum necessary intervention to achieve objectives and must be capable of adjusting quickly to changing market conditions; and this in turn would require the use of markets and decentralized organizations enabling quick response functions; and
(v) the economy must operate in a framework which encourages the use of environmentally friendly products and processes and discourages generation of external diseconomies in a costless manner.

Modern environmental theory and policy analysis conclusively demonstrates that market prices may not capture sustainability concerns. In fact, this is the initiating point of an "ecological economic policy" (see Jonathan Levin, 1990 and Baumol and Oates, 1989). Market prices are myopic in the sense that they generally underestimate the real cost of non-renewable resources. At any moment of time, given the vintage problem, a number of technologies can co-exist with the same set of product prices and there is not a priority reason to expect environmentally friendly technologies, now available, to prevail (U.E. Simonis, 1989). At the same time the great opportunities for environmentally sustainable structural adjustments lie at the enterprise level. The task is the harmonization of economic policies with markets in a manner such that enterprises follow ecological policy goals.

For simplicity sake take the example of a centrally planned economy with quantitative interventions at the level of the firm, which has to be restructured. (Much the same argument would apply to less rigidly controlled economies.) As is well known centrally planned economies led to ecological nightmares (Patrick Hubert, 1989). In Poland 27 regions are classified as ecological disaster areas and the USSR has serious pollution problems in all its major urban agglomerations. A structural adjustment programme of the desired kind would need to provide powerful incentives to introduce technological modernization of a sustainable kind being discussed. The earlier approach based on the maximal use of energy and natural resources would need to be changed with a severe structural adjustment regime. (A. Abenbegian, 1987). Extension of micro-electronics, modern communication new new materials (fibre optics, lasers and ceramics, photovoltaics and at the frontier supper-conductivity) provide the technology for meeting human needs in a manner which does not destroy the environment (J.G. Spetti, 1989 and Petrella, 1992). Also as consumer patterns and products change, the share of commodities requiring large amounts of energy and materials declines (U. Colombo., 1987 and 1999). While developing countries are far away from the consumer revolution there is no reason to ignore the possibilities of an ecologically friendly industrial revolution based on modern technology, provided the problem can be visualized as that of global cooperation in technology diffusion.

To return to the level of the sector, an example helps again - that of electricity pricing. The economics of the transformation from a non-sustainable to a new technology energy plant would be higher capital costs at the margin but lower current costs and working capital requirements. Plant-wise analysis would show that the marginal capital cost need not always be that of a green field plant since modernization and existing expansion costs are generally lower. Thus a long range marginal cost schedule (LRMC) based on expansion possibilities for each plant, can be built up to introduce the new technology for the industry. Suppose this gives a modal price Pc. Pc would involve lower working capital costs than historical plants, but fixed capital requirements would be higher, although in most cases, still lower than a green field investment. However, there is no a priori reason to expect that Pc would equal the going market price if modern environment policy literature and theory is a guide. Now if a particular plant is going to produce electricity with real costs which will be higher than a long term best practice price trend, it has no business to be in business anyway and environmental considerations would doubly dictate it to exit. The real world, however, in many cases consists of marginal cases. In such cases an "ecological economic policy" would use tax reliefs, import tariffs or pricing policies to see to it that the producer gets the LRMC price.

Recently the Indian electricity regulator has strongly recommende such a long run marginal cost pricing policy for the power sector rather than the existing cost plus pricing setup. (See CERC, 2000). Also the Maharashtra Electricity Regulator has not allowed the cost plus price of Enron's Dabhol plant for interregional transmission, but has allowed the Tata's cost as an "availaibility" tarrif, as suggested by the present author (See Alagh, 1991 and 1998 and MERC, 2000).

The problem of sustainable industrial and urban development is seen as particularly difficult to resolve. (I. Sach, 1988). However, if a serious attempt is made to link up the enterprise incentives with macro-policies, it is not as intractable as it looks.

Selective liberalization and structured change of the kind discussed above require adjustment and strengthening of policy procedures. The emphasis may shift from details of disaggregated quantitative interventions to greater concentration on policy issues, but the focus on analysis of policy and strategy options would be more pronounced. Therefore, questions of tariff pricing, licensing and related issues need to be synchronized with development processes with a major emphasis on modernization programmes in a sustainable development strategy. Methods such as domestic resource cost, effective rates of protection or demand elasticities and the use of numerical magnitudes of these concepts can be integrated with comparative static policy design. However, it is important to appreciate that policy and developmental problems are essentially of a dynamic nature involving investment and technology choice questions. The desired price to encourage the required supply response may need intervention in the market. This may take many forms such as dual prices, tariff interventions or tax interventions. The one theme emphasized in

this paper is to use to the extent possible, markets and decentralized organizational forms as instruments of a strategy and a policy. The technical counterpart of this requirement would be to work with models and methods of reasoning which use prices as policy variables and endogenize tax, tarrif and other prices.

Conclusions

The linkage question is one of developing policy and organisational rules to replicate on a much faster scale, the successful experiences o f sustainable development, whether they are in the fragile land question, the issue of fast non agricultural growth or application of recent technology developments.

National and global organisations and financial rules incentives and disincentives, and working of markets, are not particularly well tuned to these needs. In fact it becomes very difficult to support market oriented and communitty based self supporting organisations. This requires innovative fiscal, pricing and lending rules, which at present dont exist. Communitty collateral, integrating labour components into lending securities, municipal and local body debt paper markets are not the rule.

Creative use of long term efficiency pricing rules for sustainable development is absent.This is not a paper which discusses international negotiations on environment questions. However, some implication of the analysis of policy and strategy options stand out and need attention.

International discussions and policies for sustainable development of fragile lands, need to consider more explicitly and in detail the many interesting attempts at local solutions to problems involving community effort, local adaptive science inputs and leadership. (A. Agarwal, 1984, A. Khosla, 1989. Y.K. Alagh and Nandini Roy, 2001) The whole question of information sharing, replication and resource provision for such efforts needs more active consideration on an interregional/global plane.

Many of the frangible land issues are truly supra-national and international - thus supra-national policies needs greater focus (Himalayan Watersheds, desertification.) Many of them require transport and communication strategies for meeting sustainability requirements. Examples are communication projects in the Brahmaputra or Mekong valleys.

The question of modern technology has been seen primarily as a developed country preserve. This is incorrect. Modern technology interfaces with the fragile land problem in terms of inputs (water saving, agro-processing, seeds and bio-technology) as also experience of newer organizational forms, markets or decentralized governance. The issue of energy and material conservation in urban or industrial sectors is of high importance and operational answers will require both access to modern technology and capital resources. Regional and global requirement of sharing of experience and resources are evident.

Above all international sympathy is required for approaches of structured adjustments emerging from an environmental economic policy. This will need substantial changes in current international financial institutional practice.

Table 1

Selected Characteristics of Watershed Development Projects in India

S. No	Name	Land/Water Developmet Cost Rs/Hec	Current input Rs./hec	Return Rs/hec annual	%	Remarks
0	1	2	3	4	5	
1	Naigaon	11,364	2809.56	912		
2	Sukhomajri	22,221		7979	19	benefits include those to village and Govt., agric., dairying, fisheries and fodder. Col. 5. Refers to IRR
3	Samithed	1,500	N.A.	N.A.		Returns are in terms of plantations, rise in water table and fodder in 312 acres of land; 78000 saplings.
4	Ralegaon Sidhi	9,689	N.A.	N.A.		Drinking water available within 100-150 metres of each household
5	Tejpura	4,246	Additio nal 816.8	3764		Doubling of bajra and jowar yields: 70 cross bred cattle are given green fodder
6	Mittemari	2,030	N.A.	N.A.		Incremental income of Rs. 2540 per household as compared to control village
7	Sikandurpur and Kotpurva	11,220	10,825	255 days of grain requirem ent for a family plus 400 days of fodder for pair of animals		Saline Land Reclamation Project

7	Sikandurpur and Kotpurva	11,220	10,825	255 days of grain requirement for a family plus 400 days of fodder for pair of animals		Ussar Reclamation Project

Table 2

DEMOGRAPHIC CHARACTERISTICS OF SURAT CITY

Year	Population (million)	Annual Growth%	Workers (million)	Annual Growth%
!971	0.47		0.15	
1981	0.91	6.84	0.32	7.80
1991	1.52	5.20	0.52	5.10
2001	2.81	6.61		

Table 3

TIRUCHENGODU: A PROFILE

1. Located in Salem District of Tamil Nadu in South India ; Dry, rainshadow backward region.
2. Growth of Population ; 1971/91 71% ; average for size class of towns 37%.
3. High male selective migration shown by low sex ratio.
4. Number of electricity connections per thousand of population for industrial and commercial purposes was much higher than for district capital of Salem.
5. Major Industries; textile garments : body building for trucks, second largest centre in India now : satellite dish antennas: truck/rig operation, truck/rig 5000 units working in dry regions of central, western and south India.
6. Garments and satellite dish antennas mainly for export.
7. Strong inherited artisan skills; caste level training and education centres.

Source: F. Hullier, V. Bener, L. Kennedy , 1994.

References

Alagh, Y. K., (1991), Indian Development Planning and Policy, WIDER Studies in Development Economics, Delhi, Vikas.

Alagh, Y. K., (1991), Sustainable Development: From Concept to Action, in UNCED and UNDP, below.

Alagh, Y.K., (2000), Sustainable Development Policies for Developing Countries,Keynote Address, UNU/IAS-OECD Conference on Sustainable Development, Tokyo.

Alagh, Y.. 1979, Task Force on Minimum Need and Effective Demand, See, Govrnment of India, 1979, below.

------, et.al., 1984, **Policy Modelling for Planning in India**, in E. Thorbecke, ed. , below.

------,1988, **Guidelines** for Agroclimatic Planning: A Draft for Discussion, **Journal of Land Development .**

-----, (1989), The NIE's and the Developing Asia-Pacific Region, **Asian Development Review,** Vol. 7 (2), pp. 113-27

------, 1991, **Indian Development Planning and Policy**. WIDER Studies in Development Economics, Helsinki and Delhi, Vikas.

------, 1991, Sustainable Development, From Concept to Action: Techniques for Planners, UNCED.

--- and M. Khattab, 1993, Food Security Information System for Arab Republic of Egypt, Vol.3 (Models), Cairo, FAO.

------, 1994, **Planning and Policies for Indian Agricultural Research,** 25th Lal Bahadur Shastri Shastri Lecture, reprinted in ICAR, Landmarks in Indian Agriculture.

------, 1995, India's Agricultural Trade with the ESCAP Region, in U.N., ESCAP, **Agricultural Trade in the ESCAP Region,** New York, U.N.

------, 1999, India's Agricultural Trade, **Indian Economic Journal,** First Dantwala Memorial Lecture.

-----, 1999 , Participatory Institutions and Rural Roads **,** U.N., ESCAP, **Transport and Communications Bulletin for Asia and the Pacific**, No.69, pp.1-28.

-----,2000, **Water and Food Security in South Asia**, Invited Plenary Lecture at World Water Forum and Ministerial Meeting, Hague, subsequently published in the **Journal Of Water Resources,** Jan. 2001.

-----,2000, Global Sustainable Future and Developing Countries, Tokyo, UNU/IAS.

-----, 2000, Report of the High Level Committee on Legislation for Corporatisation of Cooperatives, New Delhi, Ministry of Company Affairs.

-----,2000, Sustainable Development: India 2020, Tokyo, UNU/IAS

Alexandratos, N., (Ed.), 1995, **World Agriculture Towards 2010, An FAO Study,** Chichister, Wiley.

Asian Development Bank (ADB), 1999, The Growth and Sustainability of Agriculture in Asia, Manila, ADB.

ADB, 2000, Rural Asia: Beyond the Green Revolution, Manila, ADB.

ADB, 2000 *Rural Asia: Companian Volumes (I-III)*, ***Oxford, University Press.***

UNU/IAS. Baumol. W., and E Oates Wallace, (1988), Theory of Environmental Policy: Externalities, Public Outlays and the Quality of Life, Englewood Cliffs, Prentice Hall.

CERC, (1999), Discussion Paper on Energy Pricing, New Delhi, Government of India. Colombo, U., (1986), New Technology, Bulletin of Social Information, 2, pp. 232-237.

Colombo, c., (2000), Foundation Day Lecture, New Delhi, TERI.

Chopra. K., and G. Kadekodi,1993, Watershed Development, **Economic and Political Weekly,** June 26, pp, A61-A67.

Colombo, c., (2000), Foundation Day Lecture, New Delhi, TERI.

Desai., Rohit. D., 1995, The Household Sector; A Study of the Zari Industry, New Delhi, Har Anand.

F.A.O. , 1978/81, 1982, **Agro-Economic Zoning Atlas** , Rome, FAO-UNESCO.

F.A.O. , 1993, **Agriculture Towards 2010,** Rome, F.A.O., for final published version see, N. Alexandratos

Colombo, U., (1986), New Technology, Bulletin of Social Information, 2, pp. 232-237.

Gangrade K.D. and N. Radhakrishnan, (Ed.) , 2000, Gandhi and The Changing Facets of India, See paper by Y.K.Alagh, Gandhi and the Indian Economy the 21st Century , pp.44-62, New Delhi, Gandhi Smruti

Government of India, 1989, Planning Commission, P.P.D., **AgroClimatic Planning : An Overview,** New Delhi, Planning Commission (authorship, Y.K.Alagh, et.al.)

Hayaami, Y., 1981, Understanding Village Community and the Direction of Agricultural Change in Asia, Delhi, IEG. Occasional Paper, New Series, No. 1.

Houllier, F., V. Bener And L. Kennedy, (Ed.), 1994, **Industrial Decentralisation and Urban Development in India,** Pondicherry, Pondy Paper in Social Sciences, 23, Institute Francais de Pondicherry.

Hubert, P.,(1989), l ecologie dans les pays dubbe communiste, Futuribles, May, pp.53-60.

Kashyap, S.P., and R.S. Tiwari,(1985) , **Shaping of Diamonds in Surat: An Enquiry into Some of its Passas (Facets),** Monograph No. 12. Ahmedabad, SPIESR.

----------, (1988), Growth of Small-size Enterprises in India: It's Nature and Contents, **World Development,** Vol.16, No. 7.

----------,(1992), Recent Development in the Small Enterprises Sector in India, Discussion Paper No. 48, Geneve, International Institute of Labour Studies.

Levin, J., (1990), Comment traiter environment daus le compat nationale, Bulletin du FMI, June, pp.168-69.

MERC, (2000)Order, Case No.1 0f 1999, Mumbai, MERC, April 28

Petrella, R., (1990), Globalisation of the Economy, Brussels, EEC.

Petrella Ricardo and C. Granrut, (1992), **Le Mondealisation de la Econome,** FAST, Document No. MO 75-5/34.

Pronk, J., and M. Haq, 1992, Sustainable Development: From Concept to Action, UNCED and UNDP.

Pyke, F., (1992) **Regional Development in an Era of Globalisation,** Geneve, International Institute of Labour Studies.

Reserve Bank of India, (2000), **Report of the Expert Committee on Agricultural Credit**, (Kapur Committee.)

Sachs, I., 1991, **Background Paper for the Hague Declaration,** extensively reprinted in **Nature** and by RIS.

Sengenberger, W., and F. Pyke, (1992), eds. Industrial Districts and Local Regeneration, Geneve, International Institute of Labour Studies

Schwank, O., T.W. Stokar and Nichole North, (2000), Long Term Carbon Emmission Targets, innP. Audinet, p. Shukla,and F. Grare, India's Energy, Delhi, French Research Institutes in India, pp. 121-143.

Stopford, J.,(1994) **The Impact of the Global Political Economy on Corporate Strategy,** Pitsburgh, Carnegie Bosch Institute, Working Paper No. 94-7.

Vaidya, C., 1999, Private Sector Participation in Financing and Management of Urban Water Supply and Sanitation Projects, Delhi USAID FIRE Project, reprinted in 31st Annual IWWA Technical Volume.

Wade, R., (19992), East Asia's Economic Success, **World Politics,** Vol. 44, pp.270-320.