1993
Draft

Search for sustainable solutions : How do we build upon Indigenous Ecological Knowledge system?

Anil K Gupta[1]

I. Introduction

This paper is about the mediation that a cultural and institutional memory provides to the interface between objective environmental conditions and subjective human preceptions. Disturbances occur. But societies which survive evolve ways of repairing the errors. The ecolgical systems also have capacity to repair themselves but with in their homeostatic limits. Mutations occur. The selection of chance solutions in socio-ecological interactions does not take place only through laws of natural selection. Human cultures can inhibit some times and enable at other times selection of certain arrangements. Gupta and Ura (1992) have observed in Bhutan that the consequences of what may be considered an externality is in fact the outcome of cultural consciousness. In Bhutan, a wide boundary of responsibility leading to shared consequences was an important outcome of historical institutional development. Once the state or other authorities supersede the power of religion, village or community institutions without providing space for them to evolve and adapt, the conflicts between desired perceptions of this boundary and its newly legislated limits invariably arise.

A proper solution to these conflicts only comes after the relationship between cultures, institutions, technologies, and nature is properly appreciated. I illustrate six dimensions of the solutions *for sustainability* building upon above relationships through certain metaphors and specific resource management situations in part one of the paper.

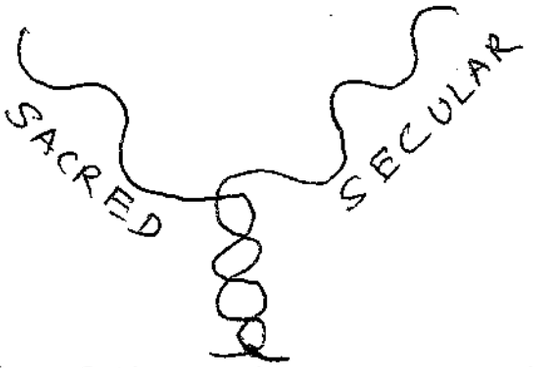
---

1. Professor, Centre For Management in Agriculture, and, Chairperson, RM Centre for Educational innovation, Indian Institute of Management, Ahmedabad-380015, India

Author invites comments and criticism as also further suggestions for his reading and learning. Contact can also be made through email(anilg@iimahd.ernet.in *slightly erratic at our and some times),* fax{ 91-272-427896) or phone (o:91-272-407241 ext 4927 or r: 91-272-469079)

This paper draws upon earlier papers entitled, Saga of A Star Fish, 1992 and Building Upon Local ecological Knowledge Systems, 1991.

The *sacred* and the secular strands of consciousness, I will show intertwine like a double helical structure of DNA (see figure one below)



It seems, the meaning of the words *progress* and *development* was interpreted by the modern mind as retreat of *sacred* and the domination of secular. The problem would have been less serious if the language of discourse had paid attention to the meanings attached to the words dominating our worldview. For instance, among various meanings of the word secular (most of which are negative meanings i.e. non religious), the ones seemed to signify the present meanings best were,"caring for the present world only, unspiritual" or " of belonging to the present or visible world as distinguished from the eternal or spiritual world". Thus the world secularism was defined as" The doctrine that morality should be based solely on regard to the well being of mankind in the present life, to the exclusion of all considerations drawn from belief in God or in future state". I hope that my problem is better understood by the readers. If our concern is only with the *present world* to the total exclusion of the concern for future state drawn from belief in future *state* of some kind, how would the discourse on sustainability be pursued?

The word *Sacred* was less problematic. At least so many of us believe. It meant " Of things,places, of persons and their offices etc.,: Set apart for or dedicated to some religious purpose, hence entitled to veneration or religious respect". I do not have to trace the roots of religious wars, or communal riots in Ireland, India, Bosnia, Quebec(with Mohowak) or other parts of the world. The protest of Cree and Inuits over James Bay II may not be totally secular nor ii is entirely sacred. Though both the elements are intertwined.

Perception of nature, I will argue in this paper does influence the way we see the relationship between scared or profane or secular or Holy. I will also suggest that search for Sustainable order (and not just any order) would be better pursued if we looked into the language of sense making as distinct from the language of discourse. We can follow *sacred* syntax in the former and *secular* syntax in the latter. And be trapped in the consequent sanctuary of secular meanings. In the absence of the sacred

context, the institutions of collective sense making are often not accessible to us. I will suggest that we us our own consciousness as a laboratory for experiments and see which meanings dominate the perception of nature. "Touch Wood" would then acquire different meanings. The role of vernacular would become particularly important because certain meaning are accessible only in that medium.

Part One: Understanding institutional aspects of sustainability

I deal with six illustrations. The first one stresses the need for understanding how the spirit of sustainability is vital for undertaking sustainable missions through non sustainable but inspiring triggers. In most discussions on the subject we tend to ignore this dimension. The second case looks at the responsibility we have for perfect strangers (like the unborn) or some of the non-human beings. The third example highlights the importance of rule making process as much as rules in common property institutions. The fourth illustration deals with multi-functional indigenous institution which have *simple, robust and fair* rules. The fifth case deals with the endemic conflict between holistic and reductionist framework in devising sustainable outcomes.

a: Sustainability of Spirit is the key

Even if we have technologies which can help in use of resources with in sustainable limits, will appropriate institutions emerge if the spirit is absent? Such was the question posed once in an Indian epic, Ramayana. In this epic, Lord Rama symbolizes the *Dharma.* (noble conduct) and Ravana (who otherwise was a very wise sage) the *Adharma* (bad conduct).

> Ram was very frustrated on knowing that his wife, Sita (abducted by Ravana) was just on the other side of a vast expanse of water and he didn't have wherewithal to cross the sea or build a bridge. His followers were equally restive. The task appeared impossible. Suddenly a ray of hope emerged.
>
> Ram observed that a squirrel was behaving in an odd fashion. She was wetting her tail in water, coming back to the shore, rolling in sand and going back to the sea and washing her tail. She was doing it repeatedly and almost furiously. As if in a great hurry. Ram called that squirrel and asked her the reason for her odd act. She replied that knowing the challenges before them, she was contributing her mite. She was trying to fill the sea by the sand attached to her tail so that a path could be built.
>
> The entire work force of Ram felt ashamed at their despondency. And soon, with their collective effort, the path was built.

The projects like the squirrel's efforts are seldom sustainable. The trick is to unfold the locked up entrepreneurial energy of all those around. The momentum so generated may eventually solve the problem or generate the ripple which unsettles those believing in maintenance of status quo. The spirit of sustainability is prior, the substance is subsequent.

b: Sustainability requires acknowledgement of rights of the 'Others'(birds, beasts and unborn human and non human life)

In most societies and cultures, strands of philosophy are found which justify the rights of the 'perfect strangers' like the unborn and other living forms which provide the much needed biodiversity. It is necessary for us to understand the process through which such a consciousness is ingrained in the day to day use of resources and observance of boundaries. A folk song I heard (as a part of our discussions in an action research project on watershed management in Shimoga district of Karnataka state in south India) suggests how societies have kept the germ of this consciousness alive.

> In a drought year, the crop has suffered very badly. A women is coming back from the field after picking up whatever grains she could. On the way she meets a parrot. The parrot starts staring at her. She asks the parrot as to why was he looking at her so intently. The parrot replies that he was actually confused after looking at the women's necklace. The necklace had a green agate stone. He mistook it to be a grain. Only when woman came closer, he realised it was just a stone. Woman asks him had he not got anything for eating. The parrot replies that hadn't she brought all the grains from the field- even the ones which had fallen on ground. The women realizes that parrot was hungry, and she also needed the grains very badly for her children. She asks the parrot to come home with her and share whatever she gives to her children. But the parrot flies away leaving the woman dumb founded.

Why did parrot fly away? Did parrot realize that if he delayed search for grains other people would also pick up whatever grains were left in the fields. He remembered his young ones who were waiting to be fed. Did he think that poor humans were so meek and weak that they could search for grains only in a limited space where as he could fly over long distances. He should thus leave the grains for the poor woman. May be he thought, he had right over the grain so long as these were in the field. Once these were in the hands of a human being, she had the right over-it (an instance of superior ethic than the one we humans use!).

There could be many other interpretations.

The song has several messages. It speaks about a cultural system in which the right of birds are being debated vis-a-vis the right of human beings even in a drought year. Perhaps there was some reason why the traditional varieties of millets or sorghum had loose set grain which was easy for birds to pick. At the same time there were elaborate designs of birds scaring devices built to reduce the loss due to bird attack. Perhaps people knew that bird would kill insects some of which harmed the crops. How much of the contribution of birds was negative or positive would be reflected in the (a) technology i.e. selection criteria of local varieties, design and efficiency of bird scaring devices, (b) the spirit of co-existence with other parts of nature, and (c) collective consciousness as well as culturally approved behaviours.

How does one interpret this song would also depend upon how one conceptualised the right of different claimants over natural resources. If birds were also considered as legitimate stake holders in the natural resources, then the viability, sustainability and effectiveness of any institution would have to be interpreted very differently. Many times, resource scientists have taken a very limited view of human nature - a view which excludes the rights of other natural beings. The modern conservation ethic anchored on such a view seldom can produce sustainable outcomes.

A knowledge system which generates concern for various parts of eco-system obviously could not have evolved through just the individual innovations. It would have required evolution of cultural norms, folk lores cemented by various kinds of sanctions and rewards for socially approved behaviour.

c: Sustainability through creative culture bound indigenous institutions of management of Common Property Resources(CRP)

Most of the sustainable arrangements for natural resource management require group action through some kind of CPR institution. While many of the available frameworks of analyzing such institutional arrangements have emphasized either game theoretic or utilitarian perspectives, I stress the need for giving importance to the process of rule making as much if not more than the rules per se. Further I also feel that there is an admixture or what I may call double-helical intertwining of explicit and implicit, secular and sacred and 'this' and the 'other' worldly consciousness in these indigenous institutions.

> A village panchayat (assembly of elderman) in Rajasthan devised an unique way of punishing person who cut some branches of trees from common land where such poaching was prohibited. The person when caught was asked to stand barefooted under open sun in the hot summer and feed the

birds two and a half kilograms of grains from morning to evening (Agarwal, 1990).

It may be difficult to establish relationship between the cutting of tree branches, reduction of bird arrival, increases in the pest attack or decrease in the bio-diversity because of lack of seeds brought by the birds and the feeding of the birds. This relationship is entirely my speculation. It is quite possible that this punishment would have been interpreted differently by different people in the village with some common meaning but some uncommon meanings too. On the one hand the culprit was punished and on the other, he was supposed to have been blessed by the Gods for having fed the birds in such an hot environment standing barefoot.

An element of ambiguity characterizing such judgments provides a creative ground for exploration and speculation. Institutions are seem to be embedded in the socio cultural and religious world view of the people. It is quite possible that access of various social groups or classes to the same common lands may not have been equitable for all the resources. However, to infer from inequity in availability of one resource, say, wild berries from common lands that inequity or indifference should exist in the institutions for other resources, be they of aesthetic or material nature would be a mistake. In this case the deliberations were guided not just by keeping the interest of human claimants on the natural resources.

The conflict among religious and other identities have to be resolved through open negotiations rather than through authoritarian interventions. Lot of traditional ecological knowledge has been retained through codes legitimized by religious or cultural institutions.

The global concern for sustainable development and conservation of bio-diversity is dominated by the strategies and styles suitable for essentially the degraded environments. Since degradation in environment inevitably is accompanied with the degradation of the institutions, these policies take absence of institutions as given. Much greater reliance is placed on public interventions which in turn mean bureaucratic interventions.

d: Sustainability through multi-functional institutions of restraint, reciprocity and respect generating collective responsibility for nature

The role of culture, religion and other collective social institutions in modifying individual needs has not been adequately appreciated. There is a custom that people go to the forest for collection of shingle wood in Bhutan together on a particular day. There are several implications of this practice.

a) While collecting wood on the steep slopes, if somebody falls down, there around to help in the emergency.

b) Everybody monitors everybody else's collection of wood.

c) Since collection of wood has to be done keeping in mind the age, health, a tion of the tree corrective restraint helps in maintaining those co

d) Some people are either too old, handicapped, weak or their requirements if they can manage their own, groups help in such cases and carry the

e) There are sites which might have suffered some damage due to rain, lands, otherwise. The fact that such sites are observed together enables mobilizir the will for corrective action more easily.

f) In addition to the utilitarian dimensions mentioned above, the group act own reward when there is music, fun and laughter around.

Thus, emphasis on only the economic part of a resource would not provide sufficier information or insights for building institutions that can help in managing sustainably. Development is possible only through creative institutions which can vidual choices to some extent and yet provide scope for entrepreneurship

e: Sustainability through blending of holistic and reductionist perspective for regenerating resources

I intend to take help of a story from another epic of India viz: Mahabharat. There was a famous Guru (teacher) who had an ashram(college) situated in a forest specially meant for royal scions. His name was Dronacharya. Five brothers sons of the king Pandu were his choicest students. Since Droanacharya was the best known teacher of the art of Archery, his students were supposed to share this excellence too. Once he took all the five brothers for an examination to a nearby place. He hung a bird on the tree and asked each one of them one by one to take an aim at that bird and tell him what did they see. When the turn of the eldest brother (Yudhister) came, he said that he saw the entire cosmos of which the earth was a pert of which the tree was a part and finally he saw bird on the branch of that tree. Dronacharya asked him to sit down. The next brother came. He said that he saw he earth, tree, branch and the bird. He was also asked to sit down. Then came the turn of his favourite student Arjun (the hero of the famous story of Gita). he could see only the eye of the bird. Undoubtedly, he became the best known archer of his time (surpassed only by a tribal student Eklavya who was denied admission by Dronacharya to his Ashram since he was a commoner).

The bird of the eye reflects the extreme reductionist attitude just the whole cosmos shows the holistic perspective. My contention is that we need both and not just any one as many environmentalists claim. Any theory building requires drawing a *boundary* which renders the phenomena being studied as partial. On the other hand we need holistic view so that interconnections of

different parts of nature can be seen. Sustainability requires balancing the sea saw of these two ends of the same spectrum.

Bio-Ethics for sustainability:

The sustainability of a resource use requires development and demonstration of an ethics which guides decisions regarding current versus future consumption of resources. The conception of nature and relationship between human and non-human, animate and in-animate, born and unborn etc., are defined if not determined by this ethics. The bio-ethics can raise following choices:

a) Do I draw natural resources at a rate that the resource renews itself within a short cycle.

b) Do I draw as much as I can till it is available and once exhausted, I shift or change the resource base.

c) Do I draw less than what can be used without impairing the ability of resource to renew itself.

d) Do I draw resources only as much as I need simultaneously ensuring that the genuine needs of others are also met and the resource is renewed before it drains down to its critical limits.

e) Do I draw as much as possible, hoard it if feasible and then market it at a very high price to ensure some kind of rationing of its use.

f) Do I develop an institution which through its inefficiency generates a constraint on the maximum sustainable yield.

The right of the unborn.

Given extreme poverty and deprivation in most developing societies, the rights of the unborn are always discounted. It is seldom recognized that what we bequeath may often influence how we survive. The future can occur faster than we think. The hazards expected in the next generation often prepone their arrival. Declining biodiversity, increasing disease and pest hazard and consequent increase in vulnerability is a phenomena which we are witnessing right in our generation. We can relate the technological choices with these rights very precisely. For instance, the rate at which soil nutrients are mined may influence and be influenced by cropping pattern, intensity and partitioning efficiency of a crop plant.

We may not even estimate various consequences of the nutrient imbalance for the elements of which functions are not fully known. The rights of the next generation are thus negotiated

through the assumptions made about the present resource use pattern and consequences thereof. The effect of soil mineral properties on disease and pest vulnerability is still being properly assessed. The right of the unborn can be argued not only on ethical grounds but also on efficiency ground. These rights imply a very long time frame and most sustainable technologies fail to prove their effectiveness in shorter time frames. For such technologies to be given a fair trial, invocation of the rights of the unborn thus is a pragmatic political strategy.

A: **Evolution of Institutions and technologies:**

The pooling of resources is a necessity for communities that are in close touch with nature and its uncertainties because the cost of the alternative, i.e. individual maintenance of inventories is very high. Institutions that endorse co-operation and empower collective action must evolve to make collective survival possible.

Much of the emphasis in the current debate on sustainability is on appropriate technologies rather than on appropriate institutions. It is appropriate that institutions sanction technologies rather than the reverse(though the feedback works in both directions)[2]. Institutions are also like steps on a moving staircase (Gibson, 1993) from which people view their relationship to other people (in other classes, of other ethnicity, of other, including subsequent, generations, etc.), to nature, and to technological change. Institutions provide rules and rule-making processes that are necessary for both individual and collective action. As such they provide legitimacy for trying alternatives that may not be entirely rational or cost effective in short the term but that may help to insure long-term success for the collective. Decisions concerning technological choices, i.e. the appropriate mix, pace, cost, and 'efficiency' of resource transformation etc., are part of this search for alternatives. The institutions provide ethical and normative range of acceptable behaviours to cope with cycles of affluence, subsistence and deprivation. The technologies provide the means or instruments of converting access to resources (ecological or otherwise) into investments with in institutional and cultural context described above.

---

2. In a very interesting paper, Amulya N Reddy (1981) had shown that the technology carried the genetic code of the society (or social context) in which it evolved. Lakshman Yapa (1981) had also demonstrated in another paper on EC-political Economy the range of technological choices which evolve depending upon the relative factor supplies in an economy. This was similar to the idea of Hayami and Ruttan (1980) on induced institutional innovation model. The difference between what these authors have suggested and what I am submitting is more in the area of eco-specificity of institutional forms and rules and the cultural context in which these rules are interpreted. I also suggest that the institutions provide 'grammar' while the culture provides the 'words' of a language of sustainability(Gupta, 1990).

An organisation evolves into an institution, I submit, when *internal commands* with in individuals replace the *external demands* made by the organization as motivation for action. If people behave in the collective interest not because someone is supervising or has an authority to reward or punish, then they are responding to internalized commands or values. Sanctions perhaps are necessary as a point of reference in the transition period or as reminders of the consequence of possible disorderly world.

Consensus on values does not necessarily mean consensus on perspectives or actions. Thus at one level everybody in an organisation may share the values and yet the norms may provide freedom to interpret them differently. As long as the range of interpretations is narrow, the organization does not have to segment on the basis of belief. Rather, it can differentiate on the basis of tasks and skills. But once the range of interpretation widens, organisations either divide into smaller autonomous units (Holbek, 1988:254), use coercion to influence the minority view, or generate internal markets of IOUs so that 'giving in' on one issue may not necessarily require acquiescing on all issues. Once an organisation becomes an institution, the need for divergence to divide into sub-units gets reduced considerably. In the best democratic tradition the minority view may be heard and if necessary allowed more time and energy to influence the rest, if the argument so demands.

Even if creative differences remain, the sustainability of an organisation would depend upon the dynamics unleashed by the differences. It is possible that some efficiency is sacrificed in favour of outcomes that are less than optimal but are certainly sustainable.

If a hen that lays golden eggs was being developed, the technological aim of outside 'professionals' might be to have the entire egg capacity of the bird available to the recipient society in day one of production. But what if the capacity of the society was constrained in its ability to manage all these golden eggs in such a short time, or constrained in its ability to ensure proper investment of this wealth such that in future the eggs are never required again. In either case the society has to learn to live without the sustained supply of golden eggs. It is not without significance that traditional societies never evolved a calculus that would justify *getting all the eggs in one day.*

Technological innovations evolve in an institutional context. Which resources are economized or expended at what rate, till when and how, to get what results is influenced by how the peer groups define success, valid behaviour or ethics of resource use. The rules that guide the propensity of approval or disapproval also determine how cultural adaptation would take place in the wake of technological change.

Socio-Ecological Context of Technological Change

Most of the literature on people's participation in resource management pertains to generating incentives for people to participate in externally designed programmes and projects. Even when consultation is at the design stage, the control over resources and the way these are used is almost always in the hands of outsiders. If the proposal is to implant a new technology of the type that requires extensive external involvement, then micro-surgery with a long-term telescope should be part of that proposal building or alternatively its coup de grace.

Even when people are the focus, all too often the external "professionals" only select a small, cooperative sub-group of the local community or otherwise implement only part of the program, that which fits the pace of the external agency. If they choose the former approach, then alienation often occurs. The selected group becomes an elite portion of society, controlling resources, discourse, and the instruments of governance. If the 'professionals' choose the latter, its only justification is as an attempt to gain time. But eventually, the partial program results in dissatisfaction and frustration, and may even lead to violent unrest.

I have discussed elsewhere(Gupta, 1981,1985,1989) how the portfolios of enterprises of different classes of households can be classified on the basis of average returns from a technology and the variance in these returns over time and space. Thus we may have four kind of portfolios viz: High Average Returns-High Variance(Type 1), High Avg. Returns- low variance(Type 2), Low Avg. Returns-High Variance (Type 3) and Low Avg. Returns- Low variance(Type 4) . The households who have portfolios characterised by Type 3 portfolios will be the most vulnerable and thus disadvantaged. The processes for participation of outsiders in the survival strategies of households with different type of portfolios will of course vary. We will look into the survival strategies over space, season, sector and social classes in the next part to understand the options and scope for building participative institutions and organizations.

C. Enabling People to Participate

Enabling people's total participation, requires learning the history, culture, and language of local people and the embedded rationality of local practices. It requires a willingness to move at a pace, literally and figuratively, that local communities find reasonable. New participatory, accountable structures can emerge only if the ancient culture and institutions of local knowledge systems provide the building blocks. In the following

section I describe how people have in the past and continue to organize in present for survival.

II. Survival Over Space, Time and Sector

This section on risk adjustment draws upon, among others (Jodha, 1973, 1979, Gupta, 1981, 1984), two recent papers, "Household Survival Through the Commons: Perspectives in an Uncertain World" (Gupta, 1990) and "Pastoral Adaptation with Risks in Dry Regions" (Gupta, 1991) . The socio-ecological perspective acknowledges that rural households must diversify their strategies of resource use in order to survive, individually and collectively, in a high risk environment, e.g. desert or hills with in the limits defined by the ecological context. However, the scale at which different economic activities are combined to generate different types of portfolios depends upon several other factors viz: (a) culture and institutions (e.g. kinship, caste, religion, ethnicity)and (b) the nature of the state and its delivery systems—access to factor markets, e.g. land, labour, capital, to product markets, and to technologies. A causal model of household adaptation that effectively links the ecological context with the evolution of an enterprise portfolio, i.e. with household perceptions of risk and response, and with feedback processes involving the household and the ecological system, is necessary to the development of appropriate resource management programs. It is the feedback process that in a dynamic framework constrains or broadens household choices over time.

The stakes different classes have in environmental preservation are modified by the surplus, subsistence, or deficit condition of the household budget on one hand and by the institutional context on the other.

A. The **Nature** of Risk—Space, Season, Sector

Spatial hazards are the area specific contingencies. These are the risks which emerge due to presence or absence of certain endowments. Seasonal hazards refer to over time risks mainly concerned with climate and location interactions. Sectoral hazards broadly refer to risks associated with economic activities. Transport, communication and agriculture sectors face greater incidence of sectoral hazards in drought prone or flood prone regions or hill areas. Seasonal hazards consist of abnormal monsoon, flood, stormy wind, hailstorm etc. Spatial hazards would require identification of territories which suffer from region specific hazards.

Usually some components of the risk can just be appreciated (i.e. we have to take note of them but we can do very little to change them), influenced (we can modify the causal factors only marginally), or manipulated or significantly modified (Lethem et at, 1980). The strategies for risk adjustment at the household level can be strengthened or weakened by public policy.

See Annexure one for a detailed list of various risk adjustment strategies evolved by the households in high risk environments.

B. Interaction Between Time, Space, and Social Exchange

When we look at social institutions we begin to appreciate the advantage of taking a long-term view of human interactions. This is especially true for traditional societies, which view the space-time continuum much differently from the modern societies. Most cycles in nature, those to which traditional societies are attuned, have very low frequencies vis a vis cycles in the digital age (Periera, 1989, Chaitanya, 1992). Usually inherent as well is a sense of optimism, a patience to wait for the silver lining to come into view as the dark cloud rotates. Transmigration of the soul (among different life forms) over time and space is a concept very deeply embedded in most cultures that powerfully and reverently respect the domain of nature.

From ecological theory, species occupy niches where conditions for their survival are optimal. No two species can occupy exactly the same niche, i.e. the same space at the same time. Humans, as a result of technology, have altered the condition of the niche-specificity model. Humans have discarded the concept of them as a species playing only a finite portion of the roles which exist to make this biosphere properly function. A modernist worldview that holds the rights of humans as superior to other organisms, treats the rest of nature as something that is meant to be modelled, controlled, and used. Prominent among many barely extant societies, ranging from arctic Amerindians to tropical tribal communities, is a radically different view of existence. These resource-conserving communities often designate critical or fragile sites, such as the origin of rivers, erodable mountain peaks, or special lakes as sacred areas that are full of mythical metaphor, for the purpose of restraining people's use. This is not functionally so different (or even less mythical) from modern policies that designate vulnerable sites as sanctuaries for the protection of biodiversity. But, it is only the latter that must devise regulatory forces for keeping people out. Likewise, hunting of certain animals is banned by modern bureaucratic regulators to prevent excessive exploitation, but these easy-to-design measures, which require extensive external policing, are rarely sustainable. We have something to learn from societies wherein people perceive territorial arrangements with other humans differently and wherein people have only limited rights relative to other organisms, because of the alternative ways of conceptualizing collective action. Ramakrishna's work with shifting cultivators in North-east India shows very strongly the potential of learning from such communities under pressure of modernist 'developmental' interventions.

Larry Merculieff(1990), commissioner of the Sea Otter Commission, Alaska, raises a fundamental issue with respect to defining resource boundaries and legitimacy of people's traditional practices. He suggests that environmental activists as a result

of their desire to protect animals are destroying the sustainable coexistence that native Alaskans have developed within nature. The activists are obviously working from a belief that shears apart animal and human worlds and then projects back misplaced human values onto animals. Merculieff counters that the native Alaskan knowledge is one based on a,

> "...hundred of generations which allows us to understand that humans are part of all living things and all living things are part of us. As such it is spiritually possible to touch the animal spirit. In order to understand them. Our relationship with animals is incorporated into our cultural systems, language and daily lifestyles. Theirs (the activists') is based upon laws and human compassion. . .Because we are intricately tied to all living things, when our relationship with any part of such life is severed by force, our spiritual, economic, and cultural systems are destroyed. Deep knowledge about wildlife is destroyed, knowledge which western science will *never* replace... I leave you with this last thought—we have an obligation to teach the world what we know about proper relationship between humans and other living things(in Gupta, 1991).

An example of misplaced control and management is the Bharatpur Bird Sanctuary. It was set up to provide safe breeding ground for birds migrating from Siberia. Pastoralists had been grazing cattle on the site for ages, but since it was assumed by planners that the cattle would disrupt the birds, this activity was excluded. The restriction generated tensions that eventually resulted in police firings and pastoralist deaths—nonetheless the ban stood. Then, after some years when the grass had grown tall in the absence of grazing, the birds stopped coming. Ecologists discovered that the insects, which had been attracting the birds, could no longer be found in the tall grass. The absence of cattle meant the absence of birds. The sanctuary now symbolizes a monument of human arrogance and ignorance[3].

Development personnel must begin view the non-utilitarian constructs of local knowledge as a necessary adjunct to short-term utilitarian logic. The need for myths has existed in all times. Safe nuclear energy is as much myth as a mountain named after a God who does not like iron (lest people take axes or knives on this mountain and cut trees). In one case the myth may serve large corporate interest, in the other it may serve the larger human cause.

---

3. Such tensions are getting built world over when the people (who co-existed with the wild life in the forests for centuries) are excluded. It is often forgotten that the interactive systems survive with human interventions. If there are cases of poaching or excessive hunting, it either shows corruption and collusion of the Forest Protection authorities, or weakening of the property rights of the people over the natural resources. In some cases, it may also be because other support systems for the local people have become weaker. In a few cases it could just be the opportunism of the greedy fews. In any case, the institutional solution may have a better chance of surviving rather than a coercive route(also see McNeely, 1989, Gupta, 1991).

Space also provides an identity that is linked to the maintenance of biodiversity. The uprooting of people in the name of technological progress undoubtedly robs them of long-evolved, specialized knowledge. This knowledge has been sustained by the cultural network. The concomitant loss of both can not be stemmed too quickly. Tribals who are being rapidly and extensively ousted, e.g. by irrigation and other 'developmental projects,' are protesting the loss. Some of the most biodiverse regions are inhabited by poorest communities. The market is not able to generate demand for natural products of different shape, colour and sizes(Gupta, 1992a, 1992b).

What kind of compensation, rehabilitation, and stake building is required to generate appreciation and accommodation of local visions(see Sen, 1992; Periera 1989, 1991, Gupta, 1992) so that space remains properly articulated is an issue. The answer may depend upon our understanding of the coping strategies of local communities and the conflicts inherent there in.

III. Eco-specificity of Social Interactions:

A restraint on individual desires and an acceptance of environmental limits in deference to the claims of next generation may be difficult to institutionalize if only (so-called) rational rules are used.

In different ecological regions different constraints predominate, thus an eco-specific mix of strategies and social structures is required for success. However, there are distinctly different patterns of finding solutions in market-dominated versus nature-dominated regions. The former regions are the well endowed, irrigated, low risk, high population density pockets. Since large surpluses are available to people, strong market forces can replace the support that might come from social institutions in nature-dominated regions.

Some of the key contrasts are mentioned below:

	Market dominated	Nature dominated
1. Communication system	Digital	Analogical
2. Pooling of resources	Very low	Very high
3. Reliance on common properties	Low	Very high
4. Settling of books of account	Very short term	Long term

5. The proportion of women headed or managed house-holds	Very low	Very high
6. Women participation rates	Very low	Very high
7. Reciprocities	Specific	Generalized

In a market-dominated region, if a guest comes unexpectedly one can always get things from the shop. In drought, flood, forest, or steep terrain regions this possibility likely does not exist. Instead one might rely on the informal co-operation of neighbors. Similarly, if it rains in a drought-prone region on one side of the village and not the other, then the collective sense is there to pool bullocks and implements so that the scarce moisture is not lost.

Communication systems involve metaphorical or analog means in nature-dominated regions largely because here ambiguity provides a forum for personal meanings. Digital communication functions on a binary, yes or no format, whereas analog communication requires messages to be coded in culturally-specific metaphors. The compliance of collective decisions is much higher in analog systems than in digital ones.

In some nature-dominated regions IOUs are never 'settled,' rather they continually move—just as nature itself is continually moving. If we wish consider the settlement of IOUs in these regions, at least we must be willing to peruse a large expanse of time. The other thing we notice is that, given variabilities in endowments, exchange in one resource is usually balanced only by another form of resource. Reciprocity becomes very generalized. It would be difficult to work out the equivalence between thatching a hut and ploughing a field.

B. Diversification and Social Exchange

The degree of variability in social interaction depends upon the degree of environmental variability. The latter is reflected in characteristics of the household portfolio. Economic household portfolios can be grossly grouped into four categories on the basis of their mean value and their variance: High Mean-High variance (HM HV), High Mean - Low Variance (HM LV), Low Mean High Variance (LM HV) and Low Mean Low Variance (LM LV).

Households that have HM-HV portfolios engage in high income, high

fluctuation enterprises. We can expect their access to institutions will ensure their ability to meet the high input requirement of these portfolios. The networks that these households have among themselves and with other social groups, and the institutions that they will be part of, will be characteristically different from the other categories. Bringing such households together will have its special concerns.

Households with HM-LV portfolios will obviously have very high control over resources and institutions and also accumulate maximum surplus among all the groups.

Households with LM-LV portfolios are characteristically ones with simple technology, small-capital enterprises with low, but stable demands, e.g. farmers using local variety crops or livestock breeds. Such subsistence-oriented households are quite stable. Concomitantly, the social ethos of such groups is bound by stable institutions and cohesive leadership. There will be limited motivation for entrepreneurial shifts.

LM-HV households are the most vulnerable category. Farming households will have crop and livestock enterprises that are vulnerable to environmental and market fluctuations. This will lead to low surpluses and budget deficits. Their dependence on other social groups and on informal institutions, such as like moneylenders is enormous. Their vulnerability often acquires highly exploitative forms that in turn serves to divide them into conflicting subgroups. Collective action among such people is extremely difficult for economic purposes. For cultural and social purposes, they have perhaps one of the strongest indigenous institutional infrastructures. Unfortunately, their rich, tacit knowledge base is confluent only with abrogating self-images. There are exceptions, however, particularly with artisans and pastoralists. Such groups may have a stronger self-image and less vulnerability (especially in regions where some demand for their product exist.) The risks spread over space, time, and sector must be carefully appraised in perceiving how to best participate in the evolution of their institutions.

IV. Collective Action, Risk, Redundancy, and Diversification

Collective action takes place at many levels. Each household irrespective of the above mentioned categories will have several identities, each of which has emerged from a prior knowledge base. Collective knowledge is often embedded in metaphors, myths and folklores. This knowledge manifests itself in both formal or informal roles.

In the formal role, knowledge is expressed as information relevant to participation in social, market or state institutions. Although individual participation may vary its consequences can be measured or accounted for. In its informal role, knowledge is expressed through cultural, religious or ethnic networks. Innovation and creativity are associated with both roles, but are more pronounced in the case of the informal role(For extensive

review of institutional aspects, see Ostrom, Feeny and Picht, 1988 and for CPR see, Ostrom, 1990)•

A. Risk **and Redundancy**

Redundancy can be seen as portfolio insurance against unpredictable scarcity. What would rationally appear as a negative return enterprise becomes as a positive one from this perspective. Such an enterprise might be kept in a portfolio if it (a) reduces the portfolio variance by generating externality (e.g. manure which has no market value but which is necessary for successful crops or unmarketable tree species that are necessary to the health of the overall agroforestry system), (b) meets certain cultural needs (e.g. varieties of rice that have little market value but that are used for religious occasions or old cows that are not culled due to religious taboo on slaughter) or (c) provides opportunity for renewing certain skills which otherwise may get lost or weakened . However, too much of redundancy may confuse and too little may cripple (Gupta 1985).

Buzdar (1988) investigated multi-enterprise, multi-resource based survival strategies in an alpine region of Pakistan The interaction between private and common resources across altitudes here those in the Swiss Alps (Netting 1972) and in Bhutan (Gupta & Ura, 1990). In Pakistan, the agricultural land and animals are owned individually whereas water and pastures are owned collectively. No single altitudinal belt can provide total sustenance to villagers. Households require access to different micro-environments and to variety of enterprises for the purpose of reducing the risk associated with of bad years. Consequently an collective plan involving time and space evolved to insure the success. Pastoralists regulate entry and exit such that presence of the animals coincides with fallowing of fields. This means that cultivators grow crops that mature concurrently.

B. Cooperation and diversification

Runge (1985) drawing upon the work of Amartya Sen (1967) suggests that free riding was an option but not an imperative in collective choice situations. Particularly if institutions provided opportunities of learning overtime, and gaining order and security in an uncertain world by providing assurances. The assurance problem was seen as a zone of possibility raising two issues:

(1) the potential and actual demand for different resources needs to be taken into account while analyzing the incentives for cooperative action, and

(2) the rules that may coordinate behaviour of groups will vary over size, sector, space and time. The dynamism of this variance may be difficult to capture, we submit once again, if institutional rules pertaining to anyone resource such as land, labour, water, etc., are only taken into account. Hence, the utility of portfolio approach.

Study of natural laws helps in understanding the correspondence between the ecological imperatives and social motivations. For instance, in the Andes it was found that most indigenous fruits were available during rainy season (November to March) such that the dispersal of seeds through human intervention would take place when water was available (Tillman, 1987). There are several examples of such correspondence between the need for a resource to regenerate and evolution of social customs, resource use patterns which are collectively and individually in conformity with ecological requirements of sustainable resources. There are tribes who do not fish during the period of spawning. Further, high germ plasm variability in some of the regions having highest degree of poverty generated a cultural requirement for different types of varieties say rice or potato and tolerance of low level of returns with high variability in different varieties. The survival was ensured because there existed a contra variance in returns of different local varieties. Thus, some output was available no matter whether rainfall was too little or too much. But with declining demand for the skills of such communities or inappropriate rewards for maintaining bio-diversity, the income levels of people have declined. Once the portfolio shifts took place in favour of uniform varieties or some other enterprises, the cultural edifice supporting respect for sustainability through diversity crumbles down.

Some other ways in which the traditional societies try to manage correspondence between common and private resources are : establishing correlations between one system and another (to use proxy variables like flowering of certain shrubs or grasses to regulate decisions about beginning or ending grazing activity at a given place), generating rituals requiring respect for common properties, instituting customs or festivals which serve as reminders of individual responsibility for a collective good etc. Much of the literature on institution some how has ignored the rich tradition of cultural mechanisms available for management of commons.

Summarizing discussion in this section, we note that environmental risks are adjusted by various social groups through a combination of strategies that vary over space season, sector and social groups. The patterns of diversification have evolved over a long periods and not necessarily toward economic ends. The act of performing sometime is its own reward.

V. Eco-Institution Perspective: Access, Assurance, Ability and Attitudes

This framework helps in appraising any option

Eco-Institutional Perspective

	Ecological Resources	Institutions	Technology	Culture
Access	*****			
Assurances		*****		
Ability			*****	
Attitudes				*****

The time frame in which sustainable options become feasible may depend upon the tenurial rights or assurances available to various resource users. Two kinds of assurances needed are:

i). Vertical assurances i.e. future returns from present investments. If I grow a tree today, will I be allowed to cut it tomorrow.

ii). Horizontal assurances i.e. others behaviour vis-a-vis one's own. If I don't graze my animals on common land, will others also not graze.

The attitudes are both the result or the outcome of the experience with resource utilisation and also the causal influence on the response to institutions. The attitudes provide a cultural basis of institutional working.

All the four As i.e. access, assurance, abilities and attitudes, must be satisfied in a system level intervention for it to be sustainable. The advantage of the framework is if we know any two dimensions we can speculate about the third. And if we know three, we can speculate the fourth. Let us take the. case of a technology for plant protection. It is useful for me to use

biological pest control, if I have some assurance about others behaviour. But if I did not, I might spend more on chemical pesticides, and increase the cost of plant protection of others as well. Further it is not enough to have access to technology and skills or ability to use it, if assurances are not available. Likewise, the culture of collective survival vis-a-vis individual survival would also influence the sustainability of technology as well as institutional arrangement.

For instance, pastoralists need access to grazing land, water, place for night shelter, food and other necessities like veterinary medicine during migration. Need for assurance about security of livestock and self in the unknown or less known regions generates institutions for collective survival. Agrawal (1991) illustrates how in some of the migrating dungs (group of shepherds) a sort of relay race is performed for night watchman duty. Every person has to guard the herd in the night by moving around the herds settled in concentric rings with women in the centre and the animals and the men around them. He takes a small stick to be handed over to the appointed person at fixed time in the night to change their turns. If a person sleeps over, it is easy to find out the culprit.

Likewise, there are other mechanisms developed to have other assurances. People in Andhra pradesh villages receiving herdsman from Rajasthan have an informal arrangement for deciding whose fields should be penned this year by whose heard, an assembly of village elders negotiates with the scout party of the pastoralists about which herd will stay in whose field. The obligations of payment to a village common fund, herdsman or the farmers are also spelt out(Wade, 1980). Friendly relations among the visiting herdsman and the local settled populations can not always be taken for granted. There have been many cases of violence against pastoralists around grazing in forests (with or without sanctuaries) , private fallows, roadside fallows, at inter-state borders etc. There is a Supreme court Judgment permitting unrestricted right of pastoralists to move from one state to another. However, weakening of assurances from state or host village communities obviously increases grazing pressure on more marginal uninhabited lands leading to ecological crisis.

The improvement in access or assurances only will not help if the skills of the pastoralists to use available opportunities do not simultaneously improve. Most pastoralists can inject medicines or vaccinate their animals themselves. But there remain a vast range of traditional medicine systems or knowledge about combination of stress fodder and feeds during drought which remains to be properly analyzed, screened and diffused.

Gupta and Ura (1992) have noted the peculiar way in which ecological and social interactions emerge in the context of mountainous contexts. Cultural norms can help in counteracting some of the 'rational' (in short term), but non sustainable resource use strategies. A pastoral group can evolve norm of spending

most time on patches with highest rate of return[4]; or can evolve norms of mobility even if resource supply did not warrant it. It could be guided by the need to avoid intermixing of yak herd with cattle herd (as we shall see later) to avoid disease transfer. In some cases, hunting tribes have used a randomization rule to overcome the tendency to hunt where the maximum game is likely to be found [5]. Assume that there is a water point where animals come at a particular time in the day. 'Rational' strategy might imply hunting the animals when they come there. Some tribes use different ways of deciding the direction in which to go for hunting by circulating a stone tied to sling of rope and then throwing it. In which ever direction the stone went became the direction for that day's expedition.

Such norms require that group should consider no catch or game some day with lots of catch on other days with equanimity. It is also expected that norms of sharing will emerge to take care of the bad days.

Centralized exchange network sometimes could compensate for geographic diversity [6]. In a study of Torbel, a small mountain village in Switzerland, the adaptions of the community to diversity of resources and uncertainties of environment has been explained through expansive, intensive and regulation process [7]. Building irrigation channels though inter-village coordination was the expansionary strategy. Fertilization of meadows, repair or modification of irrigation channels and recovery of washed away soils were described as the intensification process. Regulation referred to the exclusion of outsiders from the citizenship of the village, limiting number of grazing stock, limiting of wood cutting and democratic means to centralization of power.[8]

Mixing fluctuating scarcities with geographic diversities and resource concentration could lead to complex social structures

---

4. Anthony Stocks (1987) "Resource Management in an Amazon Varzea Lake Ecosystem: The Cocamilla Case", pp. 108-120 in Bonnie J. McCay and James M. Acheson (eds.) The Question of Commons: The Culture and Ecology of Communal Resources, The University of Arizona Press, Tucson.

5. Luther P Gerlach and Gary B Palmer (1981) , Adaptation through evolving interdependence ,In Handbook Of Organizationai Design ,Paul C. Nystrom and William H.Starbuck(eds.) Oxford University Press, London, pp 323-384.

6. M. Sahlins (1968) "Notes on the Original Affluent Society" in Man the Hunter, R. Lee and I. DeVore (eds.), pp. 85-89, Chicago: Aldine.

7. R. Netting(1972) "Of Men and Meadows: Strategies of Alpine Landuse" Anthropological Quarterly, 45 (3), pp. 132-144 in Gerlach and Palmer, 1981 op cit.

8. R. Netting (1976) "What Alpine Peasants have in Common: Observations on Communal Tenure in a Swiss Village", Human Ecology 4(2), pp.135-146 in Gerlach and Palmer, 1981, op cit.

among three groups of people in Zagros mountains of Pakistan viz. Pathan farmers, Kohistani farmers and Gujar Herders. The farmers using rich soil and water resources exchanged goods with the herders who exploited dispersed grasslands. Two of the groups shared a resource. Gujar herders utilized Kohistani pastures in the winters when the latter fed their cattle from resources [9]. Mutual dependence among cultivation and herders in some cases could be mediated by state control as in the middle east [10]. The segmented, polycentric, integrated network on the other hand concede the autonomy of different sub groups, diversity of their goals and multiplicity of leadership or potential for leadership [11]. Gerlach and Palmer (1981 : 350) suggest several possible ways in which strategies of environmental adaptation could be classified [12].

(a) Diversity as compared to uniformity of resources could be dealt with through alternating structures and resources, by specialization of segments, and exchange through networks; Alternating structures imply temporary cooperation. The centralized exchange networks may compensate for geographic diversity.

(b) Societies respond to concentration of resources through consolidation of consuming and protecting seg ment, by coordinating productive and defensive efforts in cooperative networks and by expanding resource development. Concentration Centralization may in the long term be quite mal-adaptive since it is like putting all the eggs in one basket and is characterized as producing disastrous inter-connectedness.

(c) Scarcity of resource could be responded through (i) competitive expansion of control over resource use and elimination of outsiders; (ii) involution of structures, diversification of resource itself, increasing efficiency of resource use, specialization of segments and emergence of centralized structures.

(d) Fluctuation required alternating structures, establishment of redundant resources, networking and surveillance of sources, randomization of risks, storage of resource and decentralization of structures.

---

9. Fredrik Barth (1956), Ecological relationships of ethnic groups in Swat, North Pakistan, American Anthropologist 58:1079-1089 in Gerlach and Palmer ,op cit 1981:362-363.

10. Daniel G. Bates (1974), The role of the state in peasant-nomad mutualism . In Yehudi A Cohen (ed), Man in Adaptation :The Cultural Present (2nd edition):2S5-296. Chicago:Aldine.

11. Gerlach and Palmer , 1981 , op cit

12. Gerlach and Palmer ,1981 ,op cit

Bhutanese experience not only illustrates use of several of these strategies but also expands the framework of adaptation through interdependence. Just like Japanese villagers, Bhutanese may not rely entirely on socialization as a means of ensuring behaviour that avoids the tragedy of the common [13]. They do not rely just on material incentives or disincentives. There is no assumption made about isomorphism between 'religious reformulation and practical experimentation' (Brightman, 1987:137); and long standing contradiction between 'sign' and 'interest' values provide impetus for continued experimentation about relevant rules and principles for changing resource endowment.

The 'sign' values are semiotically determined through social sharing and reciprocity of meaning. The 'interest', value signifies the position of valuated object in relation to purposive activity'[14] . The red rice may be grown because it required less water and also served symbolic purpose for certain religious offerings. Once foreign demand for this rice converts it into a highly prized commodity, the 'interest' value might supersede momentarily the 'sign' value. After advent of Buddhism, animal sacrifices were substituted by symbolic rituals in India requiring animal forms made of flour or other eatables .

While designing institutions[15], excessive emphasis has been given

---

13. M.A. McKean (1984) , Management of Traditional Common Lands (iriachi)in Japan., paper prepared for the Fall 1984 workshop on Common Property and Environmental Management ,Duke University, sponsored by BOSTID, NRC , National Academy of Sciences, USA in Institutional Arrangements for resolving the commons dilemma: some contending approaches. In McKay and Acheson ,op cit.

14. M Sahlins, (1981) Historical Metaphors and Mythical Realities Ann Arbor :University of Michigan Press.,pp 68-70 ; also see Robert A. Brihtman ,(1987) Conservation and resource depletion :The case of Boreal Forest Alonggquins in The Question of Commons :The culture and ecology of resources, Bonnie M McCay and James M. Acheson (eds) Tucson:University of Arizona Press.,pp 135-136.

15. Gupta and Prakash (1992) have reviewed the institutional context. Eisner views Institutions as "set up of rules for decision making on part of individuals in repetitive decision making situations involving more than one person which has acquired general recognition to the extent that the individuals concerned have reciprocal expectations with regard to their respective behaviour" (Eisner: 1987:5-14).

They add:

> Institutions have regulated human behaviour since time immemorial. Institutional intervention acknowledges both the economic and the non economic character of human beings (Neo Classical framework views man solely as an economic entity)(Myrdal : 1977:3-4 ; Wolozin : 1977:33) It therefore uses both economic and non economic processes to bring harmony between individual rationality and collective rationality. Further institutional innovations don't assume decision makers behaviour/taste /preferences to be given. Thus compatibility between environment and growth may be initiated not only through appealing to 'human selfishness' but also through changing the thinking of people (green movement, Responsible care code amongst chemical companies in U.S.A.) or through redefining / creating new markets (e.g. market for Sulphur Di Oxide quotas in U.S.A.)

on utilitarian, quantifiable or measurable dimensions of economic realm disregarding the other dimensions as mentioned above. Sustainable institutions can be designed only when sustainability of spiritual dimensions and processes can be ensured. The revival of religious identities world over indicates that the gaps in social existence left unfilled by the markets, state and formal institutions are sought to be filled through religion. To my mind such a view is valid but only partially. To me it appears, that many individuals and social groups are trying to fill these gaps through nature augmenting innovations in technological or institutional fields. It is these innovations to which we shift in the next part.

VI. Local Creativity and Organizational Development

A prevailing reason why many interventions fail is because the local knowledge system is discounted. If considered, local knowledge is seen only in an utilitarian perspective(Gupta, 1980, 1981, 1987, 1989; Richards, 1989, 1985, 1992; Verma and Singh, 1969; Dharampal, 1971; Chambers, 1983; Bebbington,1992; Periera,1991). Although development planners have realized this for some time the mechanisms they choose to incorporate local knowledge are often worse than the problem. Various short cut methods popularly called as rapid rural appraisal (RRA) are invoked to get a quick handle on local situation.

The spirit of excellence, critical peer group appraisal, competitiveness and entrepreneurship, so vital for self reliant development emerges in networks of local 'experts', innovators and experimenters. Again, it is true that farmers and artisans experiment, but not every one is equally creative. In addition, the organizing and motivating principles characterizing creative groups are also likely to differ. The organizational principles

---

...Continued...

Ostrom (1990:53-54) argues that three kind of rules influence the institutional evolution viz: Constitutional rules(governancs, boundary, legitimacy related), Collective choice ru!es(prescribing policies for resource management) and Operational rules (allocation, monitoring and enforcement). She further adds that the operational rules are easier to change, the collective choice are more difficult and the constitutional the most difficult.

To put it more simply, one could also suggest that we could have basically two kind of rules: the boundary and the resource allocation. The conflict resolution rules evolve in the context of these two (Gupta, 1985). The boundary related rules determine the jurisdiction, who is in and who is out, what makes people accept these boundaries (customary rules, traditions, culture, historical experience and nature of governance) etc. The Resource Allocation rules determine who gets what when, how will some people be compensated if some others gain or do not lose; or what goals to be pursued(not taking the societal goals as given).

The Conflict Resolution Principles deal with the process through which conflicts are resolved, for example, arbitration, adjudication, various bargaining models, voting, consensuses through general body meetings or through delegations (elected, non elected), etc. The principles provided in the Boundary Rules and Conflict Resolution Rules are operationalized through Conflict Resolution Rules (relating to processes), so that institutional environment for sustainable resource management can be generated and maintained.

which guide collective action in different regions would obviously have some common but many unique dimensions as those guiding individual entrepreneurship.

A. **Building Upon What is Known**

The institution building process involves intervening, simultaneously, in eight dimensions of organizational change: leadership, stake building, value reinforcement, clarifying norms and rule making process, capacity building, innovation and creativity, self renewal, and networking. Institution building (IB) theory evolved to increase the capacity of third world organisations to receive funds/aid and use it efficiently and effectively. The problem was defined from external perspective and resolved accordingly. Such a perspective continues today and, therefore, can continue to provide only limited insights for strengthening the capacities of indigenous organizations. Kleymeyer (1992) observes:

> ___(T)he cultural expression, in all its richness and variety, is not just a by-product of how a society organizes its social and productive relationships; it is a vital instrument for generating the insights and energy needed to transform those relationships.
>
> Nearly two decades of grassroots development experience confirms Wali's contention that this aid is wasted unless it builds upon and strengthens the patterns of community organization which form the core of ethnic identity. This means the community must be given options that allow local people to set the agenda for their own development and to select technologies that reinforce rather than undermine community cohesion (1992:22-24).

Unfortunately, the reader can't tell if Kleymeyer is referring only to those technologies developed elsewhere. An alternative way would be to demonstrate the processes of increase in the pest infestation subsequent to the introduction of monoculture of a new variety. Later a combination of new methods with traditional ones. Although organisation building is slower and requires refocusing the scientific research process, success is more likely to be achieved in this scenario.

B. Ecological Ethics in Indigenous ecological Knowledge systems

Restoration of the ecological ethics in the communities where it has become weak as evident from decline of common property resources and associated knowledge systems, will depend upon identifying historical strands of critical thinking as mentioned above. By linking the new interventions with the old ideas, such institutional processes are triggered are more likely to generate respect for continuity and at the same time enable change. One doesn't have to romanticize the capabilities of indigenous knowledge system. There are, however, strengths of the local knowledge system which can help extend the frontiers of natural as

well as social sciences.

The relationship between culture, technology, and environment has to be understood if local organisations are to develop and take root. The example of parrot flying away or the poacher punished by being asked to stand under the sun and feed the birds, illustrate how indigenous institutions blend an environmental ethic into their culture.

The linkage between formal and informal knowledge systems as also institutions mediating our perception of nature can be seen with the help of the diagram given on next page.

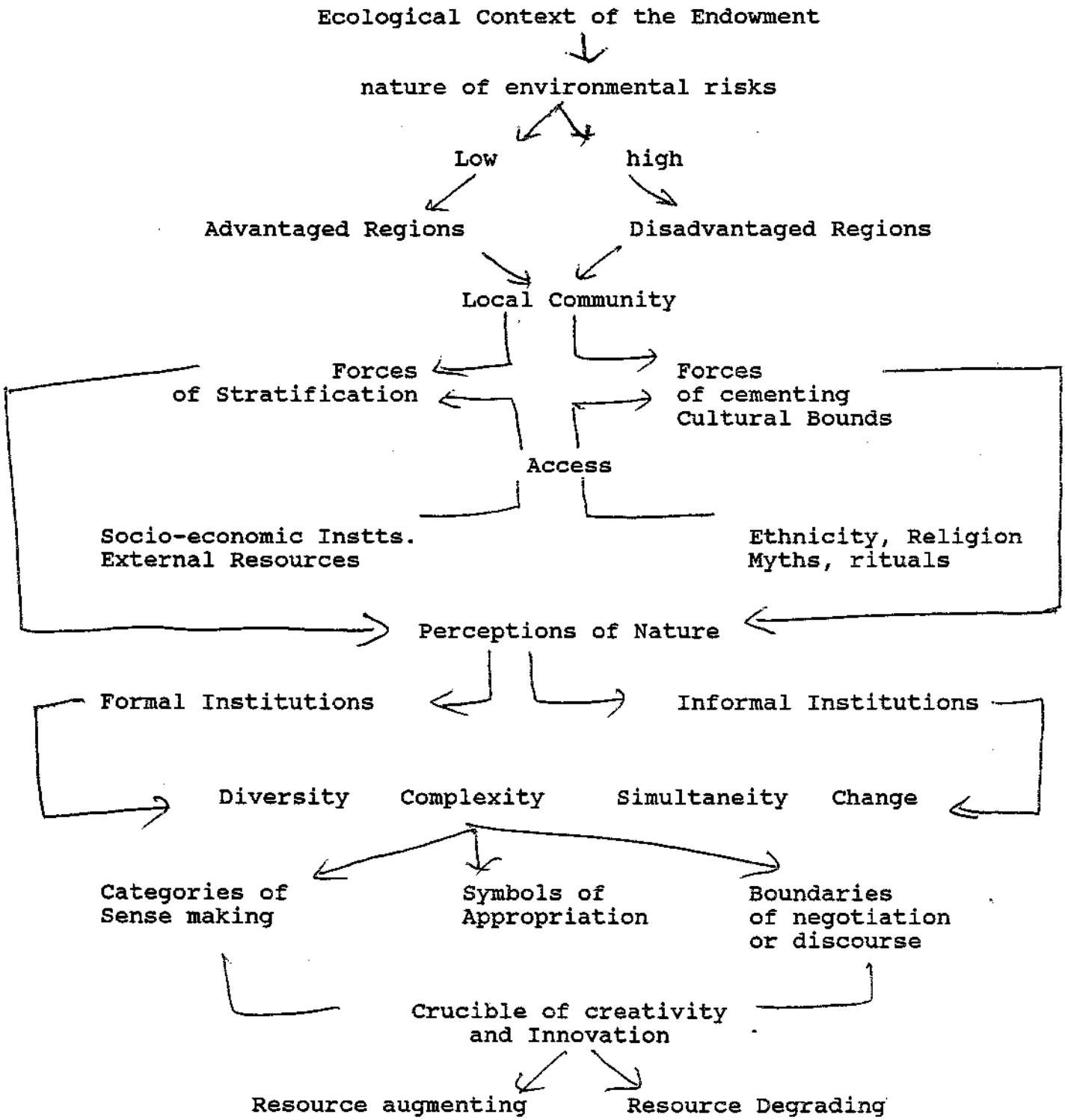
The local communities have elements of stratification and cohesion at the same time. The access to resources may be unequal due to property rights sanctified culturally or by state or some times just the local usurper. The stratification may occur due to inter-generational transfer of property or bad luck in discriminating good from the bad opportunities.

But there are unifying tendencies too. It could be religion, caste, ethnicity, myths or rituals. The cooperation through this route may take place at sub group level. That is why most institutions of resource management have fuzzy boundaries. In each group there are people who agree only partly with the rules. The pluralism of this sort is also a guarantee against too quick an agreement(which I have asserted is a sure sign of abortion of the idea eventually, Gupta, 1984) or for too long.

The perception of nature is mediated by formal institutions in just as much by informal institutions. There are four facets of nature which have to be made sense of in any transaction. The diversity indicates the ability of a natural system to cope with different stresses. It also produces possibilities for human mind to select and specialize. The complexity refers to interconnections among different parts of nature. Change in one may lead to change in many others and often in unpredictable ways. The simultaneity of exchange of energy and information is to counterpoise the issue of sequentialism and linearity so deeply associated with so called modern science. Change is a consequence as much as it is precursor for nature to deal with chance and necessity.

The categories of sense making distinguish the formal and informal knowledge systems. Once certain categories become powerful in defining the boundaries of a phenomenon, the systems of appropriation gain legitimacy through the efficiency with which resources are extracted. The crop and weed are two such categories. Who are considered as stakeholders in a resource context also get determined by the systems of sense making. For instance, what is a forest, a place where tree grow, wild life lives,, rivers originate, herders graze their animals, farmers collect seeds, manure and pine needles for cattle pen and later for manure-, etc. One can widen or constrict the boundary of discourse depending upon

who are considered to be involved. A temple site in the forest brings pilgrims from all over. May be it has also prevented denudation of the forest for so long. The sacred and secular meanings are contested and crucible of creativity is the outcome.



C. Honey Bee: An Experiment in People to People Learning

Honeybee is an informal network started three years ago. We realized that for the masses in rural areas, experimentation and innovation was a matter of life and death given the uncertainties of nature in their fragile environments.

9. Why Honeybee?

Bee collects honey from flowers and, although these insects extract nectar, they greatly increase success and adaptability of plants through pollination. Researchers extract knowledge of people which can exacerbate their poverty. Efforts are seldom made to connect farmers with other farmers. We write in English language which connects us globally and also domestically with the elite but which prevents us from reaching the people from whom we have learnt. We grow in our careers and achieve wider recognition and professional rewards, the people suffer often silently. The ethics of knowledge extraction—its documentation, dissemination and abstraction into theories or technologies— is a central concern to the Honey Bee staff (Gupta,1989).

It is possible that private corporations may not have much interest in the development and diffusion of such alternatives which pass control of knowledge in the hands of people. However, an informed, educated and experimenting client always spurs better market innovations (see Gamser, 1988). Therefore, there should not be a basic contradiction between the knowledge systems of people and the evolution of market rules to strengthen and build upon it. Honeybee in that sense is an effort to mould markets of ideas and innovations but in favour of sustainable development of high risk environments.

VII. Monitoring the Context of Collective Action

When people come together to manage catchments of a stream, regulate water for irrigation or drinking, protect crop or plantations from pests, observe quarantine to prevent other's animals getting infection, or various other resource related opportunities, they do so in a context.

The content of specific institutional arrangements has to be appreciated in the context of cultural, spiritual and socio-economic conditions existing in a given region. The context in a specific organisations may involve the informal culture, the myths, the collective memory of past experiences and the shared understanding of future vision. The evolution of collective action and its sustenance depends upon whether the members of an organisation monitor the content or the context.

Some of the lessons which may help in understanding relationships between context and content are enumerated here so that their bearing on the organisational growth can be worked out.

A. Implicit Context and Explicit Content!

The emphasis on the context provides understanding of the values and perspectives guiding individual action as well as motivation for collective processing of information. The context by definition is partly explicit and partly implicit. It involves dealing with ambiguity and fuzzy boundaries. The roles become more important than rules. At the same time, each actor in an organisation performs multiple roles and not always in consonance with each other. Different roles require dealing with different histories and boundaries. The nested nature of these boundaries requires greater emphasis on trust creating processes. The internalization of collective interest provides the necessary motivation for individual actions rather than the external regulation through control. When internal commands start dictating behavior of an individual, rather than external demands, the institution building or development can be assumed to have begun. An organisation becomes an institution when it becomes a point of reference in society.

3. Risk and Redundancy

The energy for self-renewal may be provided through the infusion of new ideas, tolerance of dissent and generation and maintenance of diversity. One of the ways in which assurance against unforeseen risks is achieved is through creating limited redundancy. Thus diversity and parsimony have a price. Too much of redundancy can create inertia and too little can cripple. The golden mean can be arrived at by matching the internal resources and external fluctuations. Higher the scarcity of internal resources and external fluctuations, greater may be the need to have redundancy in critical functions. Sometimes rituals and other cultural mechanisms serve as redundant reminders of core values. Many of the modern organisations ignore the role of such rituals and thus become weak over time.

Mechanisms of creative learning involve two basic characteristics of this world(Riedl, 1984:32),"one is a considerable redundancy content; the other is its indefinite constancy. That is to say : in most cases we must expect that the same vents will recur, but it remains quite open in what circumstances and in what sequence".

Perhaps in the rational consciousness we retain heuristics for adventure, risk taking, breaking rules. In subconscious formed over thousand of years of evolution, culturally if I may say so, we retain the redundancy in not just rules but also sense making systems, comprising secular and the sacred strands as mentioned earlier.

D. courting Errors to Avoid Blunders: How Much to Differentiate?

The splintering of an organisation can aid the original missions of an organization if the sub-groups can network and pursue original missions through multiple approaches but common concerns. The emerging challenge before management science to my mind is to get over the traditional problem solving focus and move towards mobilizational goals. In the process of mobilization, the conventional strategies of role definition become irrelevant. When a house is on fire, there is no point in differentiating roles, dividing responsibilities, establishing line of control and organizing the extinguishing of fire. It may be too late by the time organisation emerge. The spontaneous roles and responsibilities can be chaotic and may lead to costly errors. How does one avoid both the extremes.

In many of the traditional societies and even the modern but participative systems, the crisis are invented and spontaneity is rehearsed. However, it is not done too often lest it loses its sanctity. Sometimes the roles are exchanged instead of rehearsing the crisis. This way everybody learns to be inefficient in some roles and efficient in others. Instead of overspecializing, sub-optimality in some roles is deliberately sought so as to be efficient or optimal in other roles.

Whether it is watershed management or organization of collective pest control, these principles will apply and the evolutionary process of an organization can be understood.

VIII. Becoming Accountable to People: Lessons and Issues

One of the fundamental issues concerning the use of natural resources pertains to mutual accountability among users as well as humans and other species in the web of life. Many of the traditional societies devised elaborate rituals of sacrifices to atone for intended or unintended injury to other life forms. Among the people, mechanisms of peer culture have always existed though effective to varying extent in different groups.

There are numerous ways societies build in accountability across class and income levels, resource markets, generations and living beings, in general only some of which I describe below.

A. Two-Way Communication Infers Two-way Power

Horizontal accountability, whether it is between organisational members or people within a society, cannot exist unless vertical accountability exists (Gupta, 1985). Many times the rhetoric of "participation" is used by organisations that are very authoritarian and bureaucratic (see Kanter, 1985). To expect lower personnel to be responsive to farmers, agricultural labourers, or tribals is futile if their ability to influence policy relevant to their work in the organisation is limited. It is obvious that

two-way communication and two way power can only bring about a genuine participative development.

B. Myths, Metaphors and Vernacular Language

By monitoring the metaphors we can access the informal meanings attached by people to different phenomena. Metaphors are powerful medium of communication. By disregarding these we could throw away a great opportunity of learning. Metaphors are by definition incomplete and shouldn't be confused with or are not necessarily in the form of myths. However, both myths and metaphors provide meanings which our language or, even, the traditional vernacular don't convey.

Certain values and beliefs are codified, conveyed, and sustained through myths. And although monitoring what is explicit may shed some light on content relevant to a project, local mythology and metaphors often provide the context.

It is inevitable that during or after an interaction a group will generate certain motifs, symbols, folklores, acronyms, popular jokes, etc., to codify their collective experiences. These experiences, then, remain in a community's memory, available for reference to this group, for some time to come. For instance, the 'Touch and Vanish' was a popular joke about the T&V system and not entirely without any basis. Other acronyms like IRDP (Integrated Rural Development Programme) and DPAP (Drought Prone Area Programme) are given new meanings by the clients and others through similar caricature. For instance, IRDP was expanded in Northern India by bankers as, "*inhe rin dena parega*" i.e. these people (the poor IRDP beneficiary) will have to be given loans. The meaning ascribed to this acronym illustrates the bankers' cynicism and disbelief in project objectives. Wouldn't the bankers' vernacular give an evaluator some clue of the project's status? How does this relate to banker accountability towards their clients? A costly evaluation only made the point obvious.

C. **Monitoring** Contest Changes **the** Content

The story of Akbar and Birbal illustrates how a contextual standpoint of an individual has direct bearing on what one sees as the content. Akbar asked Birbal to shorten a line without rubbing it. Birbal took no time in drawing a longer line adjacent to the line Akbar had indicated. The context was changed! Very often we monitor the content without even realizing the enormous variety of meanings which people assign to an event simply because of the different ways they go about creating and defining their context.

Again, for the project evaluator, the context of monitoring can have a substantial impact on, and therefore modify, organizational culture. In particular, it can be a very powerful tool for increasing accountability.

Of course we would hope that in monitoring context (i.e., the programme setting) we would inevitably design better policies, programmes and projects. The tragedy is that often we monitor only the content—we fail to distinguish content and content. In short, the meaning of activities (i.e. content of the programme) will change depending upon the contest in which we view it's role. The answer to the question about which context to monitor can only be given by various stake holders in a given natural resource management project or programme.

D) Reinterpreting Traditional Myths: Rediscovering the Wheel

Information theory holds that people tended to interpret new information in the context of their previous knowledge and , in lieu of this, old and new information become fused in memory. Endless examples exist of how people actually generate myths or stories to cope with life. New meanings are generated, providing a communication bridge amongst the poor as well as poor and their benefactors. Monitoring myths can increase the potential for learning about why people behave the way they do.

E.) Status and Skills Are Not Always Positively Correlated

I can't help but notice how rank and file employees of an organization hold insights and opinions not available at the "top." Ironically, organizational structures are designed so that information only flows in one direction. It goes, therefore, that vertical accountability among levels within an organization is essential if horizontal accountability is to take place.

Sound values and norms for sustainable resource management are a way of life in traditional cultures. But changes in the magnitude of a sweeping curriculum reform are necessary if we are to initiate large scale change in the way human nature interactions are conceptualised. Can an ecological ethic that will generate long term resource management be evolved the by poor when short term needs are yet to be met? Can institutions to reinforce such an ethic be developed?

X. Ethical Concerns Associated with Participatory Research

Programs involving "participatory research" often leave out some very basic steps. For instance, project scientists and/or administrators fail to share their findings with participants or, in other words, those people who actually generated the data. This failure is unethical because it entails using information shared in confidence (i.e. without clearance from those who were the source of it). To be considered "scientific" findings must be relayed back to the providers of data able to fully understand and appreciate the context of enquiry, as well as creating the opportunity for farmers to offer new insights in lieu of the project . These insights are invaluable in that they are not attainable in any other way.

Lack of mutual accountability is another weakness, for

without it relationships can be sustainable. It is rare that scientists encouraged people to closely scrutinize the assumptions of their models.

The intellectual property rights of the people are still not being protected in most studies. This is particularly true of ethno-biological research. There is no reason why experimentation by local people be considered an ethnic phenomenon. Innovations are necessary in a dynamic environment with declining resources. Many of these innovations can extend the frontiers of science. Since large number of local innovations draw upon local resources and are generally organic in nature, these provide a very valuable basis for searching sustainable technological alternatives.

There are very few technologies sustainable in nature which can be entirely managed at individual level. While the entire research focus in the field of extension science has been on individuals, the group based approaches seem to be acquiring more and more importance. The natural and social scientists have to relax the constraint of individual management while developing and diffusing group based technologies (for plant protection, drainage, watershed management etc.).

Much is said about peoples' participation in research design and project or trial implementation, yet some of the very basic factors concerning human rights is missing. For example:

Research findings are seldom shared back with those "respondents" who provided the data.

A relationship can be sustained only if those involved can be mutually accountable.

Despite the hype, the intellectual property rights of people are not protected, much less observed, in most research.

B. Horizontal and Vertical Expansion

Any organization after identifying its niche and an operational fit with clients will aspire to grow horizontally and vertically. The horizontal expansion can be through replicating a model or a given institutional arrangement in very diverse natural and social conditions. The vertical expansion implies both the increase in the reporting levels and the differentiation of tasks leading to growth in size and functions. The vertical growth may also lead to increase in reporting levels but not necessarily. Flat hierarchies can achieve through iterative leadership roles what otherwise may be possible through a multi-level organization.

Replicating an organizational model or its outputs, arrangements of providing programme inputs or any management activity over space and sector can constitute Horizontal Expansion. The success of such replication has often been limited primarily because the

emphasis has been on replicating structures rather than the process, culture, and the spirit.

I will first discuss the conditions under which expansion become necessary and then specify various ways of achieving the sealer economy. Finally, I will argue that for maintaining peoples' control over the organisations, certain kinds of horizontal expansion will be more conducive. Our thrust is on the polycentric, smaller and autonomous groups networking for common purposes to achieve the similar results as may be attempted through horizontal expansion (though with much lesser efficiency).

a) Why horizontal expansion

In any pilot project, the problems of scaling up arise. Since we do not have as precise theories of social engineering as we have in natural sciences, we have to look for experimental learning situations for evolving methods of organizing work. For instance, in an action research project on watershed, pasture development, groundwater management or sustainable pest control, any particular group of researchers, activists, public servants or NGO workers may identify certain ways of structuring relationships with people better than others. Similarly, certain technologies may be identified which may be more viable than others either because of inherent advantage or because of better institutional conditions. Sometimes the policy environment for a pilot project may be much more favourable than is likely to be the case when the activity is scaled up.

The horizontal expansion thus meets a need for making available similar cause-effect linkages to larger number of villages or local communities as were available in the pilot project. Much, therefore, depends on how we construct the cause-effect linkage in the pilot project.

One of the most common mistakes made in the replication is placing excessive emphasis on structures and very low reliance on processes of accountability, transparency and trust. The result is widespread disappointment in the performance of the project.

The scaling up may also be necessary because the concentrated attention that is given in the pilot project may be difficult to provide ail over the regions where benefits of a programme or a policy are sought to be disseminated. In the process of horizontal expansion, one may moderate one's expectations in proportion to the reduction in the intensity of effort.

The horizontal expansion may also be necessary because successful implementation of a project or programme may raise expectations in the mind of people elsewhere. In a democratic society, the legitimacy of the state depends upon making available opportunities for growth and resource man-

agement as fairly as possible to the largest number of people eligible for the purpose.

The expansion become necessary because of the widespread conflicts about the way access to natural resources should be managed and the way value added usufruct should be shared. By expanding the organizational format, it is expected that the arrangement which worked in one place will work in the other place as well and accordingly reduce the conflicts.

b) Achieving sealer economy

Various reasons mentioned above may justify horizontal expansion of an organisation. However, it is not obvious from the above discussion as to whether creating the similar organisations elsewhere would be the right way. There are many ways in which horizontal expansion can take place:

i) Setting up legal structures in all the villages or districts where a similar need as was evident in the pilot project, exists.

ii) It is possible that pilot project may have been conceived by an NGO, individual researcher or administrator, without necessarily seeking horizontal expansion. An outside agency (government, NGO, aid agencies or professional network) sees the merit of the experiment and accordingly tries to learn the critical steps that made the pilot project succeed. In such a case the expansion takes place not by the agency or group which spawned the pilot project. Instead, an interface organization emerges to replicate the critical lessons as identified by it.

In such a case the interest of the interface organisations may overshadow the interests of the client organization or communities. Since such an organization often garners external resources for the recipient system, the sub-optimality of the horizontal expansion is tolerated or masked till the resources flow in.

iii) A bureaucratic organisation such as forest department may find it difficult to protect the forests in the regions where alternative sources of fuel, fodder and timber as well as other minor forest produce are limited. Given the need for generating partnership with people, the department may extend a model of joint management of resource to different areas having problems of protection or resource augmentation (i.e. afforestation). Such an horizontal expansion can be part of the policy to provide enabling conditions for joint management arrangement to emerge. It can also be an excuse to prevent diverse models of management to be tried and evolved. Since monitoring of diverse organisational designs is always difficult, Bureaucracies prefer standardized designs. The horizontal expansion often is accompanied with

rules and regulations which may have been designed keeping the most favourable site in mind. Expansion in such case may have limited success because of inherent low fit with the diverse conditions of endowment.

iv) Expansion can also be achieved by contracting out certain functions to large number of agents or semi-autonomous units. The core organization does not expand but its functions do. In the case of agency arrangement, certain outputs and associated inputs are agreed mutually so that the agent performs the given functions. The accountability is limited at the same time the outreach is larger. In cases where outputs are precise, measurable and have limited range of quality, the agency arrangement may work. The limitation here is that in the absence of local competition or/and proper regulation by the contracting organization or other bodies, the agents can extract undue rent while providing the given service or goods. By having local watchdog committees some of these limitations can be overcome. Similarly, by inducing competition without impairing ecological balance, the transaction costs can be minimized and sealer economy can be achieved.

v) When the tasks require deeper understanding of local resources and historical arrangements for using them, the horizontal expansion in sustainable manner can only be achieved by involving local communities. The core organization can spell out the broad boundary within which different NGOs, local bodies and other individuals may be encouraged to either bid or seek affiliation. In such a case, the core organisation may or may not provide resources and yet the horizontal expansion of the desirable management conditions may take place. The value building and social mobilization are two major planks on which may rest the success or failure of horizontal expansion. The value building is an institutional process which is triggered through shared beliefs, trust and commitment to common goal. The social mobilization depends on the leadership quality of the core organization or its leader, mutual accountability and the mix of mobilisational strategies and tactics used by the core organization. Sometimes, when the odds are against the given model being replicated, the social mobilization becomes a more effective means of expansion than just the value building.

vi) Networking among autonomous, polycentric and segmented units, organisations or informal association of individuals may provide another way of horizontal expansion. Such networking is voluntary and not equally strong at all the nodes of interface. In other words, some members of the network are more active than others. And yet one carries along such members in the hope that sooner or later, the whole network would move forward. The way each member of the network interprets common goals or means of resource management may not be entirely congruous and yet a kind of

commitment to reach the same point generates tolerance for the diversity. It is recognized that no one way to reach the goal is proven to be right for all the conditions. It is also recognized that different members in the network have varying experience in the past of managing resources and collaborating with others. The expansion in such cases is more of a spirit than the structures.

vii) The expansion can take place through religious, cultural or other social organizations which may not be connected directly with management of a given resource. For instance, if a priest in a mosque encourages the devotees to plant trees or regulate grazing lands, the moral appeal may generate compliance from those who may not otherwise be persuaded by the logic of collective resource management. The emergence of religious consciousness in different parts of the world indicates that the moral boundaries may have been unnecessarily ignored in the process of institution building.

c) Conditions for stability of scaling up

As a general rule, one can state that in the situations of very precise property rights, clear resource boundaries, well-defined inputs and outputs, reasonably well distributed access and absence of any major conflict in using resources, the horizontal expansion through bureaucratic or agency arrangements may indeed work.

However, we are aware that in most developing societies the access to resources is rarely equitous, the property rights very seldom well-defined (the customary laws and rights are often ignored) and conflicts between regulatory or maintenance agencies and the people are widespread. No single model is likely to work in such a case. The problem becomes more difficult when contractual rights of resource extraction by the organised sector (paper industry, timber and furniture industries or other industrial users) exist dating back to colonial period. These rights are in direct conflict with the rights of the local communities. The scale of per household demand of a given resource (grass for rope making, timber for house construction or for petty business or collection of other medicinal and related herbs) may be much smaller than the size of the smallest lot sold or disposed by the regulatory agency (forest department or a corporation). Since the transaction cost of retailing a resource are large, the organisation avoids incurring these costs even though it may be within its mandate. It will use various formal or informal ways or discouraging retailing business. In the process intermediaries emerge and depending upon the competition among the intermediaries, the community may or may not get the resource at reasonable terms.

In many cases, the resource dependent communities question the laws continuing from the colonial period to deny the right of local people over resources. At the same time many of the same groups who may otherwise be fighting the state, also recognise that conservation of resource is vital if the conflicts have to be resolved in any reasonable way. Because if the resources is degraded by the time people gain control over it, victory has hardly any significance. The local communities fighting for their rights have started developing strategies for conservation of the resource itself.

It is this consciousness which otherwise should have been welcomed by the state and conservation institutions, becomes the source of renewed tensions. The illegal felling of trees, mining of minerals or water or any other resource often takes place through a nexus between some of the politicians, bureaucrats, contractors and of course a few local leaders. It is this combination of forces which the local communities have now to fight against. Sometimes international aid agencies indirectly support the local power networks by sanctioning projects which deny local people enough choice in the management of resources.

The strategy of sharing the actual information about available resource, cost of maintaining/augmenting it through bureaucratic means and the distribution of benefits among the state, its agencies and the people, provides a reasonable picture about futility of most of the existing developmental approaches.

In a recent case, the scheme of granting long term lease of degraded land to poor people by the forest department was abandoned. People did not comply with the requirement of growing horticultural species only up to one-third of the total plantation. People had prefer mango trees over all other species. This would have meant providing flexibility to the people so long as resource was conserved in the best possible way identified by the local community. The joint management committees in this case became infructuous because the control of people over the organization was limited or rather minimal.

There will be many more examples of failure of horizontal expansion because of inappropriate framework of collaboration between people and the organisations.

Several alternatives can be tried in such cases:

a) Open sharing of the full cost of managing a resource through bureaucratic means must be the first building block of a dialogue with the people. It will demonstrate the non-sustainability of the bureaucratically managed strategies of resource conservation. It will also disprove the utility of routine huge international aid or borrowed capital through existing bureaucracies.

b) The ratio of establishment to output cost of maintaining or augmenting a resource should be spelt out so that expansion strategies do not necessarily lead to increase in the establishment. Studies have shown that with increase in the workforce, the time is spent in intra-organisational communication far exceeds the time spent in organisation client interactions. This will obviously alienate the organisation from the clients.

c) The pattern of actual delivery of resources to different groups of people must be shared openly so that accountability can be ensured. The expansion versus splitting up can be considered from the point of view of the possibility of different groups of people controlling different units. Conceptually, it is possible that same group of people can dominate and control all the units or sub-units of a resource management organization. In more than 200 sheep and pastor development cooperative societies in a drought-prone district of western India, it was noticed that almost all of them were controlled by non-shepherd communities (Gupta, 1985). However, this is not inevitable. If rules of access and control can be clarified, and if distribution of power is linked with skill rather than economic status, it is possible that different units may be managed or controlled by different groups of disadvantaged people (who have often better skill with regard to management of certain resources). Therefore, the disadvantage of horizontal expansion can be overcome by splitting up rather than just growing big.

Vertical Expansion;

With increase in the complexity of tasks, need for differentiation is felt in the organization. In view of the limitation of span of control (i.e. number of people a manager can effectively supervise) number of tiers increase. However, the conventional pyramidical structure of an organization need not necessarily be most efficient under all circumstances. When a task cannot be decomposed into its sub-components, when local knowledge of resource is very crucial for performance of a task, and when delegation cannot take place because of the first two reasons, the vertical differentiation into multipliers does not help. For instance, in a watershed management project, one cannot have many levels, if holistic perspective and inter-dependence of crop, livestock, trees, soil and water conservation etc., has to be maintained.

Iterative leadership can be effective in a small organization. The implication is that while there are exports, they also have to know other functions and roles in the organization. In some roles an employee may perform leadership function. Whereas in other roles, the person may perform a follower role.

In large organizations responsible for large territories of forests or watersheds or waterbodies, the above principle may not

work. However, even here, the answer may not be a conventional bureaucracy. It has to be remembered that bureaucracies function best when task is standardized the goals are well-defined and authority is proportionately distributed. Therefore, in army or during a crisis such as drought even a development bureaucracy can work with a single line of command, well ordered authority rules and minimum ambiguity about tasks.

Such organizations often become out of tune with changing environment and are almost always unsuccessful in dealing with ecological, cultural and socio-economic diversity. Several models have been tried to deal with such problems. For instance, differentiation in time rather than over space can be used (Shepherd , 1967, described experience of a military raiding unit during II World War using alternating structural forms over time).

> The planning before a raid was done jointly by the entire unit - the private having as much opportunity to contribute to the planning as the colonel. During the raid, the group operated under a strict military command system. Following each raid, the unit returned to the open system used in planning for purposes of evaluation and maximizing learning from each raid.
>
> Similarly, a group or organization in civil life might shift its structure while moving through the various stages of the innovation process. With two major stages in the process, this calls for a dual structure (Zaltman and Duncan 1977)•

The role of NGOs, networks, social and ecological movements and **voluntary initiatives of creative** deviants:

In this paper I have discussed how the debate on sustainable development for natural resource management has been pursued in the context of developing an accountable and responsive organizational arrangements. The self-reliance among the people is possible only when their visions and concerns get articulated in the discourse. Unfortunately, the language of discourse has remained alienated from the idiom that people at grass root level use. Our inability to access this idiom stems partly from our reliance on English language references and terms and partly it is because of our insistence on looking for globally generalisable solutions for local problems. I have argued in this paper that sustainable resource management requires rethinking the very basis of entering into dialogue with people.

Sustainability of resource management depends upon the way we define a causal model of interactions, draw a boundary, attribute responsibility for consequences, organize institutions to correct or contain the negative consequences and maintain the positive ones, generate information and feedback sharing system so that enlightened self interest can become compatible with and lead to collective rationality.

Recognizing that nobody likes a person who warns of a grim future, I want to end this paper on an optimistic note. Once a person was walking across the seashore. There were lot of star fishes being thrown on the shore by the waves. These star fishes were dying very quickly. Another person, a lady observed the first person picking up star fish one by one and throwing it back into the sea. The lady asked this person why was he doing it. There were so many star fishes dying, his action would not make difference to such a large number. This person picked up a star fish and threw it back into the sea and said, "my effort makes difference to at least this star fish which I throw back into the sea".

The research on sustainable alternatives even if does not change the face of the earth would certainly change the person pursing the research. This itself is a good enough reason for modifying one's research agenda and action values. At least one can have one's cake and eat it too this way.

Annexure one:

The strategies for risk adjustments can be analyzed at household, technological, institutional and cultural level.

1. *Household risk adjustment strategies.*

Intra-Household	asset disposal, migration, reduction or modification of consumption, reallocation of resources among different enterprises, etc.
Inter-Household	labour, credit, land related bilateral or multilateral contracts, informal sharing, gifts, etc.
Group or Communal	reliance on Common Property Resources, group ploughing, sowing or other farm operations like plant protection, drainage, purity of breed, etc., group level grain, fuel wood and resource reserves, etc.
Public Interventions	Drought or flood relief, aerial spray for plant protection, distribution of seed or seedlings after natural catastrophes, infrastructural interventions, etc.
Cultural artifacts	Myths, folklore, religious or other sanctions against private profit from community deprivation or for sustainable resource management, use of lunar calendar to synchronize farm operations, informal cooperation through cultural rituals regulating resource use, etc.

2. *Technological adjustments*

Agronomic	dry sowing, early sowing to break synchrony in the vulnerable stage of crop and virulent stage of pest, summer ploughing, cropping, contour ploughing and sowing, inter and mixed cropping, mixed aus and aman sowing (in paddy), laddering and planking, sowing in set and furrow system, water shed technology etc.
Contingency	In many regions probability of some major treatments or risks can be anticipated and accordingly provided for through mid-course correction. For instance, relay cropping, thinning plant population after stress, mulching (it can be both - regular practice or a contingency practice), devegetation, etc.
Salvage treatments	Once a crop or some other enterprise suffers a shock or disturbance, technology may be required to recover or recouperate from the losses. For instance, in flood prone regions, cold temperature at the grain feeling stage may cause sterility for which harvesting crop as fodder and ratooning may help, in a flood damaged deep water rise cutting and sowing of stem of the surviving plants may help.

Preventive treatments	Several indigenous ways of seed treatment by organic gels and other materials exist to minimize drought and pest damage, border and trap crops for pest control, indigenous vaccination among animals, etc.
3. *Institutional risk adjustments*	
Spatial	The banks can lend to less risky villages, scientists can locate trials at less risky sites, the input agencies may locate distribution points in less risky regions because of larger demand.
Seasonal	The lending can be constrained in monsoon season, input supply may be erratic and inventory level low or nil in kharif season, the banking disbursements may be clustered around financial year end even if results are sub-optimal.
Sectoral	Loans for non-farm purposes, rainfed crops, small ruminants, long gestation investments like watershed treatments, etc., may be highly restricted. Credit for various purposes may be clustered even though there may not be a rational justification for such a portfolio.
Procedural	High margins, insistence on collaterals, shorter repayment schedules (even though this practice may eventually increase the default risk), multi-enterprise loans, linkage between investment and working capital loans, group guarantees, saving and lending groups, linking banking and technology, etc.
Background risks	Deposit and credit insurance and guarantees, crop and other enterprise insurance, failed well subsidy, etc.
4. *Cultural risk adjustments*	
Collective action	Group based management of resources such as water streams in hills, plant protection, watershed management, grazing land and common property resource management, rotating saving and credit associations and use of discount money for common property assets such as temples, school furnishings, pesticide sprayer, group norms for collecting fuel wood or roofing material on particular days in the hills, etc.
Folk ritual	Several folk songs, myths, stories, proverbs, etc., are used to generate psychological assurance or social resilience in the local communities, attitude formation and generation of ecosthic is also facilitated by folk media.
Institution building	Generation of norms and values suggesting respect for common properties and participative processes of decision making aid risk adjustments, pooling of bullocks, implements and other resources also facilitated by institution building processes.