Human Ecology of Sikkim

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HUMAN ECOLOGY OF SIKKIM

A Case Study of Upper Rangit Basin

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Contents

Preface

Sikkim is a land of pristine beauty with unique culture caused by the diffusion of Buddhism, Hinduism and Animistic rituals of different religious faiths. It is still relatively untouched by the burgeoning human development activities as is seen in the rest of India. The Upper Rangit Basin is the spiritual Centre in the Himalayas in general and Sikkim in particular through the destiny of religious centres. The residents of this secluded habitat, which on account of its isolation, have continued to live and function in a traditional life style in accordance with their respective ethnic and religious customs. It thus affords ideal holistic view of all human ecological aspects resulting from the interrelationship between humans, the biotic life and the abiotic physical environment.

The objective of this research was to study and analyze all facets constituting the human ecological aspects of Upper Rangit Basin, an important mountain enclave in the Eastern Himalayas in the Indian state of Sikkim.

Religious faith among the local folk has been the mainstay, and living beacon in their day-to-day life, festivities and rituals, even at the cost of personal and state development projects. The lamas and monks reign supreme, and the simple ethnic folk consider the lama's word as 'law'. However, the people of the Basin, especially the youth have the keen desire to modernize; but this is at the cost of losing out on their traditional knowledge of ecology and customs gathered over generations of learning and centuries of experience and symbiotic interrelationship. A mutual incompatibility and antagonisms between traditions and modernity leads to societal conflict.

This conflict can have wide ramifications on development and policy paradigms of the state government. This research has been focused on arriving at solutions based on human ecology of the various human and geographic ecosystems in Sikkim, i.e. Deep Ecology, Cultural Ecology and Spiritual Ecology. This could be the basis for the intellectuals, government officials and religious heads plan development activities based on a healthy inter-mix of traditional ecological knowledge with modern scientific techniques.

1
Introduction

SECTION - I
THE PROBLEM

Principle, Concept and Philosophy

The physical human environment, in a broader sense "the biosphere" has been of an absolute importance for the quality of life of human societies. Throughout the evolutory history of the mankind, it has been only recently that human development began to threaten its very existence. Does the humankind have an absolute right over nature? This has, of recent, cropped up as one of the fundamental issues of environmental ethics, and has been reflected in some of the environmental principles agreed upon by the members of the United Nations Organisation (UNO) (Glaeser 1995).[1]

Principle 1 of the Stockholm Declaration on the Human Environment (UNCHE : 19) states, "Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well being, and he bears a solemn responsibility to protect and improve the environment for present and future generations—". This statement highlights both, the fundamental human right, and also the implied human responsibility. Principle 4 supports this interpretation of Principle 1, "Man has a special responsibility to safeguard and wisely manage the heritage of wild life and its habitat. Nature conservation must therefore receive importance in planning for economic development".

Ecology and (economic) development have been clubbed together to form the concept of "ecodevelopment". Deriving the purpose of this clubbing, we may conclude that development is not solely to enhance economic growth, it must be sustainable, and should preserve and improve the environmental basis for economic development. This

is therefore clear from the UN Conference on the Human Environment (UNCHE) and the Stockholm Declaration of 1972 that Development Policy has to go hand in hand with nature and environment. Thus their recommendation is "Development policy in accordance with nature and environment".

The 1992 United Nations Conference on Environment and Development (UNCED) acknowledged the fact that humanity's relationship to nature and the use of resources and ecological services, have seldom been considered important. The scientific discipline of human ecology provides a framework for thought and research along these lines from political, theoretical, ethical, ethnic, cultural and habitat perspectives.

Reflecting on above, there thus is a need of a philosophy that has a radical departure from the current Western trends. The humankind needs an eco-philosophy that strengthens the nature's roots in the Earth. The grid to be penetrated now, more than at earlier turning points, is one that has grown dangerously abstract in relation to human needs. The urgent task now is to regain concreteness. The concrete world is a value saturated creative process of Oriental Buddhists and Hindus, and Western philosophers, central to the development of eco-philosophy. (Kvaloy 1994).[2]

Environmental Influence and Impact on Environment

Even though technology has removed us from close touch with nature and reduced a certain amount of environmental hazards, our physical surroundings can still exert an influence. Some natural hazards are actually intensified by modern culture. Our modern society has chosen to build large scale multipurpose dams on rivers astride major seismic earthquake zones in developing and developed countries, producing catastrophe of much greater proportion than a conservative folk culture will face in that area in centuries of time period. (Jordan 1990).[3]

Modern culture makes some heavy demands on environment. This is true even in the realm of recreation and tourism. Since early fifties leisure time and related recreational activities by certain rich plainsmen have increased greatly in the Himalayan states/countries. The demand for "wilderness" recreational zones has risen sharply in the last quarter century, and no end to the increase seems at hand.

Hikers, campers, hunters, fishers, bikers, snowmobile enthusiasts, weekend cottagers, mountain climbers, boaters, sightseers and others are making unprecedented demands on the Himalayan states. Persons

engaged in wildlife trade, and those engaged in illegal felling of trees and other fauna have also been drawn in. Such massive activities have put a stop on conservation of the physical environment, let alone nurture it. Mountain roads now suffer from traffic jams, and the mountain towns suffer from residential congestion, litter and noise pollution. The study of Darjeeling hill areas (which forms the southern fringe of Rangit Basin catchment areas) revealed substantial environmental damage including soil loss and long term soil deterioration. Erosion of soil during monsoons, and water scarcity during lean seasons has become a common feature. In less congested wilderness, such as is available in the Upper Rangit Basin, hordes of hikers can beat down trails to the extent that vegetation is altered, erosion encouraged, and wildlife diminished. Even the best intentioned, conservation-minded visitors do some damage.

Ethical Dimension

The starting point for an environmental ethical system is a critique of the instrumental relations between humans and the environment. In contrast to the anthropocentric ethical systems that have been so common throughout the history of philosophy, environmental ethics also makes nature the object of human responsibility. This orientation touches human ecology, which is biocentric at its core. What both have in common is the quest for a social dimension. In the philosophical tradition, the ego was enthroned in knowledge and action. The 'domination-of-nature' ideology arose out of the dissociation of cognition and action from ethical principles, and in the wake of the sheer success of science and technology. (Glaeser 1995).[4]

Environmental ethics of survival demands that humankind have to mend their ways, change their behaviour and attitudes of life, cut their material demands, record their priorities, simplify their life-styles, forego consumerist culture and harmonise with nature. Ecological ethics demand that mankind has to learn to :-

(a) Live with less; do more with less and be content with less.
(b) Produce few consumers; consume judiciously according to need, cut out greed and conserve for future.
(c) Minimise wastage in daily life, avoid criminal wastage of food, water and electricity and all other forms of energy, and
(d) 'Reduce', ' reutilize', and 'recycle' all kinds of wastes within ecologically possible limit. (Sinha 1995).[5]

The philosophical war on the subject of environmental ethics - the

ethical divide between the East and West continues unabated. The strange combination of Western 'mind' in its self proclaimed instrumental and positive form, and the Eastern 'heart', which is more conservative and spiritual in nature, does not resolve gospel of a peaceful co-existence. Sharing a common platform for sustainability remains a far cry. (Bookchin 1996).[6]

Mismatch of Politics and Human Ecology

Political will for environmental protection has been conspicuous by its absence. Environmental problems are by their very nature holistic, needing collective or concerted action, which the governments find hard to deal with through normal political and diplomatic practices. Environmental issues are so different from developmental issues, and do not affect day-to-day life as the issues of poverty and economics. Their impact is hard and of very longterm to point out. Hence politics/ international politics and environmental problems fit badly together because of different nature. (Ramakant 1995).[7]

The mismatch of politics and ecological problems is portrayed below :-

(a) Politics on which the national governments are formed are based on narrowly focused short-term national/political interests, which in turn determine their worldview. The governments do disregard areas that adversely affect national interests, and stress more on their respective political party interests. By contrast, environmental problems are global, and affect nations indirectly in a longrun.

(b) In a way behavioural orientation in the study of politics has become quite dominant. This orientation leaves out values and morals that cannot be measured or expressed in economic terms. Most of the environmental problems are moral issues by their very nature.

(c) Activities of the private sector are mainly devoted to profit. In modern times the so-called economic issues, are related to scarce resources, and the private sector brings tremendous pressures on the governments to give them a free hand or greater freedom in exploring these resources.

(d) While modern politics is supposed to deal with "realism" and real subjects, ecological problems are not regarded as real or serious issues by political leaders (Ramakant 1995).[8]

The basic problem for environmental ethics, and later on, for

political environmental policies is the determination of whether environmental protection should exist for the sake of humankind or whether it should exist for its own sake. One essential difference between ethical and political blue prints of earlier times and those of today lies in the fact that, in the past, the contents of human actions were known. The ethical approach that aims at the individual could be confident that healthy, mature persons could know, and had to know what was good and what was evil. If we observe the effects of human intervention into the ecosystem, we can see that this is no longer the case. The ecosystem of Planet Earth is not entirely known, and cannot be controlled instrumentally. Although we are generally aware of the hazards of pollution, for instance, even ecosystem researchers are not able to predict with any degree of certainty what the impacts of individual interactions might be. Thus in many cases the harmful effects of interventions into nature are difficult, if not impossible to estimate. It is precisely because knowledge of the effects of technology is lacking - so goes the new argumentation - that there is the ethical demand to handle nature as carefully as possible, and to intervene in the natural order as little as possible . (Glaeser 1995). [9]

The starting point for an environmental ethical system is a critique of the instrumental relations between humans and the environment. In contrast to the anthropocentric ethical systems that have been so common throughout the history of philosophy, environmental ethics makes nature the object of human philosophy. Environmental ethics makes nature the object of human responsibility. This orientation touches human ecology, which is bio-centric at its core. What both have in common is the quest for a social dimension. In the philosophical tradition, the ego was enthroned in knowledge and action (ethics). The domination of nature ideology arose out of the dissociation of cognition and action from ethical principles, and in the wake of the sheer success of science and technology. (Glaeser 1995) .[10]

Historic - Religious Dimensions

Gradually throughout the rise of agricultural civilisations during the last 10,000 years, man has increased his confidence and ability to control the means of subsistence. Religion became more a means of establishing favoured relationship with the unknown, and less a means of survival per se. Landscape became property and the concept of proprietary ownership developed. The Judaic-Christian philosophy in particular portrayed land as the God-given property of man. Nature

existed for man to be used by him, and exploited for his own good. Man no longer considered himself merely one part of biotic community, interacting with it in a humble and mutually beneficial way. He was now its owner and master, capable of treating it like any other property. Christianity rose as "the most anthropocentric religion the world has seen". The egocentricity of man could be seen, however, long before the time of Christ. For example, the famous passage from Genesis 1 : 28 exemplifies favoured status which religion bestowed on man:

"And God blessed them, and God said to them, 'be fruitful and multiply, and fill the earth and subdue it, and have dominion over the fish of the sea and over the birds of the air and over everything that moves upon the earth." (Southwick 1972).[11]

The religious traditionalists of Judaic-Christian faith however contest the view that their religion has acted as a catalyst agent towards deterioration of environment. The environmental damage occurred all along throughout broad reaches of Asia where other religions thrive. Yet it is true that advance of mankind has carried with it, the possibility of some destructive force. The Asiatic and African cultures were not particularly gentle with nature. They slashed and burned, overgrazed and stripped the forests for firewood. But their power to do damage was limited. (Toffler Alvin 1980).[12]

Summarizing of Human Ecological Problems

Ecology of Popular Cultures Vis a Vis Rural Folk Culture. Eugene. P. Odum classified ecosystems according to source and level of energy, as outlined at Table 1.1. Serial 4 of the Table represents the popular culture of cities, suburbs and industrial parks. This is aptly named the 'Fuel powered Urban Industrial System', being wealth and pollution generating system, in which fuel replaces the Sun as the chief energy source. These kinds of ecosystems are parasitic, and dependent on the natural ecosystems, and ecosystems based on rural folk culture. With time, the wealth divide has increased, bringing high pressures on the quality of life of the folk cultural region dwellers. (Odum 1975)[13] . (Jordan and Rown Tree 1990).[14]

TABLE NO 1.1
ECOSYSTEMS CLASSIFIED ACCORDING TO SOURCE AND LEVEL OF ENERGY

	Annual Energy flow (Power level) Kilo-calories per Square Meter
1. **Unsubsidized Natural Solar-powered Ecosystems** Examples: open oceans, upland forests. These systems constitute the basic life-support module for spaceship earth	10000-10000 (2000)*
2 **Naturally Subsidized Solar-powered Ecosystems** Examples : tidal estuary, some rain forests. These are the naturally productive systems of nature that not only have high life support capacity but produce excess organic matter that may be exported to other systems or stores.	10,000-40,000 (20,000)*
3. **Man Subsidized Solar - powered Ecosystems** Examples : agriculture, aquaculture. These are food and fiber-producing systems supported by auxiliary fuel or other energy supplied by man.	10,000-40,000 (20,000)*
4. **Fuel-powered Urban-industrial Systems** Examples : cities, suburbs, industrial parks. These are man's wealth-generating (also pollution -generating) systems in which fuel replaces the sun as the chief energy source. These are dependent (i.e., parasitic) on classes 1-3 for life support and for food and fuel.	100,000-3,000,000 (2,000,000)

* Numbers in parentheses are estimated round-figure averages, (1975) E.P. Odum actually little more than guesses since the earth's ecosystems have yet to be inventoried in sufficient depth to calculate averages.

Inter-Ethnic Divide. According to Robert H Jackson, an ethnic group is a collection of persons who share a racial identity, occupy an ethnic platform, recognize and value their common occupancy, and are organized and therefore have a common interest in maintaining their association. (Daniel 1996).[15] When faced with other societies and ethnicities, either on fringes or in core regions of a geographical entity, acculturation and assimilation between them does not normally take place. Conflicts give rise to ethnic warfare, leading to long drawn insurgencies. Most world regions, especially South Asian and South East Asian countries are facing major ethnic turmoils, adversely affecting human development.

Population Pressures. No one cause can be attributed to environmental impact where population is concerned, however a number

of critical factors which when combined, contribute significantly. They include rapid population growth, distribution of the rapid growth (often occurring in the most biologically rich and ecologically vulnerable world areas), density, migrations and tourism. They include very high rates of resource consumption and concurrent pollution. The 'Environmental Impact = Population × Consumption × Technology' equation illustrates how population interacts with environment. Most often when (P) Population and (C) Consumption increase either independently or together, Environmental (I) Impact increases. Technology (T) can contribute both, negatively (pollution) or positively (energy efficient technology). (Khan 1998).[17]

Deforestation and Allied Degradation. Forest has been reduced world wide to approximately 55 per cent of its original cover, and the rate of deforestation is in excess of 10 million h. every year. In India, the annual rate of destruction of forest is 1.3 million ha. The total global loss of species from deforestation alone is 140 species every day. Dr TI Khan explains that deforestation is causing a number of irreversible ecological changes, because of the large-scale exposure of the natural soil systems, which leads to increased erosion and an indirect impact on water resources. The link between food production, soil and water resources is more delicate in the mountain ecosystems.

Loss of Gene pool. Andrew Gouldie (1990)[17] has warned, "Aside from nuclear war, there is probably no more serious environmental threat then the continued decay of the genetic variability of crops. Once the process has passed certain point, humanity will have permanently lost the coevolutionary race with crop pests and diseases and will no longer be able to adapt crops to climatic change. DDT has major effect on sea birds. Their eggshells become thinned to the extent that reproduction fails in fish eating birds. Then, there are indirect causes of wild life decline vehicle speed, noise and mobility have upset remote and sensitive wildlife population."

Human Agency and Geomorphology. All kinds of landforms have been rendered into a state of acute and dangerous brinkmanship of disasters. Landforms produced by excavation, by construction and dumping and accelerated sedimentation, accelerated weathering and mass movement; deliberate and non-deliberate modifications of channels and river channel changes; accelerated coastal erosions and mountain avalanches and land slides and human impacts on seismicity and volcanoes have collectively and individually rendered the planet earth unsafe for all varieties of life forms.

Climatic and Atmospheric Changes. The world climatic conditions hithertofore underwent slow and gradual changes in terms of long drawn out geological periods. Human engineering activities and industrial after effects have together contributed towards accelerated changes on the global atmospheric and allied surface conditions. Prolific increases in release of carbon dioxide and other green house gases, the ozone depleting CFCs, aerosols, air pollution, acid rains, and photochemical smogs are constantly converting the air blanket and earth's surface info a toxic hell, having an irreversible adverse effect on the earth's biodiversity.

SECTION - II
HUMAN ECOLOGY AND HUMAN ECOSYSTEMS

Introduction

Eugene P. Odum,[19] the father of modern ecology defined ecosystem development in terms of three parameters: -

(a) It is the orderly process of community changes, which are directional and therefore predictable.

(b) It results from the modification of physical environment and population structure by the community.

(c) It culminates into the establishment of an ecosystem, which is as stable as is biologically possible in the area in question.

Development of ecosystems as explained above continues to be governed by the nature unless and until there is direct or indirect human intervention. Human ecosystem is conceptually different. It is largely because the massive harvests of negative inputs from human's fuel powered and energy intensive systems modify, halt or abort this developmental course.

Ecology deals with the dynamic balance of nature, with the interdependence of living and nonliving things. Since nature also includes human beings, the science must include humanity's role in the natural world - specifically the character, form, and structure of humanity's relationship with other species and with the inorganic substrate of the biotic environment. From a critical viewpoint, ecology opens to wide purview the vast disequilibrium that has emerged from humanity's split with the natural world. One of natures very unique species, *Homosapiens*, has slowly and painstakingly developed from the natural world into a unique social world of its own. As both worlds interact with each other through highly complex phases of evolution, it has become as important to speak of 'Human Ecology', as to speak of natural ecology.

'Human Ecology', explains Amos H. Hawley[19] (1994), in his write up on 'Ecology and Human Ecology', like plant and animal ecology represents a special application of the general viewpoint to a particular class of living things. It involves both, a recognition of the fundamental unity of animate nature and an awareness that there is differentiation within that unity. Man is an organism, and as such he is dependent on the same resources, confronted with the same elementary problems, and displays in essential outline the same mode of response to life conditions as is observed in other forms of life. Thus the extension of patterns of thoughts and techniques of investigations developed in the study of collective life of lower organisms to the study of man is a logical consummation of the ecological point of view.

Hawley goes on to further emphasise that, the extraordinary degree of flexibility of human behaviour makes for a complexity and a dynamics in the human community without counterpart elsewhere in the organic world. It is this that sets man apart as an object of special enquiry and gives rise to a 'human ecology' as distinct from the general study of ecology.

Definition

The International Organisation for Human Ecology (IOHE) in Vienna (1981)[20] defines human ecology as follows : that which deals "with human life in all its physical, chemical, biotic, mental, social and cultural manifestations from an ecological point of view ; this means considering the interrelationships of a human being or several human beings and the outside world surrounding him/her or them".

The IOHE believes that human ecology should proceed from Haeckel's definition of ecology as the 'ecology of the species *Homosapiens'*. The science of the interrelations among living beings and their surrounding world manifests itself as a systematic science. Interrelations and interactions depend on the traits of those affected, on the one hand, and the characteristics of the surrounding world on the other. Human ecology is understood to be one of several special ecologies, namely that of humans. The specific difference is that, "Human beings are capable of purposive action and of understanding the functioning of systems of which they are part". (IOHE, 1981).

The Compass of Human Ecology

There were some writers during pre World War II period, who would have human ecology encompass the whole field of social science,

and there were others who relegated it to the status of a mere sociological research technique. (Hawley, 1944).

The idea of 'wholeness' or 'holistic approach' to human *ecology* research studies took concrete shape through the works of Klaus and Buhr (1976)[21]. The works amplify that by 'wholeness' we mean the characteristics of things or systems that display a 'qualitatively distinct and autonomous behaviour with respect to their constituent parts. Concepts such as completeness, intactness and autonomy are relevant here'. Thus it is necessary to distinguish between 'wholeness' and 'totality'. While 'wholeness' relates to "qualitative definition', 'totality' (entirety) is 'quantitative composition' of elements or parts.

Bernhard Glaeser (1995)[22] and contemporary human ecologists contribute towards the qualitative holistic approach.

The holistic view on human ecology as summarized by James N. Anderson (1995)[23], "My conception of human ecology comprises all aspects of man as a biocultural animal as they are subsumed within the structure and functioning of ecosystems, including human morphology, reproduction, population genetics, stress, physiology, nutritional requirements, the ecology of health and disease and human adaptability. It also encompasses human population ecology - that is population process; fertility, mortality migration and population structures to include: -

(a) The feedback between biological and cultural factors (technological, economic organisational) in populations.
(b) Spatial and economic distribution and ecological consequences of populations trends.
(c) Interrelationship of population's ecological perceptions, environmental cognition, language as cultural codification, ideology, spiritual inputs and their ecological applications, creative thinking, planning and decision making.
(d) Rural, urban and industrial ecosystems, environmental aesthetics, design and planning, government-citizen interactions, and environmental law and policy making.
(e) Human interactions with biota, and earth's biotic environment.

Cultural Ecology

'Cultural Ecology' is used here to denote the interactional analysis of environmental - cultural relationships, an essentially deterministic position that has developed under the leadership of Julian Steward (1995)[24] and (1968)[25]. The definitive characteristics of cultural ecological approach are:-

(a) 'Adaptation' is the major process of cultural changes.
(b) The analysis of sociocultural-environmental adaptations serves to uncover variables that explain the origin of particular cultural features or structures in similar environmental conditions.
(c) The degree and kind of functional interdependence among the parts of culture are not equal; 'core' features, those closely interrelated with subsistence activities and economic arrangements, have casual priority over 'secondary' features.
(d) The functional relationship of relevant environmental factors causes certain organisational relationships, which in turn give rise to other relevant aspects of the culture; i.e., causation in simple, linear and one-to-one. Analysis is directed to the investigation of the environment and subsistence concerns; i.e., to the 'relevant' or 'effective' environment of the culture core.

Ethnoecology

Ethnoecology is an ethnographic endeavour. It is the study of constituent ethnic groups residing closely together in a traditional human habitat. Ethnic groups in a given geographical habitat perceive the environment in accordance with their knowledge, traditions and mind sets. Bates (1960)[26] in a compelling description of 'environment' in relation to ethnic groups states: -

(a) The environmental elements as perceived, which may be called 'perceptual environment'.
(b) Elements perceived or not, that effect the organism, which Bates terms the 'effective environment'.
(c) The environmental elements, influential or not, but are detectable and inferable, is aptly termed 'total reality'.

Vayda and Rappaport (1968)[27] summarise the characteristics of ethnoecology as follows: -

(a) Its emphasis upon perceptual environment and its general lack of serious consideration of interactions between cognitive domains or with effective environment result in narrow and least interactional approaches.
(b) Its analysis is limited to intra cultural ecological relationships.
(c) Insofar as it deals with effective environment, it seeks to evaluate and predict the effects of various behavioural possibilities on the cultural micro environment.
(d) It makes assumptions of a high degree of homogeneity and stability in cultural categorisation.

Summary of Studies of Human Ecology and Human Ecosystems

The foregoing descriptions, lead us to following assumptions that merit research and studies (Andy 1965[28], 1971[29]) :-

(a) Human populations are an integral part of most, if not all present ecosystems. Ecosystems are, as they are because of man, his numbers, his varying behaviour, and his use of energy.

(b) The nature and structure of local ecosystems is everywhere relatively recent. Although most biota predate man's entry into specific ecosystems, some biota are more recent than human invaders of various niches of the ecosystems. For instance, man himself provides few niches for parasites and micro organisms. His behaviour diverts energy flows and creates artifacts, thus providing new niches.

(c) Humans, as individuals and in populations are involved in profound reticulate transactions with physical elements of the environment as well as with biotic ones. This is readily detectable in soil and watershed characteristics.

(d) Human's transactional relations with an ecosystem can be treated from analytic and synthetic standpoints, just like those of other major components of its biota. The difference between humans and other living things is relative. Human populations are more dynamic, more manipulative and more dominant than other species in ecosystems. Complex human sociocultural behaviour enables him to collapse the time span required or biological adaptations, and has permitted an unparalleled explosive adaptive radiation into virtually all the earth's biomes.

(e) Human populations and their complex sociocultural behaviours are in constant flux. It is unnecessary to determine if a specific population and its behaviour are changing, but only to determine the rate or nature of change. The rate of change is relative. The change was relatively slow during the era of gathering and hunting. Once domestication of botanical and zoological life took concrete shape, the pace of change accelerated.

(f) The humans possessive behaviour leads to collective arms aggression, leading to war, which may be local, regional or global. The ability of human's to unite against another human group has historically affected and changed cultures of both, the victors as well as the vanquished.

A holistic integrative study of any or all the human ecosystems will therefore need to encompass all assumptions and ecosystems facets listed above.

SECTION - III
HUMAN INTERACTIONS

Interaction Oriented Models of Human Ecology

Various conceptual models have been devised that attempt to incorporate interactions taking place between human groups and the environment. A model devised by Philips -Howard (1985)[30] is depicted at Figure 1.1. The model is useful for studying the local human interactions with the environment. The model also emphasises the intrinsic interactions within the human community, and those within the local non-human ecosystems.

Figure 1.1 represents a model of interactions within human settlements. This model by Boyden (1979)[31] is exemplary for the efficiency with which it incorporates social, cultural, economic, technological and especially psychological interactions. From the Figures 1.1 and 1.2 emanates the action by humans at various levels in various conditions. The same is depicted in Table 1.2 below (Bernhard Glaeser (1995).[32]

The model at Figure 1.1 helps in studying and understanding human and environmental impacts caused due to the chain of inter-relationship factors. The non-human factors on the left hand side of the figure are linked to each other, and have their individual and collective links with the human factors on the right hand side, which again are inter-linked through history, culture and social environment. Action at one place has its resultant reaction at one or more factors. Positive human actions add to the health of other factors, while negative actions may start a chain of degeneration.

Figure 1.2 is an integrative model for ecological studies of interactions within human settlements. The main concern of the model is with the impact of societal conditions on the natural environment, and on the quality of human experience. It is a reflection of the explicit and intrinsic values for the integrity of ecosystems and the health and well being of people. The model demonstrates that the state of human health is directly related to humans' interactions with the environment.

Table 1.2 Levels and Types of Action

Level of Action	*Type of Action*
Theory	Knowledge
Aesthetics	Perception
Ethics	Justification of norms
Politics	Implementation of norms
Planning	Regulation
Economy and Technology	Production
Spirituality	Worship and religious fervour

SECTION-IV
DETERMINANTS OF HUMAN ECOLOGY

In recent years, human ecology has been given greater attention by scientists and social scientists. A number of different conceptual approaches have been employed in the study of human ecology. Anderson (1977)[33] argues that the necessity to view man within the framework of his habitat tended towards the adoption of two fruitless positions that for long dominated the thoughts of social scientists. With some simplification these positions can be seen as extremes on a continuum, one pole being environmental determinism and the other cultural determinism. Their less extreme versions are known by the terms "environmentalism" and "possibilism".

Above views, summarise Vayda and Rappaport (1968)[34] tend to separate man and his culture from environment, and behaviour from ecology. They tend to treat them as opposing entities. These views although much diluted, still have their adherents. The major conceptual approaches merit to be discussed independently.

Environmental Determinism or Environmentalism

During the first quarter of the twentieth century many scientists adhered to the doctrine of environmental determinism. These scholars believed that the physical environment, especially the climate and terrain was the active force in shaping cultures, emphasizing that humans were essentially a passive product of the physical surroundings. As analyzed by Jordan and Rowntree (1990)[35], the logic of the 'deterministic view' considered humans equivalent to clay, to be moulded by nature. Similar physical environments were likely to produce similar cultures. Environmental determinists thus viewed human ecology as a 'one-way street'.

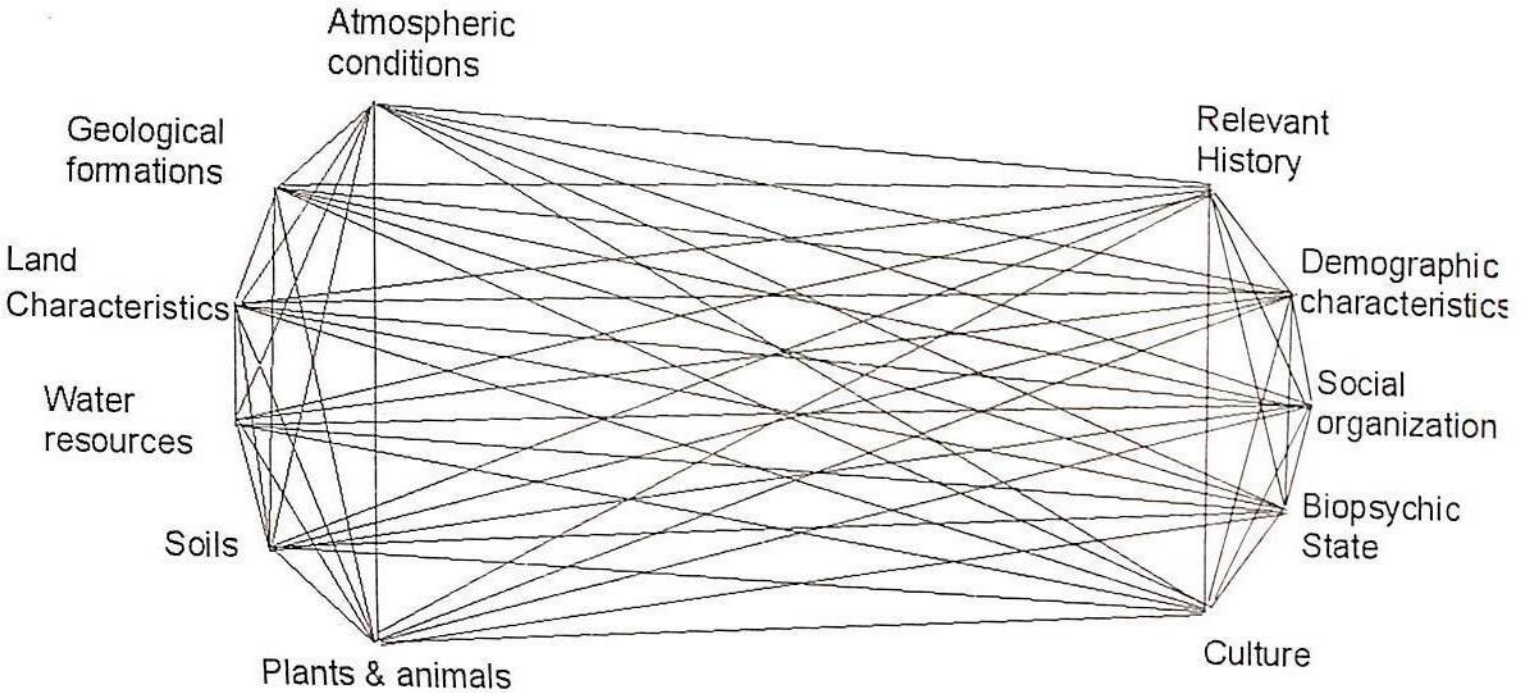
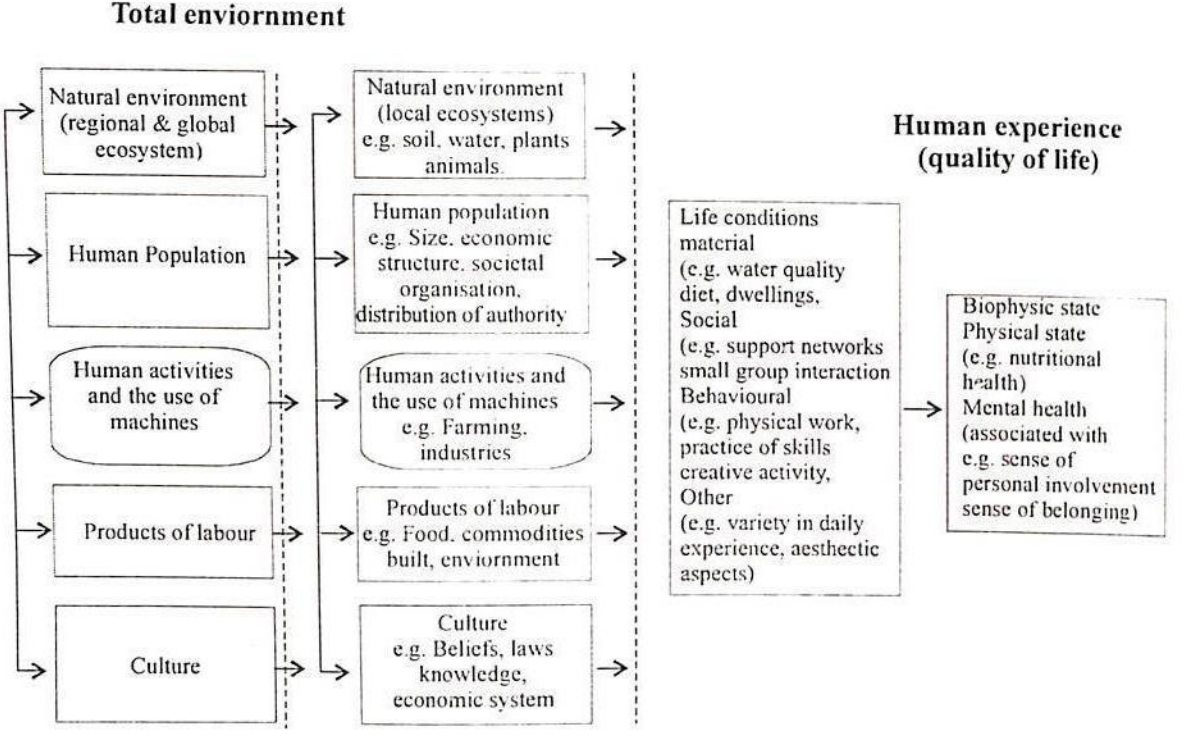


Fig. 1.1 Interactions between the Man-Enviornment system.
Source : Philips-Howard (1985).


Total enviornment
Natural environment (regional & global ecosystem)
Human Population
Human activities and the use of machines
Products of labour
Culture
Natural environment (local ecosystems) e.g. soil, water, plants animals.
Human population e.g. Size, economic structure, societal organisation, distribution of authority
Human activities and the use of machines e.g. Farming, industries
Products of labour e.g. Food, commodities built, enviornment
Culture e.g. Beliefs, laws knowledge, economic system
Human experience (quality of life)
Life conditions
material
(e.g. water quality diet, dwellings,
Social
(e.g. support networks small group interaction
Behavioural
(e.g. physical work, practice of skills creative activity,
Other
(e.g. variety in daily experience, aesthectic aspects)
Biophysic state
Physical state
(e.g. nutritional health)
Mental health
(associated with e.g. sense of personal involvement sense of belonging)

Majid Hussain (1994)[36] and Jordan and Rowntree (1990)[37] give a number of examples of determinist beliefs. Determinists believed that people of the mountains were predestined by the rugged terrain to be simple, backward, conservative, unimaginative and freedom loving. Dwellers of the desert were likely to believe in one God, but to live under the rule of tyrants. Temperate climates produced inventiveness, industriousness and democracy, whereas coastlands produced great navigators and fishermen.

Cultural Determinism or Possibilism

In place of environmental determinism a new theory called 'environmental possibilism' or 'cultural determinism' or simply 'possibilism' was expounded by Forde (1934)[38]. The followers of this school assert that the environment does not directly cause specific cultural developments but the presence or absence of specific environmental factors limits the development either by permitting or forbidding their occurrences. Toynbee (1955)[39] is of the opinion that development of civilisations could be explained in terms of their response to environmental challenges.

Possibilists do not ignore the influence of the physical environment, and they realize that the imprint of nature shows in many cultures. However the possibilists stress that cultural heritage is at least as important as the physical environment in affecting human behaviour.

Possibilists claim that any physical environment offers a number of possible ways for a culture to develop. Most possibilists feel that higher the technological level of a culture, the greater the number of possibilities, and weaker the influence of the environment. Technologically advanced cultures, in this view, have achieved near total mastery of the physical surroundings.

Jim Norwaine (1981)[40], however, warns that even in these advanced societies the 'quantity' and 'quality' of human life are strongly influenced by the natural environment, especially climate. Norwaine further amplifies that an unusually favourable climatic cycle has characterized the 20th century and witnessed the rise of possibilist thought. The present world population of over 6 billion and the unprecedentally high living standards typical of advanced countries may be untenable when a deterioration of the weather regime occurs. Perhaps in our zeal to discard environmental determinism, we have overstated the possibilist view.

Economic Deterministic View

This view originated in the West as a branch of the possibilistic view. It is based on the basic ideology of man's mastery over environment, and continued economic and industrial expansion through the application of modern technologies. "The basic thesis of the growth (affluence) school is that economic growth is required for political, social and economic stability." (Savindra Singh,[41] 1991) . 'The quality of environment' in this view normally assumes lower priority in formulating planning proposals and in long-term planning because the deterioration of the environment is generally protracted and socially less oblique than a deterioration in the economy (Park[42] 1980).

Economic determinism is based on two assumptions: -

(a) There is a positive correlation between the population of a given region and the level of economic development and activity in that region.

(b) The interactions of people, resources and society are governed by universal economic principle. (Zelinsky,[43] 1966)"

Based on these two fallacious assumptions, the 'economic determinism' believes in man's ability to solve environmental problems arising out of continued economic growth and industrial expansion. It may be pointed out that this extreme concept of economic determinism of the rich materialistic society led to rapacious exploitation of the natural resources in the Western developed countries, and their colonies in the Third World Countries, and thus has created most of the environmental and ecological problems of global dimension.

Ecosystem based Model

Since culture and environment are dynamic, a need for a more dynamic model was felt. Vayda and Rappaport[44] (1968) proposed an ecosystem based model for human ecology. In their view, human beings constitute simply another population among the many populations of plant and animal species that interact with each other, and also with the nonliving components of their local ecosystem. Thus the ecosystem, rather than the culture constitutes the fundamental unit of analysis in the conceptual framework of human ecology. The cultural traits are of interest only because they can be shown as contributing towards the population's survival in the context of the ecosystem.

The Systems Model

A major scientific development in recent years has been the theory

of "general systems theory" which is concerned with the general properties of the structure and functions of systems as such, rather than with their specific components. Odum (1971, 1977)[45] presented a systems view of ecology with particular emphasis on the integrity of the ecosystem as an analytical unit. He also presented mathematical models for analyzing the flow of energy, materials and information between social and ecological systems.

In the systems model of human ecology, both the social systems and the biological systems interacting with each other retain their integrity as ecological systems. In this process each system changes its structural configuration according to its internal dynamics. At the same time each system received energy, material and information from the other and these inputs also influence its structure and functioning. However, each system is also open to influence from other systems of the same kind so that a social system is altered by inputs received from a neighbouring social system just as an ecosystem may be changed by inputs from other ecosystems eg. migration and colonisation.

Nathawat (1995)[46] amplifies on the model of given basic structural and functional relationship in the systems model and has emphasized the following four relational aspects: -

(a) **Inputs from natural ecosystems into the social systems:** The inputs may be in the form of flow of energy (fuel, food, petroleum), materials (building material) or information (sound, visual, stimuli etc).

(b) **Inputs from the social systems into the natural ecosystem:** These may be flow of energy (heat or pollutants), mineral (waste) and information generated by human activities.

(c) **Change in the institution of social system in response to inputs from ecosystem:** These changes may be primary because when an increase in death rate due to environmentally transmitted diseases takes place, it changes the population structure of the society. They may be secondary, when they come from a change generated in other social system. Social system changes in response to inputs from ecosystem are usually adaptive, i.e. they contribute to the continuing survival of the social system under changed environmental conditions.

(d) **Change in the ecosystem in response to inputs from the social system:** These changes may be primary, such as elimination of a species (of biodiversity) by over exploitation or secondary due to alterations in the other ecosystem components caused by primary anthropogenic change in one of its components.

Perhaps the greatest virtue of the systems model of human ecology is that it offers specific guidelines for doing research on human interactions with the environment. The real values of human ecology lies in helping humans to see previously unrecognized relationships between what people do to the environment, upon which they are dependent for their survival.

SECTION-V
AIM AND OBJECTIVES, HYPOTHESIS, METHODOLOGY AND THE CHAPER SCHEME

Aim and Objectives

The main objective of the present work is to study and analyse all facets constituting the human ecological aspects of Upper Rangit Basin, an important mountain enclave in the Eastern Himalayas within the state of Sikkim. The main objective could further be split under following sub-heads and sub-groups:-

1. To assess and evaluate human ecology of the various human and geographic ecosystems in Sikkim.
2. To study the consitutent ethnic groups in Sikkim in general, and Upper Rangit Basin in particular in their traditional human habitat.
3. To assess the determinants of Human Ecology and human ecosystems in the study area.
4. To study and assess the geographical, geological and climatic conditions having overriding effects on human habitat in the Upper Rangit Basin.
5. To analyse the existing terrain features in Upper Rangit Basin with reference to human ecology and habitats that incorporate base line vegetation, land cover, agriculture and fallow lands and vegetation zones.
6. To draw out a human geographical mosaic of Sikkim as a whole with reference to location, history, demography, dress patterns, ornaments and jewellery, food habits, religions, social structure, housing patterns, festivities and political setup.
7. To study the realms of spiritual and deep ecology and the dimensions of *ecodharma* in Sikkim.
8. To study the monasteries with reference to their architecture and the relations of architectural symbolism with human eco-systems and deep ecology.
9. To study the diffusion of Mahayana Buddhism, Hinduism and Animistic faiths of different religious groups in Sikkim.

10. To study the symbolism of prayer wheels, prayer flags, and the wheel of life and what these symbols mean to the local residents, including their sentimental attachments to the symbols in day to day life.
11. To analyse the essence of *chortens* the relevant rituals with regards to passing away of the *Tathagatas*, what the *chortens* mean to the people, and the human and deep ecological relevance to the residents of Sikkim.
12. To bring out the essence of non-violence with respect of Sikkimese Buddhists, Hindus and followers of Animist faiths.
13. To relate the historical facts of Sikkim leading to the Upper Rangit Basin that became the spiritual Centre in the Himalayas in general and Sikkim in particular through the density of religious centres.
14. To dovetail and relate the thought processes of Sikkimese in accordance with their economic and class structures in relation to national culture and their local identity.
15. To study the festivals and other cultural activities in Upper Rangit Basin with special reference to rituals, constructional aspects and invasive aspects of popular culture.
16. To carry out an investigation on spirit possession, shamans and *jhakris* with respect to all ethnic groups viz Bhutias, Limbus and other Nepalese groups and Lepechas.
17. To study aspects of cross-cultural ethnobotany in relation to human ecology in the study area to include medicinal plants, home gardens, floristic diversity, dependent animal diversity and non-timber uses of forest produce.
18. To survey local ethnic weekly village folk markets to assess use of local resources, patterns of specific commodities, thereby evaluating the sustainability of the natural resources, and the factors responsible for each activity.
19. To study the dietary ethnobotanical culture of inhabitants of Upper Rangit Basin including preparation and consumption of traditional fermented and non-fermented foods.
20. To study the human ecology of eco-tourism with respect to areas attracting tourists, the nature trails, spiritual tourism and the constructive and invasive aspects of tourism in Upper Rangit Basin.
21. To draw out a holistic view of all human ecological aspects relating to Upper Rangit Basin and offer recommendations where required as a result of study of interrelationship between all constituents-humans, biotic and abiotic.

Hypothesis

The following hypotheses have been formulated for the present study:

1. The residents living in the secluded habitat of Upper Rangit Basin, which on account of its isolation could easily be termed as an 'Enclave', have continued to live and function in a traditional life style in accordance with their respective ethnic and religious life styles.
2. There has traditionally been a symbiotic relationship between the humans and nature in the harsh and extreme climatic and terrain conditions.
3. Religious faith among the local folk has been the mainstay, and living beacon in their day to day life, festivities and rituals, even at the cost of personal and state development projects.
4. Shamans, *Jhakris* and faith healers have an important place in the society and people follow them in and all ethnic groups.
5. The traditional ecological knowledge has been passed on from generation to generation, and the people have a good knowledge of existing natural floristic life and fauna.
6. Lack of competition due to job reservations has led to sub-par educational standards.
7. Near absence of urban market forces residents to subsist on live stock, home gardens and ethnic weekly folk markets.
8. The virtues of 'nonviolence' through Hinduism and Buddhism and strong traditional ethnic linkages have developed patience and respect for all life form amongst the population.
9. The lamas and monks reign supreme, and the simple ethnic folk consider the lama's word as 'law'.
10. There is a galore of dogmas, superstitions and taboos amongst the simple folk of Upper Rangit Basin.

Chapter Scheme

It has been attempted to adopt the scheming of chapters, in a graduated manner, commencing with introduction to the study area, followed by description of various facets concerning the aspects of human ecology in the Upper Rangit Basin of Sikkim. The study has been split up into eight chapters.

Chapter 1. This is the introductory chapter highlighting the problem, followed by theoretical descriptions on human ecology, human ecosystems, human interactions and the determinants of human ecology. The aims and objectives of the study, methodology and the outline of chapters are also given here.

Chapter 2. Chapter 2 analyses the geological, climatic, landuse and geographical relief profile of the region. Further, the human mosaic of Sikkim with reference to habitat, dressing, food habits, social environment agricultural implements, constituent religious groups and local polity are described.

Chapter 3. This chapter pertains to the realms of spiritual and deep ecology and the dimensions of *eco-dharma* in the study area. The emphasis is on interrelationship between religion followed by inhabitants with natural surroundings. The religious diffusion, monastic architecture, and deep ecology depicted through *chortens* find a detailed description here.

Chapter 4. The aspects of cultural ecology are a direct fallout from the spiritual following and religious faiths. Cultural ecology is the central theme of this chapter. The historical inputs that have lead to current cultural status have been presented. There is a brief description on why the Sikkimese think behave and act, the way they do. There are case studies on celebrations of special festivals, and on shamans and *jhakris* including folktales pertaining to *jhakris* in the Upper Rangit Basin.

Chapter 5. This chapter covers cross-cultural ethnobotany as practiced by the local inhabitants. The major aspects covered are the paradigms of ethnobotany and its human ecological connections, the medicinal and non-timber uses of floristic life, nutritional habits, the home gardens within the area, and the ethnic folk markets. A data presentation on ethnobotanical resources is also given at the end of the chapter.

Chapter 6. Eco-tourism with special reference to nature and monastic spiritual centres is the central theme of this chapter. The role of tour operators, local community and the government have been studied and suggestions offered for planning, monitoring and marketing of tourism industry, while ensuring sustainability of resources at all times.

Chapter 7. A holistic view of human ecology and human interactions through combinations of all facets given in first six chapters has been assimilated here. The behavioural patterns of inhabitants under various situations are realistically defined.

Chapter 8. This chapter deals with recommendations from the point of view of human ecology, and sustainability of human and nature's health through certain suggested actions for inhabitants, visitors, bureaucrats and the government.

Select bibliography on the subject and index are presented at the end.

Plan of Work and Methodology

In order to study the aspects of human ecology of the residents of Upper Rangit Basin, an enclave in the Sikkim Himalayas, various methodological means were adopted. The present work deals with empirical investigations, theoretical study as well as historical inputs. The government policies, both, past and present have had a profound impact on the human ecological aspects, necessitating deep insight into government ministerial reports and departmental statistics. For the purpose of meaningful investigations, structured questionnaires were prepared, and answers were sought through direct interviews and field observations. During the course of the research study, almost the entire period of stay was spent in the study area itself, in order to have a continuous contact with the land and its people.

The methodology followed in the study of the Basin is summarized as under :-

(a) Information concerning the physical environment was facilitated through published materials, maps, charts and constant visits through vehicular and foot travel through the length and breadth of Sikkim.

(b) The information of spiritual and cultural aspects was sought through personal contacts with the concerned people. Visits to monasteries and regular interactions with the lamas and monks helped in understanding and elucidating the aspects of religious ecology. A proper detailed field survey of Tashiding monastery and its surrounding terrain was carried out by staying at a tented camp site at Tashiding itself. Relief details were studied through maps and ground reconnaissance, facilitating pinpoint location of each *gompa*, residential places and *chortens* in Tashiding. Similar study was carried out on the architectural aspects of the monastries and *chortens* of Ralang and Pemayangtse.

(c) Study of cultural ecology was undertaken through the cultural and festival calendar of Sikkim. The visit to Khecheoplari lake was undertaken during the Bumchu festival in 1998. Similar visits were undertaken to the homes of Shamans, *jhakris, yumas, yebas and sambas.*

(d) Ethnobotanical study required a detailed collection and study of research and theoretical material, followed by visits to home gardens at the confluence of Rathong chu and Rangit chu. A field camp and

survey in Yuksom forest helped in collection of ethnobotanical data in the surrounds of Yuksom floristic diversity. As for traditional food habits, a visit was undertaken along the Yuksom-Tsoka-Dzongri trails. Preparation of traditional foods was witnessed within the kitchens of residents almost at all places in the study area.

(e) Eco-tourism has arrived in a big way in the Basin, its main centre being the Yuksom-Dzongri area and the Monastic centres. A direct contact was made with the tour organisers, hoteliers, trail porters and the tourists themselves. The government and non-governmental organisations concerned with tourism industry were rich resources of material and statistical details.

The District commissioners of South Sikkim and West Sikkim, the doctors in the PHCs and the District Forest Officers offered help, and facilitated study of official documents. Police department at Ravangla offered details of disciplinary and law and order aspects in the Ravangla sub division in South Sikkim.

Findings from each study and all field observations are given in the respective chapters.

SECTION - VI
REVIEW OF LITERATURE

General

Nearly all the disciplines and professions, in both, the sciences and the humanities are eager to find a common meeting ground in the arena of human ecology. The mosaic of human ecology is built around six themes: Cultural region, Cultural history, Cultural diffusion, Cultural ecology, Cultural integration and Cultural landscape. These themes are applied to a variety of topics concerning human ecology in a given areas demography, habitat, religion, language, ethnicity, politics, folklore, industry and popular culture. A brief review of literature on these approaches is therefore inescapable, and is presented in order. It is an integrative background for ascertaining the holistic emergence of the status of human ecology in the area.

Theory of Human Ecology

One witnesses a surge in literary works dealing with human ecology, social ecology and deep ecology since the late seventies of the twentieth century. John Bennett (1976)[47] frames themes and comparisons on ecological transitions, adaptations, human behaviour

and cultural, social and systems aspects of human ecology. Murray Bookchin (1996)[48] portrays the interrelationships between history, civilisation and progress in his edited work "The philosophy of Social Ecology". By far one of the most comprehensive work may be attributed to Bernhard Glaesar (1995)[49] , in his book "Integrated Policy through Human Ecology" where he conceptualises and delimits the subjects, and prepares systems models for application on environment, development and agriculture.

Travelogues

Early works describing the nature of Sikkim society and physical features are in the form of travelogues, and government reports. One of the earliest comprehensive works, encompassing most ingredients of physical features and human ecology was by the eminent botanist Sir Joseph Dalton Hooker[50] . In his book, "Himalayan Journals: Notes of a Naturalist in Bengal, The Sikkim and Nepal Himalayas, The Khasi Mountain, and C,"(1855), Hooker addressed topics such as natural terrain features, flora, history, ethnic groups, cultural and behavioural attitudes, and aspects of spiritual ecology.

Earliest works with special reference to Rangit Basin were addressed to by Major Sherwill (1862)[51] . Dr Mallet (1875)[52] , Colonel G.B Mainwaring (1876)[52], L.A Waddell(1891)[54], (1899)[55], J.C White (1909)[56] and C.G. Bruce (1910)[57].

Major Sherwill surveyed and explored the base of Kanchendzonga massif, including Rathong glacier and Rathong valley, a major feeder of the Rangit. He described his findings in the "Journal of A Trip Undertaken to Explore the Glaciers of Kanchendzongha Group in the Sikkim Himalaya in November 1861". Dr Mallet dealt with and gave a detailed account of geology and mineral resources in the Rangit Basin area. Colonel Mainwaring and Waddell entered the linguistic fields. While the former wrote a book on the "Grammar of the Rong (Lepchas) Language", the latter wrote an article on the "Place and River Names in the Darjeeling District and Sikkim", which included meanings of names of mountains, passes, rivers, villages and monasteries, alongwith their Lepcha, Bhutia, Nepali and English equivalents. J.C White penetrated into the stupendous mountain valleys of the Rangit and Tista, while serving as the First British Political Officer of Sikkim, and wrote his geographical, historical and personal experiences during various expeditions in his book "Sikkim and Bhutan". Major C.G.Bruce gave detailed descriptive accounts of Dzongri and Pemayangtse Monastery in his work "Twenty Years in the Himalayas".

Published in 1894, H.H Risley edited the first and only" Gazetteer of Sikkim" [58] . The gazetteer gives detailed historical, geographical, botanical and zoological accounts of Sikkim. Spiritual ecology of the *gompas* and monasteries finds a detailed description in the gazetteer.

Taking a holistic view of human ecology, not withstanding their year of publication, the subsequent literary works can be best reviewed by separate analyses of works on various themes.

Works on Ethnic Groups

Sikkim drew attention of anthropologists and ethnologists from Western countries and the Orient. In the 1930's John Morris [59] and Geoffery Gorer [60] spent several months in Dzongu area of North Sikkim to study the Lepchas. Their research works were published in books, "Living with Lepchas: A book about the Sikkim Himalaya" by John Morris (1938) and "Three months in a Himalayan Village : An Account of the Lepchas of Sikkim" by Geoffery Gorer (1976). Both authors deal with the social, political, cultural and spiritual ecological aspects.

R.N Thakur in his book "Himalayan Lepchas" [61] (1988) explored the customs, manners, food habits and other social institutions amongst the Lepchas, with an emphasis on the process of change in their life style due to invasive aspects of popular cultural variety. An inside view of the Lepchas is presented by A.R Foning[62] (1987) in the book "Lepcha : My Vanishing Tribe". Other authors who have addressed research works to Lepchas include Siiger Halfden[62] (1972) and K.P Tamsang[65] (1983).

K.S Singh[66] (1993) edited 39th volume of Anthropological Survey of India, "People of India : Sikkim", which offers a profile of almost all 25 communities identified in the state. Tanka B. Subba[66] (1989), in his work "Dynamics of a Hill society: The Nepalis in Darjeeling and Sikkim Himalayas", has a deep look into the history of individual Nepali castes, and describes their cultural traits. A large detailed volume, "The Limbus of the Eastern Himalayas: with special reference to Sikkim" has been authored by J.R Subba[67] (1999).

A prominent work on the Bhutias was published by Saradindu Basu[68] (1966), who carried out his research in North Sikkim, where the Bhutias are the majority ethnic group. A social and political study was carried out in his Ph.D research by a sociologist A.C Sinha[69], who prepared his research document on the "Elites of Sikkim: A study in Political Development", (1972). T.B Subba[70] (1999) worked on political and cultural ethos with special reference to current status of Kirata

tribes in Sikkim and Nepal in his work "Politics of culture. A study of three Kirata communities in Eastern Himalayas".

Folklores and Shamans

Folklores are an important ingredient in the study of human ecology. C.De. Beauvoir Stocks[71] undertook a research on the customs and folklores on particular lines of Lepcha life during 1925. George Kotturan[72] collected and published, "Folk Tales of Sikkim" in 1989, some of which highlight the Sikkimese love for nature and indigenous fauna and flora.

Shamanism, spirit possession and mystical rites are performed and openly practiced in Sikkim and Nepal Himalayas. John T. Hitchcock and Rex L. Jones[73] have jointly edited a work on the spirit possessions, which most importantly describes the reincarnation possession, and other classifications of shamans and *jhakris*.

Tulsiram Sharma 'Kashyap'[74] (1988) in "Sikkim : A Himalayan Realm" has depicted Sikkim's history, folklore culture, its nature and also political developments in the form of poems, through the intimate interaction between two characters Lakpa and Rajani, both belonging to different ethnic groups.

Geography and Habitat

The most detailed and authentic work on the human habitat and geography of the Rangit Basin however, can be credited to Maitreyi Barua[75] (1988) in her Ph D thesis Titled, "Habitat and Economy in an Eastern Himalayan Enclave: Case study of the Rangit Basin'. She has given a detailed account of the inhabitants, human geography, and agro- economy alongwith details of all physical terrain features, supported by suitably scaled maps of the Rangit Basin. Again in 1997,Maitreyi B. Choudhary[76] published a paper through Centre for Himalayan Studies (CHS), North Bengal University, on Rathong Chu hydro projects imbroglio in the Upper Rangit Basin. Maitreyi Choudhary's article in CHS journal Himalayan Miscellany[77] (1997) deals with the environment and human adaptations in the Rangit Basin.

Spirituality and Culture

Spirituality and religious realms have major influence on the thinking, actions and functional ethos of a community, that affect the human eco-systems and human ecology of the residents. Lama Kazi Dawa-Samdup[78] (1935) in his work (Edited by Evans Wentz) "Tibetan

Yoga and Secret Doctrines" explains the principles, methods and wisdom contained in all categories of Mahayana Yogic precepts. Hajime Nakumara[79] (1964) describes why the Indians and Tibetans (Sikkemese being a part of the diffused culture) do and behave the way they do, in " Ways of Thinking of Eastern Peoples". The ecological aspects of Buddhism and Hinduism are well illustrated through anecdotes in "Hinduism and Ecology", and "Buddhism and Ecology" by Ranchor Prime[80] (1992) and Martine Batchelor and Kerry Brown[81] (ed) (1992) respectively. David Brazier[82] (1997) describes the Buddhist psychology of character, adversity and passion in book "The Feeling Buddha".

CHS staff have from time to time carried out research on the theme of religion, and monastic studies on Sikkim. Ranju R. Dhamala[83] (1993) and D.P. Boot[84] (1996) produced detailed papers on the geographical location and economic structure of monasteries in Sikkim. Karubaki Dutta[85] (1997) published a research paper on "Inter Ethnic Relations in Sikkim in Historical Prospective", and another paper dealing with religion, on "Changing Status of Buddhism in Sikkim" [86] (1997). Karubaki Dutta and Tanka B. Subba published and edited the book, " Religion and Society in the Himalayas" [87] (1991), containing articles on monastic studies, bibliographical study, and functional *karmic* ethos in Lamaist society.

Sikkim Research Institute of Tibetology, Gangtok (SRIT), published presentations made in national seminar on "Guru Padmasambhava's Contributions to Sikkim" [88] (1995). The spiritual ecology theme of the *Chortens* (stupas) has been discussed in details in SRIT bulletin of Tibetology[89] (1970) and (1969) [90] through articles by Lama Anagarika Govinda and B. Ghosh respectively. An all inclusive work on "Stupa and its Technology" was carried by Pema Dorjee[91] (1996).

Rumtek in West Sikkim is the famous monastery of the Kargyud Sect, and is also the seat of the Karmapa. Ralang located in the Upper Rangit Basin has the oldest monastery of the Kargyud Karmapa sect in Sikkim. The book "Karmapa Khenno - A Sikkemese Point of View" [92] (1993) gives a detailed account of the tradition of reincarnation of Karma Kargyud Lineage. It may be noted that the sudden arrival of the 17th Karmapa to Dharamsala in January 2000, became the main news items in national and international media.

Ethnobotanical Studies

Interrelationship between earliest inhabitants of Sikkim with the fauna and flora of the place has continued since the era of gathering

and hunting. Plants have also been extensively used for medical purposes. Upper Rangit Basin is known for its rhododendron trails. Udai C. Pradhan and Sonam T. Lachungpa [93] have traced all rhododendron trails, and explained aspects of its ecology, conservation and uses in their book, "Sikkim- Himalayan Rhododendron" (1991). Topdhen Rai and Lalit Kumar Rai [94] (1994) have given a compendium of Sikkim trees renowned for their resplendent floral wealth in boom, "Trees of the Sikkim Himalaya". The medicinal plants of the Sikkim Himalaya, their status, usage and potential find a detailed description by Lalit Kumar Rai and Eklabya Sharma[95] (1994) of G.B. Pant Institute of Himalayan Environment and Development. Arvind Saklani[96] (1994) gathered information and data in the book "Cross-cultural Ethnobotany of Northeast India". It contains details and usage of flora found in Sikkim. Consumption pattern of traditional fermented and non fermented foods have been elaborated upon in details by J.P. Tamang[97] (1998) and H. Youzan and J.P. Tamang[98] (1998).

Ecology and Conservation

A study was directed at ecology, and changing contours of Sikkim culture by Veena Bhasin[99] (1989). Later, working with Man and Biosphere Programme (MAB) of the UNESCO, M.K. Bhasin and Veena Bhasin jointly authored "Sikkim Himalaya : Ecology and Resources Development" [100] (1995). Jack D. Ives and Bruno Messerli of the United Nations University analysed the environment of the Nepal and Sikkim Himalayas in book, "The Himalayan Dilemma : Reconciling Development and Conservation" [101] (1995).

Polity, Education and Economy

Literary research relating to politics, education economy and development has been popular in the past decade. Books by Manas Das Gupta[102] (1992), Jigme N. Kazi[103] (1993), N. Sengupta[104] (1985) and by Suresh Chand Rai, Rakesh Sundriyal and Eklabya Sharma[105] (1998) are of note. A study team of J.N. University under Mahendra P. Lama is currently preparing the "Sikkim Human Development Report (1999), (Unpublished)[106].

Summary

This review of literature reveals that plenty of literary works are available on Sikkim. Literature on human ecology with a holistic panoramic view is however scarce. A void is also seen by the absence of literary works on the human ecosystems of the Upper Rangit Basin.

It being the original seat of the first Chogyals, and it being the abode of the original and historical spiritual centres and monasteries of Sikkim, a deeper research into its human ecology is called for.

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