

GEOGRAPHIC

Issue No.2., Vol.1.July 2007



A Journal of Geography Association of Mizoram,
Aizawl

Geographic

The Official Journal of Geography Association of Mizoram.

Geographic is an annual publication of the GAM. Life members and annual members of the Association will receive the *Geographic* free of cost. Others can subscribe at the following rates :

Period	Rate
1 year	Rs 50
2 year	Rs 90
3 year	Rs 120

The requisite Draft / Bankers Cheque / Money Order should be made in favour of the Geography Association of Mizoram payable at Aizawl.

Correspondence for publication in *Geographic* and book reviews should be mailed to Dr G. Kumar, Editor, *Geographic* Department of Geography, TC & RM., Post Box 190., Mizoram University. E mail : gam_mzu@rediffmail.com

The views contained in the articles/papers are necessarily of the contributors and not of the editors or the office bearers of the Association.

Edited by Girindra Kumar and Rintluanga Pachuau, and published by The Department of Geography, Tribal Culture and Resource Management., Mizoram University.

Cover Photo: Eroded rock bank of River Tlawng - Photo and design by Rintluanga Pachuau

Printed at Standard Laser Print, Teasury Square, Aizawl.

Published by the Department of Geography, Tribal Culture & Resource Management,
Mizoram University.

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**On the even of inauguration of the Geographic by Hon'ble Minister Dr. R. Lalthangliana.
Address by the President of GAM**

Hon'ble Sir

On behalf of the Geography Association of Mizoram (GAM) and myself as its present President and editor, it is my honored privilege to thank you for granting us our request to launch *Geographic* a journal of the Association. It is a great day for us when one of the cherished objectives of the Association is going to be attained. Let me assure you, Sir, and the members of the audience present here, that we as an Association from the beginning did not seek any publicity till we had something substantial to offer to the state where we are registered, and to the people amongst whom we work. We owed our responsibilities consciously and tried and we are still trying to carry them out.

Let me inform you sir, that it was an unanimous decision of the members to request you to honour us by launching the journal, for they believed you to be the closest to the ideologies and functions of the Association

I, with your permission, sir, will like to take this opportunity to bring before you the aims and objectives that the Association set before it after its revival in 2001. The same is being distributed to this knowledgeable gathering. One of the objectives of the Association, it is my proud honor to announce, was realized 3 years ago when in collaboration with All Mizoram Geography Students Union in the interest of the Students and the people of Mizoram, it successfully was able to persuade Mizoram University to establish the department of Geography. It exists now as the Department of Geography, Tribal Culture and Resource Management.

The Association with its Headquarters in the Department is realizing its another objective today-launching of its own journal, courtesy the Hon'ble Minister. The Department as publisher of the journal with the permission of the University is proud to be associated with such an Association whose motto is 'Better World'. The very motto, you will agree, sir, suggests its passionate but unbiased character. It strives to attain its goal unlike certain pressure groups that attempt to manipulate and manoeuvre the existing system for the benefit of choicest at the cost of genuine ones. It believes in the rationale of the systems that are supposed to operate under specific norms. One of the aims of the association is to reinforce the system by disseminating the information and educating the people about the rationale of the system and measures to improve its efficiency. These objectives are implied in its constitution. It is looking forward to reach the benefits of the earth system 'Unto the last' at least in the areas of its operation.

Let me inform the distinguished guests that the *Geographic* your honorable sir, has deliberately been devoted to regional studies. And as the product as well as the creator of the phenomena of spatial structure man in and as a community has been perceived to be central to regional organization. Geography as an integrating discipline with emphasis on areal structure was perceived by the founders of this Association to provide a common platform to the

scholars who are interested in phenomena that influence mankind on local, regional, national and global level and who seek to provide plausible explanations for the same. Alternatively, the *Geographic* has been designed to provide a platform to those who are interested in the study of the earth or part of it as the abode of man. We wish to propagate the cherished ideals of its founders.

The Association in its initial stages also realized that most of the academics especially the local ones become complaisant after getting a job of one kind or the other and were reluctant to share their ideas beyond class-room teachings or immediate surroundings. The society expects more than that .It is beholden to them for their objective and professional guidance in order to have a better tomorrow. Not devoid of capability of generating ideas and follow up researches, the Association felt that many of the local scholars particularly in social sciences were short in confidence to get their research papers published. The ‘Geographic’ as their own journal provides them with an additional opportunity to let divulge their concrete ideas. Their efforts may help in providing a better regional structure to the benefit of the people in Mizoram as well as elsewhere. It is a considered view in the Association that because Mizoram has suddenly been exposed to so many processes simultaneously that people appear to be confused about what they really want to attain. It also appears to have encouraged localized and temporal use of whatever resources the state is able to garner. In the process, many areas are left behind to great dismay of their inhabitants. Not only this, uses of natural resources in such areas are hampered to the disadvantage of the state economy which is generally short on expanding economic opportunities to the people and revenue generation of its own.

The Geography Association of Mizoram through its journal based on researched articles, wishes to extend its resources to help the state Government and the planners to arrive at judicious decision making and planning. We will be happy to work with and for the governmental departments, if it is deemed fit by the concerned departments. We may also be able to provide consultancy with the help of its members spread all over the state. This certainly will require financial assistance from the consulting agencies for, the Association is financially poor. Yet the members of the association ardently believe that involvement will help democratization of planning and development processes further. It, however, requires to generate finance.

I may, at this point ,bring to your kind notice, sir, that we have been able to bring out this first issues of *Geographic* with the help only of M/s Linkman Publications, which sponsored the printing processing and design of the journal knowing the financial constraints of the Association. We are grateful to Mr.L.N.Gupta, owner of the Linkman Publication for his generous contribution. However, such practice, we are aware, cannot continue for long. But I am also not sure, whether it is possible on the part of the Government of Mizoram to grant some fund to encourage such an activity of GAM .Our Hon’ble minister may be better aware of this aspect. We are always beholden to him.

I may also bring to the kind notice of the Hon’ble Minister and participants present here that you might find many lapses in our first endeavor. I apologize for our mistakes. But I

assure you that we will make our best efforts to improve. We plan to have forthcoming articles in the journal refereed to improve upon the quality of the journal.

I, I am aware, have very selfishly, taken your valuable times Sir, But I would not have found a more appropriate avenue to speak on behalf of our Association and its ideals .You certainly will excuse me for my insolence.

Without taking any more time, let me invite the Hon'ble Minister of School Education, I & PR, Environment & Forest Dr.R.Lalthangliana to grace the launching of the *Geographic*.

Thank You

G. KUMAR

Presidential Address XXV-NAGI Conference, M.M.H. College, Ghaziabad.

Indian Geography-Vision 2020.

Prof.Jagdish Singh

Courtesy ANNALS OF NAGI

Esteemed colleagues,

I am beholden to you for the honour you have done me by electing president of the National Association of Geographers, India, and reposed faith in me for indicating the path of progress of geographical fraternity, both in terms of their intellectual pursuits and their valuable contribution to the national building. I am conscious of my limitations but nevertheless feel inspired by the trailblazing paths shown by my revered teacher, late Prof. R.L.Singh, who was never tired of enthusing his colleagues and students, many of whom have carved a niche for themselves in geographical fraternity by their singular contributions and have adorned this august office before me, to further the cause of geography as a discipline and a vehicle to national reconstruction after centuries of slumber and sufferings under alien rule.

India of the twenty-first century is poised to take a great leap, several stupendous handicaps notwithstanding; to improve the quality of life of her people by pursuing the goals of Samvikas as well as to restore her lost glory. The success depends, however, on concerted efforts particularly by the intellectual community and the political leaders in charting out a well-defined vision, coherent thought and commensurate action. Geographers, by virtue of their earth bound vision, human welfare oriented, areally differentiated approach and ecologically attuned holistic action-plans, are in a uniquely advantageous position among all social scientists, to chart a roadmap for translating the dreams of our humanist-scientist president, Dr.A.P.J. Abdul Kalam, into reality. This requires the geographical fraternity to remind themselves of the methodological (epistemological) underpinnings of their discipline which must provide the sheet-anchor of their role, as well as sharpen their tools and techniques to rise up to their responsibilities.

The Methodological Moorings:

The last two decades of the twentieth century witnessed revolutionary changes in the epistemological stance of geography, along with the changed zeitgeist and technological advances that have brought the discipline from the periphery to the center of social sciences with regard to understanding the social meaning and action. For the first time since the methodological involution of the 1920s, geography has acquired an exalted status and rightful place in the comity of social sciences with regard to understanding the society in spatial perspective as also a significant place for its pragmatic approach to the solving of the myriad problems impinging on human welfare. After the failure of positivistic and socialistic paradigms for their superficial and lopsided treatment of spatial variations, respectively, and the humanistic and behavioural manifestations of phenomenology based geographies for their “much preaching but relatively little practice” the emergence of Post modernism with spatiality in human phenomena as its core consideration, opened a new vistas for geography. I would like to delve a little deeper in this methodological advance before turning to the other two

aspects with a view to enable geographers to better appreciate their contributions and enhanced faith in their capabilities.

According to the Oxford Dictionary of Geography, Postmodernism is “a philosophical stance which claims that it is impossible to take grand statements-meta narratives-about the structures of society or about historic causation because everything we perceive, express, and interpret is influenced by our gender, class and culture. No one interpretation is superior to other. It has brought to geographer’s recognition that space; place and scale are social constructs, not external given. Of particular interest to geographers is the waytimeandspace have been compressed by modern transport systems... As a result, culture some geographer’s claim that Postmodernism challenges the dominance of time and history in social theories and instead stresses the significance of geography and spatiality... The postmodern tradition also stresses and indeed champions differences. Postmodernism is a radical break from the past trends in political economic and socio-cultural life. It came “as a response to new set of experiences of space and time”. Today, it may be space, more than time, that hides consequences from us, ‘the making of geography’ more than the ‘making of history’ that provides the most revealing tactical and theoretical world. This is the insistent premise and promise of postmodern ‘geographies’ to make room for the insights of an interpretive human geography; to create more critically revealing ways of looking at the combination of time and space, history and geography, period and region, sequence and simultaneity.”

The Basic postulates of postmodernism may be designated as:

1. Postmodernism does not believe in the rationality of human actions and hence locations and spatial patterns, as was the case during the positivist era. Modernism was decontextualised. “Positivist spatial science portrayed a landscape without power, poverty, or political struggles: areas to which Marxist and social feminist analysts drew particular attention. “(Mac Dowell, 1996) Such modern i.e. rationalities like capitalism, various kinds of organizational bureaucracies and markets were “soulless, relentless and shivering impersonal”. Theoretical confidence in a “singular notion of Truth” was discarded; and hence,
2. Postmodernism respects heterogeneity and diversity in all spheres. Spaces opened up in which ideas about plurality, diversity, multiplicity, difference, disruption, and contradiction challenged the singular emancipator vision of western science, that central notion of development and progress that sustained both the liberal/scientific and the Marxist/socialist discourse” and therefore,
3. It shuns the postulations of theories and laws or meta narratives. “Instead of search for Truth and universal laws, geographers turned towards theorization and celebration of differences and diversity, in opposition to the totalizing tendencies of liberal humanism and Marxism. ‘Instead of searching for “general laws,” they insist on the “particularity and plurality” of knowledge, on analysis of the specificity of its social construction by certain social groups, located, in particular in space-time frameworks”

4. Postmodernism champions the cause of the poor, the weak, the peripheral and the down-trodden. It does not subscribe to the fact that their plight is the outcome of their own irrationality. Rather it holds the prevailing order of things, geographical, historical, social, cultural, ethnic and the like for the exploitation of the periphery by the core, poor by the rich, the female by the male folk, and the “have nots” by the “haves”.
5. Post modernism challenges the traditional view of development as “modernization” or “westernization”, the notion of a society passing through definite evolutionary stages, the development projects deployed by western states through discourse of underdevelopment privileging the western economic systems and institutions. It discards the cultural view of development that defines people as poor because they do not participate in the market economy. In response to the western development project, myriad of “new social movements” have emerged articulating struggles for cultural, ecological and economic survival.” At the level of the economy, they have articulated conflicts over productive resources and other issues hitherto neglected by political organizations. The economic demands of new social movements are not restricted to a more equitable distribution of resources between competing groups. But are also involved in the creation of new services such as health and education in rural areas... Many of these new social movements are also multi dimensional, simultaneously addressing, for example, issues of poverty, environment and culture... by articulating concerns of justice and quality of life these movements have enlarged the conception of politics to include issues of gender, ethnicity, and autonomy and dignity of diverse individuals and groups.. In doing so, they are both resisting the modernization process and articulating alternatives-economic, ecological, political and cultural- to it. “(Routledge, 1996)
6. From the epistemological stand of geography viewpoint, the single most important contribution of Post modernism has been to correct the bias towards “historicism’ by putting spatial in the centre of explanations; spatial dialectic alongside the historical dialectic. It is worth recalling that the last decades of the nineteenth century were an era of rising historicism and the parallel submergence of space in critical social thought. “The dialectic is back on the agenda. But it is no longer Marx’s dialectic, just as Marx’s was not Hegel’s...The dialectic today no longer clings to historicity and historical time, or to a temporal mechanism such as ‘thesis-anti thesis-synthesis’ or ‘affirmation -negation-negation of negation’. To recognize space, to recognize what ‘takes place’ there and what it is used for, is to resume the dialectic; analysis will reveal the contradictions of space” (Lefebvre 1976). David Harvey, the singular geographer who discarded his own defense of positivistic geography (Explanation in Geography, 1969) in favour of Marxist interpretations (Social Justice and the City, 1973) mounted a postmodern critique of Marxist structuralism in his later works. His comments in the Preface to Consciousness and the Urban Experience. (1985) are self revealing for his intentions to focus on spatiality as against the prevailing historicism.” Revering to his earlier work, he says; “I thought to be the singular contribution of that work (The Limits to Capital, 1982) the integration of the production of space and spatial configurations as an active element within the core of Marxian theorizing”. “There has been a strong and almost overwhelming predisposition to give time and history priority over space and geography”...He re-

grets following Giddens(1981) that “We lack the conceptual apparatus” which would make space, and the control of space, integral to social theory” and that “Marxists employing a vocabulary appropriate to universal class relations, find neighbourhoods, communities, and nations that partition class struggle and capital accumulation into strange configurations of uneven geographical development”. Further, “Historical materialism appeared to license the study of historical transformations while ignoring how capitalism produces its own geography centres exploit peripheries, the First world subjugates the Third, capitalist power blocks compete for domination of space. The adhoc adjustments (in Marxism) treated of capitalism in space without considering how space is produced and how the processes of production of space integrate into the capitalist dynamic and its contradictions.” He concludes that “historical materialism has to be upgraded, therefore, to historical-geographical materialism” Harvey expresses “overwhelming concern to bring theory and historical-geographical experience together in such a way as to illuminate both”. In particular case of urbanization, “the processes of urbanization of capital are paralleled by the urbanization of social relations through, for example, the separation of work place and living place, the reorganization of capitalist systems of production and control, the reorganization of consumption process, to meet capitalism’s requirements, the fragmentation of social space in relation to labour market demands, and the like”.. “The study of urbanization, (for example) is not Gust) the study of a legal, political entity or of a physical artifact. It is concerned with the process of capital circulation; the shifting flows of labour power, commodities and money capital; the spatial organization of production and the transformation of space relations; movements of information and geopolitical conflicts between territorially based class alliances; and so on.”

7. Postmodernism believes in behavioral, experiential and participatory approaches to understanding rather than the statistical or positivistic explanations. To quote Harvey again, “The path between the historical and geographical grounding of experience and the rights of theory construction is hard to negotiate. I conceive of it as mediated by processes of reflection and speculation. By speculation, I mean the inter rogation of the conceptual apparatus through which experience is mediated, the adjustment of conceptual filters and the juggling of perspectives so as to create fresh windows and dimensions to our interpretation of experience”
8. Postmodernism puts a previously marginalized geog. at the centre of social sciences by restoring spatiality alongside historical in critical social theory; spatiality that was recognized by Kant but was long forgotten during the “mid century involution of modern geography”. It recognizes spatiality as simultaneously a social product (or outcome) and a shaping force (or medium) in social life: the critical insight for both the socio-spatial dialectic and an historical-geographical materialism (Soja 1997).
9. Postmodern geog. lays greater stress on geosocial changes, population growth, hunger, disaster or structural violence.
10. Postmodern geog. emphasizes micro as against macro; lays stress on the specific rather

than the general.

11. Postmodern geography has thus moved away from “spatial analysis to social theory”(Gauthier and Taaffee(2002).
12. It relies more, therefore, upon detailed, often case study based methods to uncover the social processes and relations of power that lie beneath geographical patterns.
13. Postmodernism has ushered in a paradigm shift in the concept of development; from structural transformation in the economy to the transmogrification of a society including “sustainable development”.

It should be abundantly clear from the above brief discourse that Postmodernism has created a congenial intellectual ambience for the perspectives most dear to geographers as never before and paved the way for greater involvement of geographers in handling the issues afflicting the habitat, economy, society, polity, culture of the communities at different spatial scales, most amenable to spatial analysis and synthesis in a hypersensitive and highly interactive milieu.

Human Development:

Simultaneously, there has been a dramatic change in the *zeitgeist* and worldview of social problems. A major fallout of economic growth through modernization, under the influence of growing consumerism as a symbol of development, had been the externalization of environmental costs involved in the reckless exploitation of natural resources bordering on ecological disintegration. Voices were raised from time to time by discerning thinkers over the lurking dangers to the future of humanity (Osborn 1948, Carson, 1962) but such calls were largely ignored. Environmental degradation was considered a small price for the sake of raising the material standard of living of the people. However, such voices became too loud and the adverse impacts too perilous and irrefutable when the Club of Rome sounded a danger signal. (Meadows et.al. 1972). A world summit was held at Stockholm to take stock of the situation of environmental degradation.

A Commission was set up under the aegis of the IUCN whose report Our Common Future (Brundtland 1987) endorsed the worsening situation threatening the future of mankind on earth. It pleaded for a new world order in which the guiding principle would be “the fulfillment of the basic needs of the present generation without compromising the opportunities of the future generations to fulfill their own basic needs”. Thus, the environmental costs were sought to be woven into the economic growth fabric. It was formalized in the Rio Earth Summit in the form of Agenda 21. However, the Rio+ 10 summit at Johannesburg confirmed that it remained nothing more than a slogan as the Washington Consensus and liberalization call swept the globe. Moreover, conceptually as well “**Sustainable development is meaningless for the developing countries which have neither sound economic growth nor healthy environment**” (Di, Castri, 1995). Another adverse impact of reckless economic growth spurred by the growing neo liberal paradigm i.e. growing spatial disparity in national as well as

international context became too glaring to escape notice. During the 90s alongside the advocacy for free trade and liberalization the very concept of development centred on economic growth came under fire. Its fallacy was exposed by Esteva (1992) who pointed out the artificial nature of division and dichotomy between the developed and developing world, following the famous speech of President Truman in 1949. "In a real sense, from that time on, they (third world) ceased being what they were, in all their diversity and were transmogrified into an inverted mirror of other's reality, mirror, that belittles them and sends them off to the end of the queue; a mirror that defines their identity with that of a heterogeneous and diverse majority simply in terms of a homogenizing and narrow minority". Since then development became synonymous to modernization alias westernization. Development continued to be perceived as defined stages (a la Rostow 1960) and quality of life synonymous to the quantum of consumption. It is this economic determinism that was basically responsible for the worsening situation of poverty and inequality" (Sachs, 1992). The subdued and ineffectual voices raised in the UN, Cocoyoc conference as early as 1971 became louder and louder. "The fact that development either leaves behind or in some way even creates large areas of poverty, stagnation and marginality and actual exclusion from social and economic progress, is too obvious and too frequent to overlook" Therefore, the purpose of development should not be to develop things but develop man" For this the very concept and paradigm of development had to change. Boserup (1999 p.7) had already sounded a different note in the 70s. She conceptualized development" as a long term interaction process "and not just reaching a " certain plateau of affluence" but. "The interplay of economic and non-economic factors in process of social change viewing human societies as dynamic relationship between natural, economic, cultural, and political structures "(RICPQL1996). Taking up the cue from Mahboob-UI- Haq who defined human development as "the process of enlarging the people's choice", Paul Streeten (1999) articulated the goal of development as" improving the human well being that would cover all aspects of human life, for all people, both in high income and developing countries, both now and in the future. It went far beyond narrowly defined economic development to the full flourishing of all human choices. It emphasized the need to put people, their needs, their aspirations, and their capabilities-at the centre of development effort. And the need to assert the unacceptability of any biases or discrimination, whether by class, gender, race, nationality, religion, community or generation." Emphasizing the inherent contradiction in the paradigm of development spurred by economic growth, Sen (1999) observed," we live in a world of unprecedented opulence and yet we also live in a world with remarkable deprivations destitution and oppression. There are many new problems as well as the old ones including the problem of poverty and unfulfilled elementary needs, occurrence of famines, and widespread hunger, violation of elementary political freedom as well as basic liberties, extensive neglect of the interests and agency of women and worsening threats to our environment and to the susceptibility of our economic and social lines". Through all these there is unmistakable reflection of Postmodernism that has been articulated in terms of spatiality by Straussfoegel(1997) as follows:

"Development is a process involving enormously complex systems composed of many interconnected aspects and structured across temporal and spatial scales. When development is considered as a process it essentially describes the means whereby one structural configuration is transformed into other... The World system view looks at development as complex,

multilayered and interconnected set of nested and overlapping competing and cooperating structures and actors.’ Accordingly, the position of a state on the coreperiphery continuum is the result of external processes originating outside of a state but impinging on it and internal processes within the states sub system. “

Therefore, one can not but agree with Sen (1999) that” development is a process of expanding real freedom that people enjoy.. It means putting life before money”. Restoring the rights of living over the rights of money would mean restoring political democracy and make it put in place an entirely different kind of international agreement aimed at holding global corporations and finance accountable to human interest. It would mean creation of healthy markets which would use life and not money as a measure of success. This would feature human scale firms and stakeholders’ ownership, rooted capital, balanced trade, sharing of knowledge and technology, energy efficient close loop production-consumption system, that functions in harmony with local ecosystems. We can be more mindful of our living and thereby contribute to the creation of a culture of mindfulness and responsibility that is the foundation of freedom,” observes David C. Korten(1998).It is this mode of Post modern thinking that shifted the focus of development from creation of wealth and enlargement of GNP to the enhancement of GNH i.e. Gross National Happiness. Thus the paradigm of development, at the beginning of the new millennium, has transmogrified from economic growth or modernization! transformation to the “Transformation of the Society” (Stiglitz 1998) forcing, at the behest of W Olfensohn(1999) the World Bank to advocate a CDF(Comprehensive Development Framework).The development paradigm is further poised to venture beyond to cover “reciprocity”, “the simple practice of mutual respect” with nature.(Abram2002).For, “the world we experience is not an objective and determinate reality...it is a social creation the society that creates this indeterminate world is much vaster than any merely human society” (Ibid).

Global-Local nexus:

The advent of Postmodernity and inclusion of spatiality in the overall context of the late capitalism (Post Fordism*) converting time and space into money (Harvey 1985) leads naturally to the issues of uneven development. Neil Smith observes in his book *Uneven Development: Nature, Capital and the Production of Space*; “Occupying the common ground between the geographical and political traditions, a theory of uneven development provides the major key to determining what characterizes the specific geography of capitalism... it is not just a question of what capitalism does to geography but rather of what geography can do for capitalism. Geographical space is on the economic and political agenda as never before. The idea of the ‘geographical pivot of history’ takes on a more modern and more profound meaning than Mackinder could have imagined. “As Soja observes while tracing the relationships between History, Geography and Modernity, “hidden within the modernity that was taking shape was a profound ‘spatial fix’. At every scale of life, from the global to the local, the spatial organization of society was being restructured to meet the urgent demands of capitalism in crisis-to open up new opportunities for super profits, to find new ways to maintain social control, to stimulate new ways to production and consumption. This process is proceeding apace requiring a study of the global-local nexus in social transformations. Scale is a crucial

dimension for understanding social practices as the necessary ordering framework for understanding society-nature relations. Geographical scales do not exist separately from the social practices that create and continue to modify them. Logically, it is not possible to carry out a social activity at one particular scale but not at others. This does not mean that scale is neutral or inert in social activities. Some practices are facilitated by focusing at particular scales because effects of practices are typically concentrated at particular scales.

*Post Fordism denotes a system of production characterized by flexibility both of labour and machinery; by the vertical break up of large corporations by better use of links between firms so that subcontracting is increasingly used, and by just-in-time production. It is associated with agglomeration around large-scale vertically integrated production systems; mass consumerism and sprawling sub urbanization.

Recent concern for geographical scale has concentrated on the global and the local as opposite ends of the range of social-space possibilities. The global implies a worldwide universalism, whereas the reality is that the processes of globalization are quite uneven. In the communication revolution, for example, the majority of humanity is “out of the loop” and there is little prospect of large swaths of the “South” being hooked into the system in the foreseeable future. Similarly, What is local? If local implies community then only small neighbourhoods and villages can be true communities based upon face-to-face interactions, but there is an underlying notion of local economy and society in symbiotic relationship facing the outside world. In fact, a nexus i.e. a complex connectivity exists between the two, limiting geographical possibilities. \

Localities are often portrayed as “economic victims” of global forces, where investment decisions made thousands of miles away can make or break communities; called regional dilemma, in the market led world. But localities are not inert population aggregates, they are constituted of people and their social networks that can, and do, devise practices to, attract, retain, boost, and otherwise ameliorate farces that seem to, be beyond control. This global local nexus is, of course, enormously complex both economically and politically. This complexity is often related to a second nexus concerning the recent rise of multiple ethnic rebellions, religious revivals, and nationalisms. Each can be interpreted in part as local resistance to, the homogenizing global political farces that favour larger and larger political spaces to counter economic globalization. These movements attempt to, generate policies sensitive to; local needs, in reaction to, destructive and destabilizing impact of economic restructuring. A third nexus is a broader formulation to, what lies behind ethnic revivals. The postmodern celebration of diversity in all forms derives from a critique of meta-narratives of modernity as a sort of intellectual globalization. The global implied by modernized space is countered by the local identified through diversity in places. But diversity is not universally accepted and intolerance has created a fourth “new world disorder” nexus wherein global changes are translated in local conflicts. The fifth nexus treats the broader nation of destruction, the overloading of ecosystems locally to, the point of producing uninhabitable localities, which can culminate in the destruction of the earth as a living system. The key point about these interlocking global local nexuses is that they each represent real tensions between activities and consequences that are separated by geographical scale. Thus globalization must be viewed not only

from above, but also from below. The global and the local must be taken into, account together .As Munuck paints out, “the current phase of globalization is precisely the intermingling of all levels in a multiplex and ‘hybrid farm of inter connectedness (p.169)”

Quo Vadis:

In the light of the above discussion of the global local nexus, Taylar et.al, (1996) emphasize the need far following remappings, implying “profound social change”, in the background of “a mare polarized world”.

1. Promotion of markets as resource allocators in an increasingly deregulated world. But markets do, not exist in a social vacuum. Market principles are often confused with market practices.
2. The challenge to, state sovereignty; the functions of the state have changed appreciably. The legitimacy it gives to, markets and other social activities continues to, be a necessary prop to, cape with social change.
3. The construction of new civil societies in which people can engage with social change through the state;
4. The necessity of a new politics which environmentalists are trying to, create;
5. Centuries old faith in automatic social progress is being reevaluated; whether postmodernism is something entirely new or basically made of the same cloth as these earlier movements like Enlightenment?
6. There is a configuration of capitalism accruing with new divisions of labour, an enhanced role of finance, and new possibilities of central through communication and computing technology innovations. This package of changes is disrupting traditional labour -capital relations within countries, but there is no, simple trend to, economic globalization. However unevenly our world is interconnected through the vertex of globalization. Polarization could work as a sustainable system if the world were populated by rather dim economic men and women. But it is not; it is full of human beings with hopes and dreams and expectations.

The Technological Strides:

Alongside the epeistemalagical - methodological shifts and changes in the worldview of human development paradigms, there has been dramatic strides in the field of technology, particularly information technology which not only altered the meaning of spatial distances but have made it possible to, free geographers from the cumbersome task of painstakingly collecting facts and data related to the potentiality, availability and distribution of natural resources, their use/misuse patterns, the natural features, the physical and human landscape,

the quantitative and qualitative attributes of the spread, and depth of infrastructures etc. Any spatial fact or feature can be visualized, measured mapped or transferred at the desired scale and in the desired format with the help of spatial information system. Thus, much of the energy of geographers earlier devoted to, acquiring of the spatial data in the desired form has been released for a better analysis and synthesis of spatially correlated phenomena. However, there is the lurking danger of missing the wood for the trees. A caution against “over optimism regarding their potential” has already been sounded by many a thinker. (Goodchild, 1995). It must not lead to “a retreat from knowledge to information”(Taylor 1990). Moreover, G.I.S. is confined to three main types of data: points, lines, areas; whereas “knowledge is about ideas, about putting ideas together into integrated systems of thought’ ht we call disciplines. Information is about facts, about separating out a particular feature of a situation and recording as an autonomous observation. Hence, disciplines are defined by the knowledge they produce and not by facts.”(Taylor, Ibid) Even the great champion of G.I.S., Openshaw(1992) who strongly advocated the application of G.I.S. to correct the situation arising out of inequality of geographical information between the rich and poor countries (and regions) perpetuating the uneven development in the world, conceded “the urgent need to interface the hard and soft parts of geography”. “Unless G.I.S. are transformed into G.K.S (Geographical Knowledge System) they will leave geography intellectually sterile-high tech trivial pursuit” apprehended Goodchild (1990).

Whither Indian Geographers?

India is very much in the vortex of globalization with its attendant spatial polarization, and fragmentation, differentiation as well as homogenization, disparities and desperations, concentration and peripherilisation. She is in the forefront of information revolution too. The launching of satellites and landing on moon proceed apace with the multiplying numbers below poverty line. There is great demographic reshuffle taking place; social upheavals are proliferating and multiplying as well. The Blue, the Green, the Saffron, the Crimson and a host of others addressing different constituencies are emerging by the day. The rising aspirations for quality education and health, the growing expectations to share the national pie, large scale migrations and unregulated sub urbanization, the burgeoning informal sector, the ambitions of young women to participate in the nation building, the call for export promotion and diversification of agriculture; the growing menace of land degradation and water scarcity; water, air and soil pollution; increasing crime and violence, the rapid growth of kidnapping and unemployment industries; all these find spatial manifestations in the mushrooming nursing homes in the metros down to the small towns and proliferations of coaching institutions and capitiation fees demanding professional institutions as well as reservation catering universities and colleges offering sterile curricula droned in by indifferent teachers; in the infosys shops and medical stores emerging in every nook and corner. The sprawling mega/million cities and ribbonisng rural settlements; ambedkarisation of villages and towns as also ghettoisation and slummisation of cities; the growing connectivities and widening communities’ cleavages; nuclear deterrants and nuclearisation of families; growing number of schools and deteriorating standards of learning; the triple shift (file pushing, housekeeping and child caring) working women and vermilion marked school going teenager girls; skyrocketing dowries and foe-

ticide seeking masses; upliftment of the downtrodden, but hurtling down of the helpless; all tell the same story. 21st century India is churning to taste the butter of higher material standards of living while yearning to find a respectable place among the comity of developed nations; enjoying the freedoms of the permissive societies while clinging to the taboos of the ancient culture.

And yet, Indian geographers seem to be oblivious of the spatial causation of these socio-economic upheavals and blind to the spatial expressions of these socio-cultural transformations. They are quick to point out the superficial symptoms of environmental morbidity but fight shy of deep pathological investigations of societies and prescribing the remedies. Most are out of tune with the voice of the times, *Zeitgeist*, and out of sync with the post-modern geography. The old guards stick to their geomorphological proclivities (ref. UGC recent most geog syllabi enjoined to be implemented uniformly all over the country!) paying scant attention to the sociomorphological expressions in the human landscape. In the beginning (during the 50s) the Chicago School's urban morphology attracted attention but it soon petered out. The Los Angeles School championing the postmodernist view of urbanization is being bypassed. The young practicing and emerging professionals are toying and tinkering curiously with the new tools of GIS and GPS. They are content to fill fresh colours in the given outlines; ill prepared to be 'remappers'. The age-old cartographic mentality and sentimentality is hard to overcome. The absence of discourses, debates, discussions and evaluation and re-evaluations in the reputed geographical journals of the country speaks volumes of the methodological (epistemological) moribundity of the discipline. The 'Voices of Concern' (Kapur, 2002) diagnoses of ailments and even 'biopsy' of the discipline in presidential after presidential lectures have failed to kindle the postmodern geographical spirit to rise to the occasion of fully partaking in vision of India 2020 by preparing a reliable 'roadmap'. Hopefully, the graduating generation of geographers will awaken to the opportunity of putting geography in the centre of critical social thought by exploring the reassertion of spatiality in postmodern thinking and exploiting it to the advantage of *Samvikas* of the communities as sketched in the sequel and thus participate in realizing the Vision 2020 set for the nation at the instance of the Head of the State.

The Vision of Samvikas (Holistic Development):

It is obvious from the above discourse that development, the single basic concern of one and all in the country, is no longer regarded as a unidimensional linearly progressing phenomenon concerned with attaining some "plateau of affluence" (RICPQL, 1996) at the gross level. Development is an all integrative multidimensional process of unfolding of people's creativity toward the enhancement of human welfare with complicated spatialtemporal-sectoral-social-ecological-technological-cultural interlinkages and interactions through the whole gamut of spatial scales from the local to the global community. And yet, development is basically conditional. "Entwicklung ist immer Kontingent" (Thiel 1999)" we have always to deal with the reality which is not uniform. The conditions change in course of time; they differ from-country to country, from place to place, from case to case. They change with innumerable individual decisions, which cannot be forecast (English version of Thiel's editorial remarks E +

Z, 2002 poll). Therefore, there cannot be any universal method of determining the status / strategy of development. Diversity and individuality have to be appreciated.

The author has attempted to weave together the different strands of development paradigm, in the sequel, in a broad framework of Samvikas with special relevance to India. It is epitomized in the diagram integrating the various dimensions in a holistic framework (Fig. 1). The diagram presents a development edifice, which depicts Human Welfare (H.W.) as the ultimate objective of any development effort, of course in a contextual sense. HW may be interpreted in a comprehensive sense, as the enhancement of the quality of community (area bound people) life. It involves at its minimum the three ingredients viz. Survival (S1), Security (S2) and Social Dignity (S3) of human existence.

Survival of the individuals comprising a community hinges on meeting the basic needs of food including safe potable water, shelter, health and education. Security depends upon ensuring the right to life through adequate legal and physical protection cover, not only from unruly and criminal elements in the society but also insulation from the foreseeable/ preventable natural hazards like floods and droughts, cyclones and quakes. These two may be achieved to a certain extent by ensuring the individual/family/community social dignity which flows basically from gainful employment. It is the lack of stress on creating employment opportunities for active population groups vis-a vis the GNP that is mainly responsible for the futility of the grand theories of development advanced during the last half a century (Thiel, 1999). The “freedom” regarded by Sen (op.cit.) as the summum bonum of development flows basically from the availability of adequate employment opportunity. It is the “Dutch disease” or “Arabian Ailment”(failure to create employment opportunities despite economic boom following the discovery, extraction and export of Gas or mineral oil) that is responsible for frustrating the efforts to eradicate poverty and hunger from Bolivia to Bhutan (Brauer, Klein,Thiel, 2003) or the exodus of people from emaciated rural to bloated urban areas throughout the Third world or from the anaemic Third to the obese First.

Demographic Stability:

Full and fruitful employment and thus human welfare at the community level depends to a large extent, on the number and quality of people in a community/nation. The first aspect relates to the maintenance of optimum population while the second is related to the building of human capital through appropriate education. While there is great ambiguity about what constitutes the optimum number, and how to achieve it, there is hardly any scope of difference that education and professional training to each and every individual is a *sine qua non* to the human welfare. In fact, education and health are the basic ingredients of human welfare. Optimum number is reflected in the population pyramid of a region. A more balanced age-sex pyramid, tall and proportionate at all stages, as in Fig. 1, is a sure indicator of demographic optimality, in developed and developing countries alike. Any measure of demographic control/incentive must have the balanced pyramid as an yardstick. Taller the pyramid, healthier the people. As for the number in different age and sex groups, appropriate socio-economic measures of regulating the birth rate, particularly through education and public awareness, backed by fair distribution of national income, more through the creation of employment

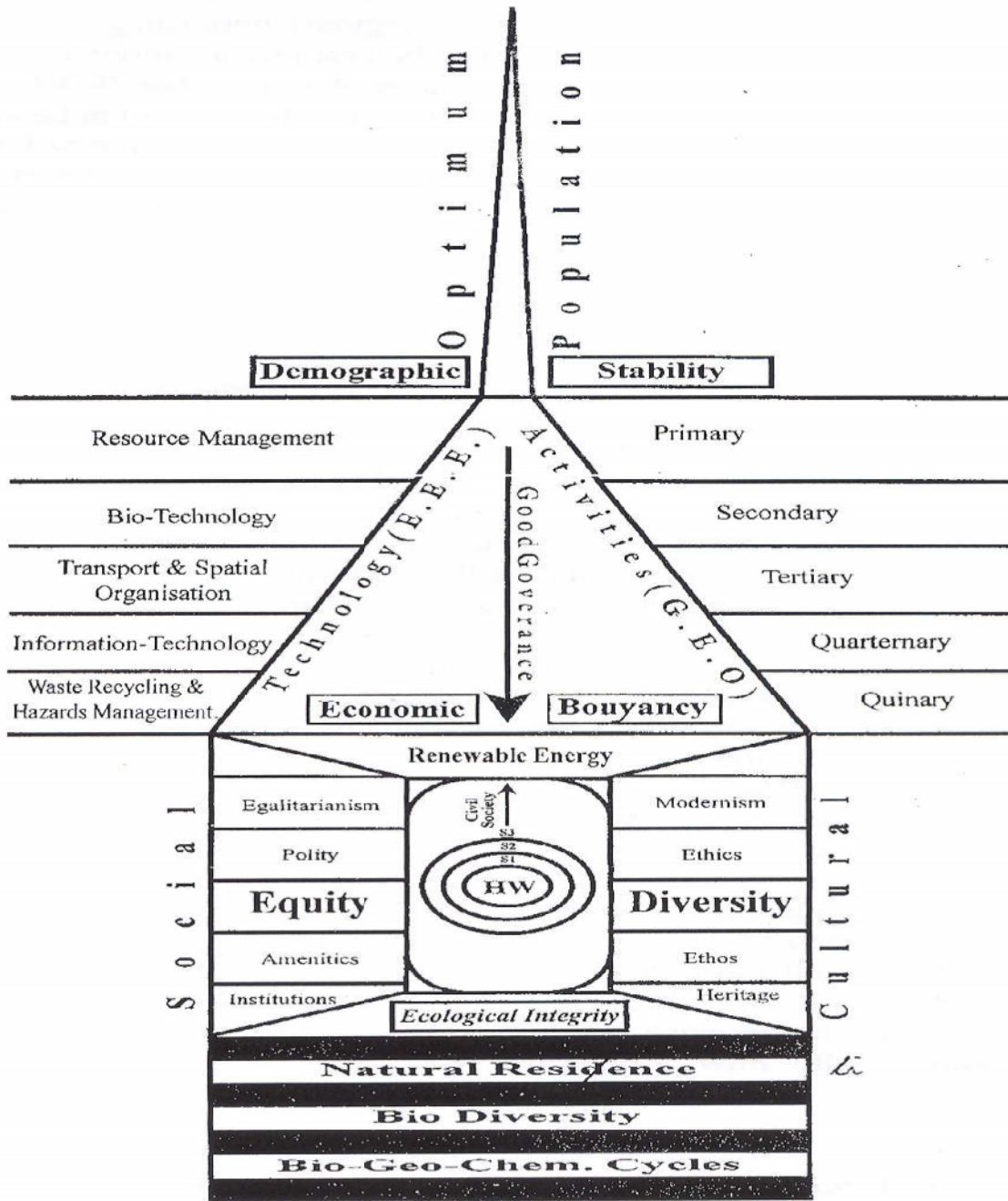
opportunities commensurate with the education and skill in the long term, and less through the short term fiscal control, may achieve the desired numbers.

Ecological Integrity:

Demographic stability in the long term, with maximum human welfare at the material plane, would depend on the ecological integrity although the biosphere, beginning from the local biome, It depends basically on the awareness and recognition in one and all, that the harmony and reciprocity with nature must inform every human activity in the spirit of veneration for the mother earth (a la Vedas & Gaia). This may come about not by approaching nature with the vanity of a conquerer but “only if nature is recognized not as a concatenation of objects but as community of living subjects, a complexly intertwined society of beings-who like ourselves- are active, animate agencies... We human beings are by no means the sole, or even the primary, agents of the world’s construction... And reciprocity, the simple practice of mutual respect-becomes an imperative. Humans are recognized not as disembodied minds but as material, bodily subjects, animals in our own right, and thus as participants in the same world that salmon (for example) inhabit.” (Abram op.cit.)

At the solid ground plane, there must dawn the awareness about the basic functioning of nature- the flow pattern of energy, the bio-geo- chemical cycles and the significance of biodiversity in maintaining the health and integrity of nature. Rather than fire-fighting pollutions of all sorts through ill conceived cosmetic measures, the ecological resilience of nature must be strengthened by allowing unhindered functioning of the bio-geo-chemical cycles and harness the dividend, not the capital, to the benefit of mankind. An irreparable damage was inflicted when land was derecognised as a factor of production and replaced by technological innovations by the Neo classical school of development.

Innovations and technology are best applied to prevent creation of waste in the process of production, distribution and consumption and effectively recycling by consigning to the bio-geo- chemical cycles of whatever waste is inevitably generated to convert into wealth. Appropriate Spatial organization (reorganization) of activities in space, laying stress on deconcentration of economic activities and achieving sectoral integration a la Growth Pole hierrachy (Singh, 1979) and so dear to geographers during the 60s of the 20th century, but which was sacrificed at the altar of economic efficiency and validated the externalization of environmental and social costs by the private entrepreneurs, particularly by the neo-liberal economists, has to be revived for sustaining (not sustainable) Samvikas. The theory of “public goods” recently advance by Stiglitz (op.cit) and elaborated by Kaul(1999) is a step forward in the right direction.



Economic Efficiency:

Of course, for the material welfare of any individual or community a regular income is necessary (though not sufficient) condition. Without a regular income flowing from gainful employment, none of the three basic ingredients of human welfare can be obtained. For this, maximum possible efficiency in economic pursuits, particularly in using of natural resources, has to be achieved through the application of technology. The technologies from the viewpoint of enhancing economic efficiency, (E.E.E. the upper left arm of the diagram) may be categorized as, (i) resource management (ii) biotechnology (iii) transport and spatial organization technology, (iv) information technology and (v) waste recycling & hazard management. Although these technologies are intertwined and cut across all activities, the grouping has been made with the viewpoint of their dominant role in, respectively, natural resource extraction (fishing, forestry, mining, agriculture) and utilization, (soil, water, biodiversity), resource conversion through industrial location and their spatial spread, tertiary and higher activities and the prevention of environmental degradation in the process of production. Of these spatial organizations so dear to geographers of the positivistic mould during 1960s and hence, rationalization of location and distribution of economic activities but brutally subdued for the sake of reaping agglomeration and scale economies at the expense of huge social and environmental costs in the neo-liberal paradigm of economic growth, has been the most neglected. This technology must be resuscitated for the sake of achieving a trade off between rapid growth of GNP and spatial equilibrium ensuring equitable employment opportunities as well as maintaining ecological integrity through space. Hand in hand with the constant enhancement in economic efficiency there must be corresponding growth of gainful employment opportunities arising more and more from the higher sectors of the economy. This entails a shift of employment from primary through secondary and tertiary to quaternary and quinary sectors. Thus can be ensured economic buoyancy, so necessary for sustained human welfare, of course in consonance with other, more important dimensions of Samvikas.

Social Equity:

Forms one of the two basic pillars of human welfare. It is the means and end of human welfare, at the same time; as has been underlined by the thinkers like Sen (op.cit) and Stiglitz (op.cit). Basic to social equity is the building of institutions to serve the cause of the poor, the weak, the deprived and downtrodden sections of the society, in particular. Among such institutions, those catering to the educational and health needs are of paramount and universally important. Without ensuring the opportunities of basic health as also, adequate and appropriate education, the members of a community cannot participate in the economic pursuits. Nor can they realize the higher goal of unfolding and realizing the creative potentials of all. Next in order are the other social amenities, designed to ensure a happier community life. Easy access to infrastructures like transport, and communication networks at affordable costs, homes for the hapless aged, amenities for the elderly. Gender equity is of crucial importance and hence, above all, institutions fostering gender indiscrimination are singularly important. For all this to be achieved an appropriate polity has to be created. It is here that the decentralized (national, state, and local) Govt. apparatus and a fair and effective judiciary have a signifi-

cant role to play. Ultimately, an egalitarian society must emerge. This is the key to harmonious social milieu which is one of the basic ingredients as well as objectives of Samvikas.

Cultural Diversity:

One of the basic presumptions of Samvikas is the maintenance and fostering of the cultural diversity. No one culture is superior to any other. Economic prosperity is not synonymous to cultural superiority. Therefore, cultural heritages which are basically a product of ecological peculiarities and diversity must be respected as also the values and the ethos of each culture maintained. Cultural diversity is as important for a healthy human community as is ecological diversity for the health of an ecosystem. To ensure all this cultural ethics of diverse societies has to be respected. At the same time, it is imperative to put indigenous mechanism in place to ensure the discarding of the deadwood (like caste stratification and cleavages, denigration of the female, child marriage, dowry system, civil codes misfit to the, ethos of democracy) and serves the cause of 'spiritual modernism' (Sri Aurobindo 1992 p.53). Everything from the past is not worth retaining; everything from outside is not worth emulating. There should be no inhibition in changing the cultural, in the sense of way of living, mores in tune with the times and in the interest of building a harmonious sound social set up. 'The ancient civilization of India founded itself expressly upon four human interests; first desire and enjoyment' next material, economic and other aims and needs of the mind and body, thirdly, ethical conduct and the right law of individual and social life" and, lastly, spiritual liberation; Kama, artha, dharma, moksha. The business of culture and social organization was to lead; to satisfy, to support these things in man and to build some harmony of the forms and the motives... fullness of life must precede the surpassing of life. The debt to the family, the community and the gods could not be scamped; earth must have her due and the relative its play, even if beyond it there was the glory of heaven or the peace of the Absolute"(Sri Aurobindo op.cit.69) This must inform the ethos of Samvikas.

It is obvious that an uninhibited interaction among the positive elements of all the dimensions outlined above can help attain the objective of Samvikas i.e. holistic and abiding welfare of a community, material as well as spiritual. Good governance, free from underhand dealings, on the one hand and conscious and active civil society, on the other, working in tandem, can and are inevitable to bring that about. Geographers must regard themselves as an integral component of the civil society and contribute their mite effectively using their science and skill of the interpretation of the socio-cultural morphology and shaping the humanized landscape to the betterment of the communities' quality of life. The Vision geography 2020 must dedicate to the 'remapping' of the education opportunity, health requirements, building a discrimination- free society, strengthening the infrastructure, expanding the employment avenues, and maintaining the ecological integrity, and releasing the positive forces inherent in the earth and people to cater to the basic needs of the community as well as contribute to the welfare of the nation at large, effectively using their unique capacity of synthesis of physical, biological and human elements.

I would suggest the following thrust areas for the next two decades.:

1. Geographers must heed the advice tendered by late Prof. Moonis Raza to provide “the much needed spatial dimension to the development process and to sharpen its focus”. “Regional development (emphasis added) should be viewed as the articulation of the qualitative changes in the geobio-techno-social complex of interdependent phenomena in such a manner that the quality of human life improves within the framework of the integrity of the eco-system”(Raza, M.2002).
2. Recognize the global impulses and impacts’ transmitted to the localities and vice versa, like that of W.T.O deliberations and decisions or MNC’s penetration, emerging trade blocks or terrorisms penetrating down to the villages; caste/class solidarity, occupational mobility, to cite a few examples, that shape the demographic exodus and alter the socio-spatial contours as well as occupational structures (viz. rag picking, hawking, door-step vending, kidnapping and killings) and impinging on the environmental, including socio-political quality;
3. Trace the socio-political causes underlying increasing spatial polarizations of affluence and ‘integrated poverty’, intensifying natural hazards and stratified vulnerability, the spatial variations in the successes/ failures in the formation and effectiveness of civil societies, self-help groups, joint management-communities of common properties, like water and forests. “The challenge posed by the accentuation of regional disparities is not only “highly disquietening” (Raza ,Ibid) but is assuming threatening postures as is evident from the growing inter-state tensions and violent eruptions of parochialisin (the recent killings of Biharis in Assam and threatening postures of Siva Sena in Maharashtra, or Kaveti water dispute, are painful pointers) in seeking employment opportunities.
4. Evaluate the impacts of information technologies, improved infrastructures, social amenities especially education and health; from the, viewpoint of ‘ geographical socialism’ and explore the prospects of people-public participation (PPP) in different combinations in consonance with the socio-cultural ethos of the region/community concerned. Taking urban facilities to the villages i.e. reviving the concept of Urban Functions in Rural Development (UFRD) (Rondenelli (1984) deserves a serious relook.
5. To delineate the dynamic, stagnant, or degenerating regions from the perspective of their position in the core periphery continuum at different scales (international, national, sub- national) and dominating, depressed deprived socio-ethnic segments (gender, class, caste, religious community etc.) therein with regard to access to resources and opportunities so that appropriate Positive empowerment measures and resource sharing /activity participation avenues may be fruitfully explored”
6. Rather than confine to measuring it} micro-units and painting in catching colours the finest categories, the different dimensions of availability and utilization of natural resources, land use changes, land degradation, environmental deterioration, the depth of poverty and the like, geographers may better devote their expertise to the spatio-socio-cultural-polity roots of scarcity of resources like water (Mehta, 2003) and processes operating beneath such physical manifestations and their socio-morphological expres-

sions through empathetic participant observations. Data matrices and cartographic coordinates must not be taken as the disciplinary matrix. The thick vegetative growth of data processing, although essential, must not hide the sheaves of knowledge. Rather, the former must be dwarfed for healthy growth of the latter. Building a Geographical Knowledge System (GKS) and based thereon carving a well-designed regional 'roadmaps', revealing alternative policy routes must be the core objective. Thus will the disciplinary capability be enhanced as well as the cause of nation building will be served. Rather than be content with acting as the Peshkars of "geographic information" to ivory tower policy makers, let geographers be the torchbearers of Samvikas and the society.

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PROCESS OF URBANIZATION IN DEVELOPING REGIONS : A CASE STUDY

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INTRODUCTION

Urban processes are believed to be induced by high density crowding of population at locales perceived suitable for different kinds of activities and complimentary specializations (Childe; 1950: 3-17). Lampard (1955: 92) also believes the urban agglomerations to be the result of 'the concentration of differentiated but functionally integrated specialisms in rational locales'. He assigns the process a function leading to restructuring of social organization that 'furthers efficiency in economic activity'. Urbanization, thus, has been conceived as a process intertwined with economic development (Carter, 1995:19) and that which attracts agricultural labour made surplus partly by improved farming technology (Haggett, 1983, 334) and in third world countries particularly due to high rate of population growth and uncertainty of agricultural production and their disposals. The townships, therefore, must provide avenues for new arrivals. In post Industrial Revolution period urbanization in industrial Countries progressed by breaking down the production and jobs to the smallest and most limited of tasks' (Carter:op.cit) leading to the expansion of urban basic activities. It has been resulting in further concentration of population and consequent enlargement of non-basic activities (Kumar, 1998, 42) to help the urban populace to attain a life style generally unavailable in uni-functional rural settlements. Urban centers thus evolve as nodes where 'geography of population and consumption interlock' (Berry, 1967). In the process, new societies and organizations are created. The urban settlements become 'mosaic of little worlds' (Park, 1936:608) sustained by economies of scale.

The process of urbanization in Third World Countries though may be considered, to certain extent, a consequence of economies of scale' they are not necessarily associated with the process of development and diversification of economy (McGee, cited in Haggedom, 1987, 280). It unlike popular belief may be considered to be a process of underdeveloped (Carter, 1995, 20-21). It may also be attributed to the continuance of colonial legacy in the form of global mercantilism aimed at disrupting the traditional labour intensive activities of the developing regions in favour of advanced economies and industry induced demands and supply. The Third world countries invariably fall prey to such designs, the benefit of which is mostly appropriated by more organized powerful groups dominated generally by a combine of the interests of business-political-bureaucratic communities which relish crowding that offers them avenues for 'least effort' in attempting manipulations in their respective spheres. They therefore, work in tandem to perpetuate such concentration of population. It also helps them to control resources abandoned by ever migrating rural population. It is in the light of the above conceptual framework that an attempt has been made to study the process of urbanization in Mizoram.

STUDYAREA

Mizoram, the 23rd state of the Indian Union in the womb of the hills, has been secluded from the main stream development. With a population of about 888000(2001) it is the south eastern citadel of North East India It is probably the most literate state in India to-day (it was 2nd to Kerela in 2001 with over 88% literacy in the state). Over 95% of the population belong to one ethnic group categorized as Indo-Tibetan with a very closely knit social organization. Wedged between Myanmar in the east and south, Bangladesh in the west normal land connectivity of the state is through Assam in the north. It has limited air linkage with Kolkata, Guwahati and Imphal.

The state is devoid of much usable mineral resources and any significant industrial base. The movement of people even from rest of the country is controlled by Inner line Regulation of 1863. These aspects are indicative of the limited economic potential of the state. Yet, by all accounts Mizoram has experienced an unprecedented growth of urban population in last three and half decades. With a meager 11 % at two urban centers of Aizawl and Lunglei in 1971, the state claims to have over 49.5% (2001) of its population living in its 22 townships at present. This makes the state the 5th most urbanized state amongst the constituents of India after Delhi (93.01%), Chandigarh (89.78%), Pondicherry (66.57%) and Goa (49.77%),

The following table shows the growth of Urban population in Mizoram since 1971.

TABLE:1

<u>Census Year</u>	<u>No.ofTowns</u>	<u>Urbanpopulation</u>	<u>%tothetotalpopulation</u>
1971	2	37,759	11.36
1981	6	1,21,814	24.67
1991	22	3,77,946	46.20
2001	22	4,41,006	49.63

Presently almost 50% of the total population of the state lives in about 2.95% of its urban area. This would make population density in urban areas on an average to the tune of over 700 persons / km².

On the other hand, Rural Mizoram has a density of population less than 21 persons/km².

Out of 732 settlements in the state 702 are connected well by all weather and fair weather roads. Almost 55% of the roads are surfaced. The National Highway No.54 traverses the state from north to south in a total run of more than 400 km connecting three major and six smaller urban centers in its linear stretch. With an annually average income of over Rs 19600/-the people of Mizoram appear to have graduated suddenly from a primitive subsis-

tence economy some 40 years back to a highly consumptive urban society despite the fact that internal revenue receipt of the state government accounts for not more than 6% of the total budgetary provisions.

In addition, despite high rate of urban growth more than 65% of the total workers are still engaged in agriculture followed by about 40% employment in jobs offered or sponsored by the Government. Only about 2.8% workers find employment in secondary sector. It is in this light that attempt has been made in this paper to analyze the process of urbanization in the state that apparently appears to be different from what is understood by the process

METHODOLOGY

Thrust of the paper being the ' process of Urbanization in Mizoram' attempt has been made to evaluate the process in the light of population growth and workforce composition at different urban centers and changes there in.

1971 has been selected as cut off year of Population change simply because of the fact that Mizoram emerged as an independent political entity only in 1972 when it was granted Union Territory Status in an attempt to bring the people in national mainstream.

Growth rate of towns has been calculated following Narayanswamy's formulae that he adopted for the demographic study of Madras (Narayanswamy, 1976) where he equated

$$\text{Growth rate with } r = \frac{P_2 - P^1}{t} \times \frac{100}{(P_2 + P^1)}$$

Where r= the average annual percentage increase

P^1 = Population at the base year

P_2 = Population at the end of the period

t= the number of year in the period.

The workforce composition has been evaluated only during inter censal period of 1991-2001 because of the fact that as many as 16 settlements were notified as urban only in 1991.

The other indicators on literacy and health have been avoided on the basis that figures for rural and urban areas in Mizoram are comparable and show very little or insignificant variability.

Table-II

POPULATION CHANGE IN URBAN MIZORAM SINCE 1971

Sl.No	TOWN	BASE YEAR 1971	CHANGE IN PERCENT		
			1981 in %	1991 in %	2001 in %
1.	Zawlnuam	2264	20.76	92.59	-9.70
2.	Mamit	2964	-15.77	40.55	44.11
3.	Lengpui	1110	34.59	21.02	32.02
4.	Aizawl	39740	137.7	108.4	47.73
5.	Sairang	2218	7.36	70.96	42.73
6.	Kolosib	5996	36.13	62.79	41.00
7.	Vairengte	2455	28.19	77.94	31.61
8.	Kawnpui	4052	11.62	16.96	22.34
9.	Bairabi	1852	7.72	21.35	36.47
10.	Darlawn	2369	18.32	28.71	7.09
11.	Serchhip	4602	52.62	86.71	25.17
12.	Thenzawl	3535	13.08	44.02	22.32
13.	Saitual	3194	9.99	142.20	30.52
14.	Khawzawl	4012	6.45	66.33	54.19
15.	Khawhai	3662	83.47	5.31	14.32
16.	Champhai	4185	78.90	177.94	27.18
17.	Biate	2132	-7.89	17.46	-4.22
18.	NVanlaphai	2895	-23.14	19.27	16.80
19.	Tlabung	4841	-122.78	56.88	7.98
20.	Lunglei	6019	185.94	106.91	32.41
21.	Hnahthial	4972	-19.35	33.17	28.61
22.	Saiha	1558	339.17	94.77	45.04
	MIZORAM	37759	222.61	160.26	38.70

DISCUSSION & CONCLUSION

Considering an average natural growth rate of 2.4% per annum it appears from the Table II that 13 of the deemed urban centers in 1981 registered a negative growth. The trend continued for at least 6 centers in 1991 and 8 in 2001. This is indicative of the capacity of the notified towns to hold even their original population despite their new status. It also suggests lack of diversification of activities, either basic or non-basic in such settlements and lack of their potential to grow as urban economies would normally suggest.

Thus, their recognition as urban centers by state administration raises doubts.

Similarly, if the workforce composition of these centres is analyzed, it is found that there are at least four settlements which have not shown significant change in their workforce composition. In, fact, share of persons engaged in agricultural activities has increased in the Urban Settlements of Hnahthial, Biate, N. Vanlaliphai and Khawhai. Yet it will be difficult to categorise them as agricultural towns for their activities do not support it. In other, settlements also barring eleven Settlements the declining change in agricultural group is partly

compensated not by occupation in other categories of economy but by rising number of marginal labour (Table III)

TABLE-III

Table showing the distribution of workers in different sectors of economic activities in Mizoram and percentile change between 1991-2001 .

Towns	Agriculture		Industry (H.H)		Services		Figures in % Marginal workers	
	1991	2001	1991	2001	1991	2001	1991	2001
Aizawl	17.0	5.8	8.9	1.9	74.2	92.4(22.60)	22.6	10.4
Lunglei	43.0	25.0	3.5	1.0	54.9	74.0(11.1)	29.8	6.2
Kolasib	60.0	40.3	4.3	2.4	39.4	57.3(12.7)	15.2	15.6
Serchhip	70.5	58.5	2.3	1.8	27.2	39.8(7.6)	18.2	10.7
Champhai	69.4	42.0	2.6	1.8	27.8	46.2(8.9)	15.6	20.8
Saiha	38.6	24.5	4.7	2.2	56.8	73.3(12.7)	9.4	5.8
Zawlnuam	66.9	62.2	2.7	2.1	30.4	35.1(8.4)	5.5	21.3
Mamit	75.9	61.5	1.0	2.0	23.1	36.6(6.5)	11.9	5.6
Lengpui	83.3	60.3	1.3	0.6	15.4	39.1(4.8)	22.4	17.0
Sairang	64.4	40.0	8.9	1.9	26.7	55.2(7.6)	23.0	16.2
Vairengte	64.4	58.6	2.2	0.8	33.3	40.6(10.8)	8.0	8.1
Bairabi	78.1	66.9	1.8	0.3	20.1	32.7(7.6)	9.3	16.7
N.Kawnpui	72.1	66.2	2.9	0.8	15.0	30.9(3.4)	10.6	11.1
Darlawn	82.1	68.3	2.8	1.0	25.1	30.6(6.5)	1.8	12.9
Thenzawl	75.4	61.7	7.8	12.5	16.8	25.7(4.)	1.0	14.5
Saitual	76.4	62.7	2.6	0.7	21.1	36.5(7.8)	41.9	14.9
Khawzawl	78.4	53.0	1.7	1.2	20.0	45.8(4.9)	25.3	15.0
Khawhai	90.4	90.6.	0.7	0.3	8.9	9.1(1.7)	42.1	20.7
Biate	80.8	84.0	0.6	0.2	18.6	15.8(2.5)	37.3	32.3
N.Vanlaiphai	70.9	71.5	0.6	1.9	28.5	26.6(5.8)	28.9	26.5
Tlabung	65.5	40.6	1.9	1.2	32.7	58.1(7.4)	42.8	9.3
Hnahthial	43.9	54.3.	2.4	1.0	53.6	44.7 (12.8)	2.0	15.8
MIZORAM	65.8	59.0	2.8	2.8	31.4	39.8(8.8)	6.2	11.8

Figures in parenthesis (Service Sector 2001) reflect percentage of workers in Trade and commerce, transportation and construction etc.

This raises doubts about the intentions of the powerful politico- administrative nexus in the state. It may be noted that there does not exist private land ownership in the state. Land in rural Mizoram is owned by community regulated by village Councils in their designated areas.

Granting of urban status to Settlements without creation of any administrative or regulatory bodies may provide the nexus an opportunity to appropriate rural resources. It is obvious from the fact that Mizoram is one of the states, which is only at the threshold of implementing 74th Amendment of the Indian Constitution. Yet the state authorities vociferously demand financial assistance from the Ministry of Urban Development, Govt. of India. It appears, that attempts to designate more and more settlements as urban there is a conscious attempts to appropriate resources from central Government but certainly not in the interest of Common urbanities of the state.

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LAND USE CHANGE IN MIZORAM

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Abstract

(The overall supply of land is perfectly inelastic. The rapidly increasing human and livestock population and expanding socio-economic functions have led to degradation of land and environment. If unchecked, the land resource may become increasingly less productive and may get irreversibly damaged. It is important therefore that a systematic data base is built to assess changes in land use. An attempt is made in this paper to discuss the nature, extent of land use changes and other associated aspects that have taken place between two different periods of time in Mizoram.)

Introduction

Since the beginning of human existence man has directed his activities with reference to earth resources and he knows how to use them for his own benefit. Man has fundamental utility of land in satisfying the human need of food, habitation and housing materials. In order to meet the needs, it is essential to choose proper mode of land use planning and allocation to various ingredients of optimum land use. For successful planning and development, a dear understanding of land classification is vital. The application of various inputs on land may change the allocation of land to different uses. Of all the factors, the conservation of the quality of our socio-economic environment is the most fundamental for the proper use of our land. This Statement is true not only of large urban centres but for most of the remote as well. The growing pressure of population coupled with an increasing variety of demands on land resources has brought extra pressure on available resources. In order to deal with these and to plan for optimum utilization of land, it is necessary to have accurate and upto-date information in all possible details on land use.

Two main factors-physical and human, influences the patterns of land use. Physical factors include topography, climate and soils which set the broad limits upon the capabilities of the land and the human factors are the density, occupation of the people, the technological level and socio-economic institutions which determine the extent to which the physical capacity of land is utilized.

DataBaseandMethodology

In the present study an attempt has been made to estimate the rise and fall in the land-area devoted to different classes of land use and their perceived causes. The study relates to the period of 2000-'01 and 2005-'06. The present study has been made on the basis of the revised classification i.e., classification on the basis of the recommendations made by the Technical Committee on Co-ordination of Agricultural Statistics, set up in 1948 by the Ministry of Food and Agriculture. The land use together may broadly be classified into nine-fold classification, which is in practice. They may be categorized as Forest, Land put to non-agricultural uses, Barren and uncultivable land, Permanent pastures and grazing land, Land under miscellaneous tree, crops and groves, not included in the net area sown, Cultivable waste land, Fallow land other than Current fallows, Current fallows and Net area sown. The study is mainly based on secondary data collected from Directorate of Agriculture and Minor Irrigation and Directorate of Economics and Statistic, Govt. of Mizoram. The study is also supported with Literature, Periodicals and Journals.

TheStudyArea

The territory that lies between Myanmar in the east and Bangladesh in the west with its Southern tip touching the Chittagong Hill Tracts in Bangladesh is Mizoram. Mizoram lies in between 20°56' N - 24°31' N latitudes and 92°16' E - 93°26' E longitudes. The state has a total geographical area of 21,087 square kilometers, which is only 0.64 per cent of India's total land area. The whole of Mizoram, mountainous terrain is a continuation of the great Himalayan mountain range. The mountain ranges runs from north to south and tend to grow higher in the eastern side and taper off to the north and south. The ranges are separated from one another by rivers creating deep gorges between the hill ranges, with only very small patches of plain.

The Population of Mizoram was recorded to be 888,573 of which 459,109 were males and 429,464 were females. Percentage decadal growth of population during the decade 1991-2001 was 28.80%. The rural-urban composition was 50.50 and 49.50 per cent of the population respectively. The density of population is 42 persons per square kilometer while the literacy rate of the state is 88.80 per cent.

SpatialPatternofLandUse

Out of the total geographical area of 2,108 thousand hectares, the land use statistics are available for 100 per cent of the total geographical area of the state. Broadly we can bring all the nine different uses of land into major classes, viz., arable and non-arable. The net area sown, current fallows and fallow other than current fallows, land under miscellaneous tree, crops and groves not included in net area sown can conveniently be put under arable group. Other groups may be combined into non-arable land. Taking the total geographical area into consideration only 17.80 per cent of its total area can be said to be arable while 82.20 per cent is not available for agricultural purposes. But as a matter of fact, out of the total percentage of available land only 5.56 per cent were actually sown with crops. This is known as 'net area sown' in the government's records: It presents the geographical extent of sown or cultivated land during a particular year. 'Current fallow' is also a part of cultivated land but it differs from the net area sown in the sense that at the time of reporting the use covered by this class had no crops in the land although it was cultivated only during the last agricultural year. Similarly 'Fallow land other than current fallows' is that type of arable land, which is temporarily out of cultivation due to the practice of crop rotation or some other reasons. But this type of land is never left as fallow for more than five years. Thus, it is justified to call it arable land. Land under miscellaneous tree, crops and groves not included in net area sown are said to be sown land under perennial and plantation crops, because they are considered to be cash crops.

Non-arable group of land are those that cannot be brought under cultivation without bringing radical changes in the environment 'Cultivable waste' is virtually a waste land owing to a number of severe limitations which stands in its way of cultivation and are necessary to be removed to bring such land under cultivation. 'Barren and uncultivated land' includes different types of land such as rocky faces of precipices, steep slopes caused by landslides and some of the unclass forest areas which cannot be brought under plough. 'Land put to non-agricultural use' has been put to non-arable uses by man himself. Among the non-agricultural uses of land are those occupied by buildings, roads, railways, airstrips etc. A most remarkable constituent of non-arable land is the area occupied by forest.

A glance at the table of land use in Mizoram shows that almost three fourth of its land is under forests. Next come fallow land other than current fallows, which occupies about 9.57 per cent of the total area of the State. Land put to non-agricultural use 'land constitutes about 5.98 per cent and net sown area covers 5.56 per cent of the total geographical area of land. Current fallows, barren and unculturable land, land under miscellaneous tree crops and groves not included in net area sown, culturable waste and permanent pastures and other grazing land are very negligible. They together constitute only 3.32 per cent of the total area of the state.

Table: Land Use and its changes in Mizoram State during 2000-'01 and 2005-06

Sl.No	Land Use type	Area in '000 hectare)		% of total		Increase or decrease between 2000-'01 and 2005 - '06	Percent to total increase or decrease
		2000-'01	2005-'06	2000-'01	2005-'06		
1	Geographical Area	2,108.7	2,108.70	100	100	-	-
2	Area under forest	1,628.4	1593.65	77.13	75.57	-	
3	Land put to non-uses	121.79	126.1	5.77	5.98	4.31	3.54
4	Barren and unculturable	8.60	7.92	0.41	0.38	-0.68	-
5	Permanent pastures and other grazing	22.50	5.65	1.07	0.27	-16.86	-74.89
6	Land under miscellaneous tree crops and groves not included in net area sown	30.60	7.53	1.45	0.36	-23.07	-75.39
7	Culturable waste	5.31	7.61	0.25	0.36	2.3	43.43
8	Fallow and other than current fallows	155.81	201.88	7.39	9.57	46.06	29.57
9	Current	36.28	41.13	1.72	1.95	4.85	13.37
10	Net area	101.33	117.23	4.81	5.56	15.90	15.69
11	Area sown more than	3.36	5.32			1.96	58.33
12	Total cropped		122.55			17.86	17.06

Changing Pattern of Land Use

From the analysis of the resultant land use table, which indicates the distribution and use of land in Mizoram between 2000-'01 and 2005-'06, according to different uses the following observations are made:

The total area under forests has declined from 1626.48 thousands hectares in 2000-'01 to 1593.65 thousand hectares in 2005-'06, registering a decrease of 2.02 per cent. The share of forests in the total geographical area declined from 77.13 per cent to 75.57 per cent), primarily caused by shifting cultivation, wanton felling of trees for timber and firewood and increasing illegal occupation of forest land. The gross area under land put to non-agricultural uses increased from 121.79 thousand hectares to 126.1 thousand hectares. The share of the same moved up from 5.77 per cent to 5.98 per cent. The reason behind the increase in area under this category is the expansion of socio-economic infrastructure like roads, residential houses, commercial establishments, educational and other institutions, industries etc. The barren and unculturable land declined to 0.68 thousands hectares during the period under study and similarly the proportion of land under this category also went down from 0.41 per cent to 0.38 per cent. This implies that a marginal portion of the barren land has been brought to economic use.

Owing to an increase in population requiring more land for cultivation, the permanent pastures and other grazing land in Mizoram has been almost usurped by the agriculture. This category of land decreases from 22.50 thousand hectares to 5.65 thousand hectares; and the percentage share thus moved down from 1.07 to 0.27 during the period under study. Again, due to the rapid growth of population and growing needs of food products, area under miscellaneous tree, crops and groves not included in net area sown are decreasing day by day. When this land is put to food and cash crops, the annual production becomes higher by several times in terms of money. As a result, the proportion of area under this category has notably declined from 30.60 thousand hectares to 7.73 thousand hectares during the study period. As for culturable waste, it is found that the frequent floods of the rivers like Chhimituipui, Tlawng, Tuirial etc., have turned considerable areas into culturable waste. Consequently, the area under this category increased by 2.3 thousand hectares during the study period.

Fallow lands (both current and old) have increased considerably, current fallows increased by 4.85 thousands hectares whereas fallow land other than current fallows increased to 46.06 thousands hectares. The area under fallow land other than current fallows is very large and rank second position next to forest by covering 9.57 per cent of the total geographical area. The high hectrage of land under fallow lands (current and old) in Mizoram is due to the large-scale practices of shifting cultivation, unproductive, infertile, lack of irrigational facilities in the region. But it is worth mentioning that there has been considerable increase in the proportion of area under net area sown and total cropped area. The net area sown has increased by 15.69 per cent and the gross cropped area increased by 17.06 per cent. It is the area sown more than once which is responsible for the increase in gross cropped area. There was an increase of 58.33 per cent in area sown more than once between the two periods. The cropping intensity increased from 103.32 per cent to 131.30 per cent during the period of five years and is an indicator of the increase in area sown more than once.

Concluding Remarks

From the above study concerning the pattern of land use, it is clear that major part of the area under study still bears a natural setting, and even to day only a negligible change in the land use pattern is seen. It is found that the change in land use under the categories of barren and unculturable land, culturable waste, land put to non-agricultural uses and current fallows have been quite insignificant. But marked changes due to human interference have taken place in the areas under fallow land other than current fallows, forests, land under miscellaneous *tree crops* and *groves* not included in net area sown, permanent pastures and other grazing land and net area sown. On the whole, the land use under the categories of forest, barren and unculturable land, permanent pastures and other grazing land and land under miscellaneous

tree, crops and groves not included in net area sown are decrease in area covered. On the other hand, there was an increase in area covered under the categories of land put to non-agricultural uses, culturable waste, fallow land other than current fallows, current fallows and net area sown. Thus it can be concluded that the change that have been taking place in different land uses are quite complicated. The expansion process of land put to non-agricultural uses, fallow lands (both) and net area sown seems to have come from reduction in area under forest, permanent pastures and grazing land and land under miscellaneous tree, crops and groves categories. This gives a general idea of changing land use pattern of Mizoram. It is therefore high time to prepare rational land use planning so that each piece of available land is put to its best use.

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ECONOMIC BASE AND POTENTIALS OF DEVELOPMENT: A CASE STUDY OF TLANGNUAM VILLAGE, AIZAWL DISTRICT, MIZORAM

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Abstract

(The economy of a region is the ultimate portrait of its geographical environment. An indepth knowledge of a region's geographical and its economic condition is always necessary for planner and policy makers to devise appropriate schemes for development. It is indeed the economic level that depicts the standard of living of the people in the area. The economic study reveals the capacity of growth and man power of the region, their major activities and strength, and helps in the formulation of development plans.

The present study highlights the economic condition of a village named Tlangnuam which is situated at 48 kilometers east of Aizawl, the analysis and study of which are based primarily on field survey and observations by the authors. The paper reveals that despite the difficult terrain and other adverse condition, the village shows some prospects and proof to have definite potentials for economic development)

Introduction:

The economic activities are the most important activities of man. The word 'economy' is concerned with all types of activities of man with respect to production, consumption and exchange of commodities among human society. Man carries on diverse type of activities to satisfy his own needs, the needs of his family and those of the society. So, the study of man's economic activities clearly depicts the capacity of growth, man power and strength and development potential of the region.

Objectives of the Study:

The scope of the study lies in the analytical study of all sorts economic activities of man that are being performed based mostly on the natural resources available locally. Due to lack of knowledge about detailed geological information and investigation of mineral deposits, the availability of mineral resources are not known in the study area. So, the main objective of the study is to examine the way in which the character and utilization of physical environment influence the economic activities of man. It also aims at identifying the potential resources and weconomic tilization of the same in the manner with maximum benefits and minimum wastage.

The present study is, thus, an attempt to examine the economic base as well as to identify its potentials for further and more meaningful development with reference to Tlangnuam village in Thingsulthliah rural Development Block, Aizawl District. The present study tries to

expose the economic character of the selected village under different heads such as occupational structure, agricultural activities, live stocks and animal husbandry etc.

Source of data :

The present study is based on both primary and secondary data. A survey was conducted in the selected village during January 2006. A detailed questionnaire was prepared which cover socio-economic aspects as well as demographic aspects. The interview relating to the questionnaire was conducted in such a way that the respondents feel free to talk.

The other necessary materials have been collected from the Directorate of Land Revenue and Settlement, Government of Mizoram., The Directorate of Rural Development, Government of Mizoram, Topographical sheet No.84 A/14, published by the Survey of India, Census Report of the year 1981, 1991 and 2001, and Statistical Handbook of Mizoram etc.

Methodology:

In view of resources and time constraints, only one village, Tlangnuam was selected . Tlangnuam, is a growing village that appears to be a good representative of the true characteristics of the rural economy of Mizoram. Despite the efforts to collect the most reliable data to ensure good representation, only a limited study of 30 random sample households picking randomly and a tentative scheduled could be canvassed. The random sample representing all the occupation classes covering 30 families out of the 225 households are taken. This sample is, therefore, taken as representative of the whole village for this study.

Various methods and technique are used for the calculation and tabulation of data, which are given below:

- (1) For the classification of occupation, the classification made by the census of India is followed in which the population is classified into workers and non workers. Workers are categorized into four (4) groups – cultivator, agricultural labourers, household industry and other workers. The cultivators are further classified into sub groups for this particular study.
- (2) In classifying the agricultural activities, the activities are divided into three groups-shifting cultivation, settled cultivation and livestock and animal husbandry. The members of workers engaged in these activities are calculated and is expressed in percentage.
- (3) To calculate the income pattern, income groups are classified into eleven (11) categories. The amount of annual income of each category is calculated after finding out the number of persons engaged in each income group and its expressed in percentage.

Further, the per capita income of the villagers is calculated by classifying all the sources of income.

Background of the study area :

Tlangnuam village is located on an elongated watershed along the National Highway No -54 in between Seling and Thingsulthliah and is often referred to as “Thingsul Tlangnuam”. It is at a distance of 48 kilometers south east of Aizawl. Situated at 92°51’ E longitude and 23° 38’N Latitude, it covers an area off 14.4 sq kilometers.

In 2001 census, the population of Tlangnuam village was recorded to be 1340 persons against 1163 in 1991 census. Thus, the decadal growth rate during 1991-2001 was 15.02%, which is much less than the 48.55% growth rate registered during 1981-1991. Due to its location a difficult terrain, it depicts a low economic and technological level. Mizoram as a whole is sparsely populated, thus, the population density is also low. The density of population in Tlangnuam village in 1981 census was 48 persons per sq. km, which rose to 81 persons in 1991, which further rose to 93 persons in 2001. However, the density of population in Tlangnuam village has been quite high in comparison with the density of population in Mizoram as a whole recorded to be 23 persons, 32 persons and 42 persons per sq. km in 1981, 1991 and 2001 respectively. High density of population in the village under study may be attributed to its close proximity to Aizawl city, good transportation and favourable climatic condition.

Tlangnuam village enjoys a moderate climate through out the year. It is neither too hot nor too cold all through the year. The winter temperate ranges usually between 11°c-23°c and the summer temperature is normally between 21°c-31°c. It receives an annual rainfall of about 230 cms and the highest rainfall is recorded during the month of May – July.

Tlangnuam village had abundant growth of vegetation. They comprised valuable species of timber, lumber and domestic resources. The dominant tree species found in the forest are *Scima walichi* (Khiang), *Cedrela toona* (Tei), *Tarmilania mycriocarpa* (Char), *Duabanga sonneratioides* (Zuang) etc.. Valuable domestic species available are *Samecarpus subpanduriformis* (Kawhtebel), *Parkia roxburghii* (Zawngtah), etc. Different species of bamboos are also found on the lower ridges along with shrubs and reeds. However, the area has undergone rapid deforestation due to increase in demand, suggesting proper management.

The Analysis:

In a traditional backward economy like Mizoram, jhum cultivation is prevalent and there are no large-scale industries or related activities. Even the urban areas grow without any employment generative units, which lead to low per capita income and low level of socio-economic development. So, it is necessary to find out the occupational structure, workforce, income and expenditure pattern in determining the level of economic development of the study area.

In Tlangnuam village, the infrastructure facilities and resource base for inducing and

sustaining economic development are not adequately developed. Infrastructures like road transport, electricity etc. is available but not highly reliable. Being in a hilly area, road and electricity are almost a gamble of monsoon. Landslide and felling of trees highly obstruct the maintenances of these infrastructures. The main resource base like soil and vegetation are constantly damaged due to shifting cultivation.

Workforce:

An analysis of workforce is imperative in understanding the diverse demographic and socio-economic relationship. The term workforce represents the number of people actually at work during some particular period.

The workforce of Tlangnuam village in 2006 is 47%, which is slightly higher than that of Mizoram i.e. 42.3%. Out of the total workforce, males comprise 57.7% while the remaining 42.3% is female. This shows that the participation rate of female in economic activities is less than that of male.

Agricultural Activities:

Agriculture includes raising of crops from the land, animal husbandry and agro-forestry. It is the chief occupation of Mizoram and of the study area. During the field survey (2006), it was observed that the people of Tlangnuam who professed agriculture as their main occupation constituted 28.8% of the total population. This figure accounts for as much as 61% of the total workers in the village.

Agriculture activities of the study area are divided into three categories as under:

- (I) **Shifting Cultivation:** Among the agriculture activities, shifting cultivation is the most prevalent activities in the study area. As much as 30% of the total family in Tlangnuam village is engaged in shifting cultivation. The main crops grown in the jhum fields are rice, maize, chilly and other vegetables. This type of cultivation, largely responsible for degeneration of natural vegetation and serious soil erosion is yet to be replaced by better methods.
- (II) **Settled Cultivation:** Since Jhuming is a wasteful means of cultivation in terms of the vegetation degraded and in terms of yield, the Government of Mizoram has been trying to persuade people to abandon the traditional Jhum cultivation. There have been various policies and projects like IRDP, NLUP and presently MIP being executed to abandon the traditional methods and to switch to settled form of cultivation and small scale industries where practicable. As a result, the number of families engaged in settled cultivation is increasing in Mizoram as well as in the study area. The number of families engaged in settled cultivation in Tlangnuam village accounted for 27% of the total family. The major crops grown in this type of cultivation includes horticultural crops like banana, pine-apple, orange and other type

of fruits. Ginger is also widely cultivated.

(III) Livestock and Poultry Farming : Livestock plays a very important role in the economic development of a region. The raising of livestock is of vital importance for economic development especially in rural areas. Livestock rearing is practised as a subsidiary occupation in many rural areas in Mizoram, which is carried out without much effort and contributing only a substantial proportion of income.

Out of the total livestock population, poultry and pigs are dominant occupying 54.6% and 20.7% respectively. Cattle comprises about 20.1% of the total domestic animals, but it seems to fetch more income than poultry and pig rearing. Buffaloes, horses and sheep constitute the remaining 4.6%.

Although Tlangnuam is predominantly an agricultural area, productivity of agriculture is quite low. The farmers produce about 55% of their total rice requirement and another 45% of rice consumed annually is imported from other places. In the case of vegetables, the village is more or less sufficient. Low productivity of agriculture in the study area is mainly due to lack of knowledge, absence of modern mechanism, aggravated by rugged topography and unproductive farming method.

Economy

In Tlangnuam village, income is generated from different sources like agriculture, government services, household industries, trade etc. However, household industries and trade flourish in a small village like Tlangnuam at subsistence level. The village is more or less sufficient in agricultural products particularly vegetables, fruits etc. In fact, the cultivators are now selling their products at Aizawl market that income generated from agriculture plays an important role in the village economy.

The analysis of income reveals that salaried group occupied the highest share of 36 per cent of the total income of the village. Income generated from settled agriculture contributed a handsome amount of 32.5 per cent. It is followed by jhum cultivation with 13 per cent. Other trade generating income are piggery (6.2 %), household industries (3.5 %), transport (2.5 %), shop keeping (2.3 %) and poultry (1.5 %) etc.

An analytic study of various economic activities, workforce, income and expenditure pattern reveals the level of socio-economic development of Tlangnuam village. Agriculture is the main occupation of the village wherein 61% of the workforce is engaged. Rice is the staple food of the people, so, it is the most dominant crop. It is mostly cultivated by the jhum cultivators, where 34.4% of the total household are engaged. Settled cultivation is practised by 26.6% of the total households. It is now realised that this form of cultivation is more productive than jhum cultivation. Hence, there has been a steady increase in this form of cultivation.

A comparison of per capita income from different occupation reveals that salaried

group earned the highest rate of Rs 98,000. Settled agriculturist earned Rs 38,210, while the per capita income of tertiary sector(transpopt) is Rs 30,000, followed by household industries (Rs 26,0000) , Jhumias (Rs 12,005), shop keepers (Rs 12,000) etc. Comparing with the percentage of workers engaged in different occupations, it is vivid that jhum has the least out turn.

Livestock rearing and animal husbandry act as an important subsidiary occupation and income generator. The per capita income of pig rearing family in the village is Rs. 11,000/- while that of poultry is Rs. 2,871/-. But animal rearing is not practiced as main occupation. Still, it can be seen that it generates a substantial amount of income for the household. Thus, there is a great potential for success in livestock rearing. The development of livestock rearing and animal husbandry is, therefore, of vital importance for economic development of the village. In addition, it can also be used as an alternative to traditional jhum practice.

Conclusion :

Due to absence of mineral resources and non-availability of adequate energy supply, no large-scale industry can be established in the study area. The existing so called industries such as furniture workshop, tailoring, and blacksmith cannot thrive beyond the consumption limit of the village. However, due to proximity to Aizawl city and with the local bamboo resources, there is a scope for establishing forest-based industries like paper, pulp and plywood industries of medium scale.

Thus, the best way to alleviate the standard of living and the economy of the study area is through the development of agriculture and allied sector. By inducing high productive method of agriculture, horticulture, development of small- scale industry, handloom and handicraft the income of the household can be raised significantly. Apart from this, due to a rapid increase of population in the state, in the absence of matching expansion of employment generative unit in the industrial sector, there will be an increase pressure of population on land and agriculture. This adds to the significance of developing rural area like Tlangnuam, which has certain degree of potential for development.

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Rural Housing Schemes in Mizoram: An Appraisal of IAY and PMGYGA

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Abstract

(The present study attempts to evaluate the two centrally sponsored rural housing schemes viz., IAY and PMGYGA in Mizoram. The present study focuses on the socio economic structural bases of beneficiaries, the level of utilization of funds, and the impact of the housing schemes on the housing conditions of beneficiaries. The study follows ex post evaluation approach and assesses the impact of housing schemes on the tribal poor in relation to housing conditions of the beneficiaries before and after their implementation. The results demonstrate the successful implementation of both IAY and PMGY in terms of identification of BPL households as well as improving the housing conditions.)

Rural Housing Schemes in Mizoram: An Appraisal

Housing constitutes one of the basic needs. Housing standards reflect the attitudes, values and ideology of a society and nation towards human habitation. Housing acquires such a significant value in human society because it is a place where human birth, growth and death take place. It is a place where his/her being is transformed into social being. Housing is the place where people in general fulfill their basic domestic and personal needs of life.

Housing has been a major challenge to the government of India since independence. The housing shortage, which was 14.5 million dwelling units in 1971, had grown to 21.1 million by 1981 and 24.7 million in 1985. But this went down in 1991. According to the 1991 census, the rural housing shortage was 13.72 million consisting of 3.4 million households without houses and 10.31 million living under unserviceable *kutcha* houses. According to 2001 census, the housing shortage is estimated to be 31.1 million dwelling units, around 4.91 million households are accessed against the availability of total housing stock, and another 12.5 million households reside in unserviceable *kutcha* houses, 6.3 million are affected by obsolescence and 7.4 million by congestion. The housing shortage estimated for rural areas worked out to be 14.8 million units; 11.5 million units are unserviceable, *kutcha* houses, 3.4

million due to obsolescence and 5 million due to congestion (Sahota 2005:4).

There is copious literature on rural housing in India. The studies are concerned with housing conditions in rural areas and social and economic structural factors associated with the same at village level (see Rao, Bhat and Venkataraman 1989; Venkataraman, Rao and Bhat 1989; Krishna Murthy 1967; Yeshwant and Ranganathan 1966; Mahajan and Bist 1966; Pichholiya 1966; Aiyar 1965). At macro level too there are a few studies (see Nayar 1997) and the role of planning and programmes in improving housing for rural poor was studied by a considerable number of authors (see Narula 1993; Sharma 1993; Ray 1991).

The existing literature on both housing schemes provides a broad canvas on one or more aspect of the problem, policy, planning, legislation and programmes for improving the housing conditions in the country. Yet, there are certain conspicuous research gaps. Firstly, there are a few studies, which attempt systematic evaluation of housing schemes. Secondly, there is rarely any study on the housing conditions of the tribal people who form nearly 8 per cent of the population and bulk of the weaker section of India. Further, there are a few studies on the rural housing in the North East (see Gogoi and Kalita 2002).

The present study addresses these research gaps with a comprehensive ex post evaluation of The Indira Awaas Yojana (IAY)¹ and The Pradhan Mantri Gramodaya Yojana: Grameen Awaas (PMGYGA)², the two ongoing rural housing schemes in the tribal context of Mizoram.

The purpose of the present study is to evaluate the implementation of the two rural housing schemes IAY and PMGY- GA in the Mizoram. Especially, it focuses on the socio economic structural bases of beneficiaries, and the impact of the housing schemes on the housing conditions of beneficiaries.

Methodology

The present study follows ex post evaluation approach and assesses the impact of housing schemes on the tribal poor with comparison of housing conditions of the beneficiaries before and after the implementation. The present study is based on the primary data collected through field survey with structured interview schedule in three villages in the northern part of Aizawl district and under Tlangnuam Rural Development Block. These three villages were selected purposively and all the beneficiaries of the two schemes IAY and PMGYGA were surveyed. The collected data was processed manually and analysed with the help of Computer. Apart from simple averages and percentages, paired t-test was used for before and after comparison. Garrett 's procedure was used to transmute ranks into interval scores with appropriate modifications.

Profile of Respondents

The profile of the respondents has been discussed with a view to find out who benefits from the housing scheme. This would reveal that whether there was any mis-targeting. Demo-

graphic, social and economic characteristics of the respondents are discussed as under.

Demographic Characteristics

The demographic characteristics of the respondents discussed include the gender, age group, marital status, and educational status, type of family, size of family and gender of the head of household (see tables 1 and 2).

As regards gender majority of respondents was female among the beneficiaries of both the schemes. More than one half of the respondents of IAY (53.13%) and more than two thirds of the respondents of PMGYGA were female. Two thirds of the respondents (65%) as a whole were female. It is interesting to note that the beneficiaries were by and large women as stipulated under both the housing schemes.

Age of the respondents has been classified into three groups viz., young (18-35), middle age (35-60) and old (60 and above). Majority of the beneficiaries of both the schemes were middle aged though a considerable proportion of them were young. More than one half IAY (53%) and PMGYGA (61%) belonged to middle age group. Further less than a third of them in IAY (31%) and PMGYGA (32%) was reportedly young. On the whole more than half of the respondents were middle aged (57%) while one third of them were young. The mean age also depicts a similar picture. The mean age of the IAY respondents was worked out to be 46 years while that of PMGYGA was 41 years, which fall under the middle age group.

As regards marital status majority of the respondents were married in both the schemes though the widowed constituted a significant proportion. One half of the respondents of IAY and more than one half of the PMGYGA (57%) were married while more than one fourth of the respondents of IAY (28%) and PMGYGA (29%) were widowed. Further it could be observed that more than one fifth of the respondents of IAY were divorced (22%). On the whole more than one half of the respondents were married (53%) while widowed formed a considerable proportion (28%).

As regards education, the results indicate that the respondents had a low level of educational status though a very few were illiterate. Since they are poor, not a single beneficiary respondent could reach graduation level and a few could cross high school education. Most of the respondents of IAY and PMGYGA had education either at primary level or middle school level. One half of the respondents of IAY beneficiaries (50%) and more than one third of PMGYGA had primary education while one fourth each of the both (25%) had middle education. It is heartening to note that only two respondents could study beyond class- X i.e. class XI and Class XII by PMGYGA and IAY respondents respectively. On the whole most of them had primary level (45%) of education. The mean years of education of the respondents of beneficiaries of both the schemes also reveal the low education status. The mean year of education of the respondents of IAY beneficiaries was worked out to be 4 years while that of PMGYGA was 5 years.

Family is the primary institution of society. Type and size constitute the two major structural properties of family. As regards type of family most of the respondents were from nuclear family. A predominant majority of the beneficiaries of both the schemes were from nuclear families. More than three fourth of the respondents of IAY (78%) and PMGYGA (82%) were from nuclear family. On the whole only one fifth of them were from joint family.

The size of the family is classified into three categories viz. small (1-3 members), medium (4-6 members) and large (7 and above). A predominant majority of the beneficiaries of both the schemes were from medium (4-6) family. More than two third of the PMGYGA (71%) beneficiary respondents and more than one half of those of IAY (56%) belonged to medium size family. Majority of the respondents as a whole (63%) belonged to the medium size (4-6 members) family. The mean size of the family of IAY beneficiaries was worked out to be 5 members while it was 4 members for PMGYGA beneficiaries (refer table 2).

As regards the gender of the head of the households though majority of beneficiaries of the housing schemes were male, females headed households formed a significant proportion of the beneficiaries. Female headed households formed more than one third of the IAY (40.63%) and PMGYGA (39.29%) beneficiaries.

Social and Economic Characteristics

To understand the socio-economic structural bases of the beneficiaries of housing scheme is one of the objectives and so social structural characteristic such as sub-tribe, denomination, and economic characteristics such as dependency, primary occupation and secondary occupation are discussed as under (see tables 3).

Mizo social structure was reported to be based on Family-clan-sub-tribe pattern (Vidyarthi and Rai 1976: 153). Conversion of all Mizo people to various denominations introduced one more component of Mizo social structure. Though information on the clans of the respondents was elicited only sub-tribe and denomination are discussed as under.

The respondents who are the beneficiaries of the housing schemes belong to five different sub-tribes viz. Lusei, Hmar, Paite, Lai (Pawih), and Ralte. Majority of the respondents of both the schemes belong to Lusei, the predominant Mizo sub-tribe. More than one half of the respondents of PMGYGA (54%) and more than one third of the IAY (47%) belong to the Lusei sub-tribe. Notably one fourth of IAY (25%) respondents belonged to Lai (Pawih) sub-tribe. On the whole one half of the respondents belonged to the predominant sub-tribe Lusei (50%) followed by Pawih (15%), Hmar (13.33%), Paite (11.67%) and Ralte (10%).

As regards religion all the beneficiaries reportedly profess Christianity but there are a number of denominations followed. The schemes benefit a wide range of denominations. The denominations professed by the beneficiaries are Presbyterian, United Pentecostal Church (UPC), the Salvation Army (SA), Isua Krista Kohhran(IKK), Roman Catholic(RC), Seventh Day Adventist(SDA), Lalchungkua Unity(LU), Church of God(CG) and one IAY beneficiary

reported that he did not belong to any denomination. Under both the schemes, the Presbyterian Church members formed the highest proportion of beneficiaries. More than one half of the respondents of the beneficiaries of IAY (53.13%) and PMGYGA (64%) were Presbyterians by denomination, which is the largest denomination in Mizoram. On the whole more than one half of the respondents were Presbyterians by denomination. Besides this, the UPC (13%), Salvation Army (10%), IKK (8%) and Roman Catholic (3%) formed a significant percentage of the respondents.

Economic standing of an individual is primarily indicated by the fact that whether she/he is earner or dependent. The beneficiaries of both the schemes were mostly earners. On the whole more than two thirds of the respondents were earners while two thirds of the respondents of IAY (66%) and PMGYGA (71%) were earners. It is note worthy that a significant proportion of the beneficiaries of both the schemes were dependents. More than one third of IAY beneficiary respondents and more than one fourth of these PMGYGA were reportedly dependents (see table 4).

Occupation indicates the location of the beneficiary in the economic structure. Occupations are varied and diverse in Mizoram as elsewhere occupational diversification is taking place in an otherwise a tribal economy. Occupations were classified on the basis of their economic standing viz., cultivator, labour, and artisan. Here, cultivation includes shifting cultivation as well as semi-settled agriculture, which are practiced by most of the tribal areas of North East India. Labour includes all the other occupations like driving, vegetable vending, street singing, petty shop, teacher etc., which are lowly paid. Occupation of the majority of the respondents was cultivation. More than one half of the IAY beneficiaries (59%) and PMGYGA beneficiaries (57%) reported cultivation as their main occupation. while on the whole, more than half of the respondents reported to be cultivators. Also a considerable proportion of the respondents noted their occupation as labour. More than one third of the beneficiaries of IAY as well as PMGYGA reported that their primary occupation was labour.

Implementation of Housing Schemes

This part discusses the aspects of implementation of housing schemes viz., sources of information, duration of application processing and mode of house construction (refer table 4).

As regards the source of information on the housing scheme Village Council President (VCP), Block Development Officer (BDO), Political Party Leaders (PPL), relatives and friends were the agencies. Of these the VCP formed the major source of information in the case of both the schemes. For more than one half of the respondents of PMGYGA (53.57%) and more than one third of those of IAY (46.88%) VCP was the source of information. Next in the order was BDO, he was the source of information to more than one fourth of the beneficiaries of IAY (28.13%) and less than one tenth of those of PMGYGA (7.14%). Leaders of Political Parties were next in the order. For more than one fifth of the beneficiaries of PMGYGA (21.43%) and less than one tenth of the beneficiaries of IAY (9.38%) leaders of political parties were the source of information.

The time taken for processing application was greater in case of PMGYGA as compared to IAY. Nearly two thirds of the applications of the beneficiaries of the IAY (66%) were processed within 6 months duration while more than half of IAY (57%) beneficiaries received the construction money within 6 months. The average months taken for application processing was worked out to be 8.56 months for IAY and 10.32 months for PMGYGA.

As regards the mode of construction of houses under the schemes no contractors were used for the construction of their house, the beneficiaries had complete freedom as to the manner of construction of their house as per the rules stipulated. On the other hand, three modes of construction viz., labour, own and both were observed. Construction by both (i.e. Labour and own) was found to be the most common mode adopted by the beneficiaries both schemes. Yet more IAY beneficiaries practiced it. More than four fifth of the beneficiaries of IAY (81.25%) used both own labour and paid labour while more than one half of the PMGYGA beneficiaries (61%) used this mode.

Fund Allocation, Release and Utilization

One of the major problems of implementation of welfare and development schemes in India is the gap between allocation and release and release and utilisation of funds. To understand this issue in the context of Mizoram, analysis of amount sanctioned under the scheme, amount released, and the amounts spent on construction, household expenditure, transportation, politicians, and officials (see table 5).

A gap is observed between the amount sanctioned and the amount released under both the schemes. The amount sanctioned under IAY on an average was Rs 23031.25 while only Rs. 22401 was released. The average amount released under PMGYGA was Rs. 21095.14 of which only Rs. 19656 was released. In percentage terms 97 percent of the amount sanctioned was released under IAY while 93 percent of the amount sanctioned under PMGYGA was released.

Interestingly, the beneficiaries of both housing schemes had spent much more than the amount they received under the schemes. A typical beneficiary of IAY had spent Rs. 34308 for house construction while PMGYGA beneficiaries on an average had spent Rs. 36406 for the same. Over 85 per cent was spent in addition to the amount sanctioned under PMGYGA by a typical beneficiary of it while more than 53 per cent of the amount sanctioned was spent excess by an average beneficiary of the IAY scheme. It could be attributed to the escalating price of building material in the hilly area of Mizoram state. It also shows the enthusiasm of the beneficiaries to have better housing. It also underlines the need for periodical revision of the amount sanctioned under these schemes.

It is unfortunate to observe the presence of elements of corruption even in the implementation of housing schemes for the rural poor in the tribal areas. On an average the beneficiaries of PMGYGA spend Rs. 539 for officials and Rs. 27 for politicians. It was also worked out that a typical IAY beneficiary spent Rs. 336 for officials and Rs. 11 for politicians. Nearly 2 per cent of the amount released was spent on officials by a typical IAY beneficiary and it was 3 per cent for the PMGYGA beneficiary.

Impact on Rural Housing Conditions

To probe into the impact of the housing scheme on the housing conditions of beneficiaries a comparison of indicators before and after the implementation of the scheme has been attempted. Some of the indicators were continuous variables and others were discrete ones. These indicators represent both the qualitative and quantitative aspects of housing conditions. The quantitative indicators include number of rooms, square feet and value of house in Rupees (refer table 6) while the qualitative indicators are ownership of house, type of floor, type of house post, type of wall and type of roof (see table 7).

Of all the quantitative indicators there has been significant improvement in housing condition of the beneficiaries of both the schemes. The paired t value for before and after comparison of number of rooms of IAY (4.38) PMGYGA (3.81) and overall (5.8) were significant at 1 percent level. After the implementation, the number of rooms of the beneficiaries of IAY on an average increased from 1.50 to 1.94. Likewise the number of rooms of PMGYGA beneficiaries has increased from 1.50 to 2.00. On the whole it increased from 1.5 to 1.97 rooms.

Improvement is also found in the floor space. The paired t-value computed for before and after comparison for IAY (3.65) and PMGYGA (3.79) and beneficiaries as a whole (5.3) were significant at 1 per cent level. The square feet of the house of IAY beneficiaries on an average increased from 232 to 310 while it reportedly rose from 218 to 303 for PMGYGA beneficiaries. On the whole the floor space increased from 226 square feet to 307 square feet for both the beneficiaries on an average due to the implementation of the rural housing schemes. The value of the house of the beneficiaries dwelling has increased significantly. The paired t value of house for IAY (9.72), PMGYGA (11.28) and overall (14.74) were significant at 1 per cent level. The average value of house of the beneficiaries of IAY before implementation was Rs. 7625, which increased to Rs. 36024.5 after implementation. Likewise an increase is noticed in the value of house of the beneficiaries of PMGYGA from Rs. 7178.57 to Rs. 39244.86 as a result of implementation of the scheme. On an average the house value of the beneficiaries of both the schemes increased from Rs. 7417 to Rs 37527 as result of the scheme.

Perceptible improvement in the quality of housing was observed in the indicators of ownership of house, type of floor, type of house post, type of wall, type of roof as a result of the implementation of both the housing schemes. Implementation of both the schemes has conferred ownership to predominant majority of the beneficiaries. About 63 per cent of the IAY beneficiaries and about 68 per cent of the PMGYGA beneficiaries who had no house of their own were able to own a house. On the whole 65 per cent of the beneficiaries were conferred ownership as a result of the implementation of the rural housing schemes.

As a result of implementation of the rural housing schemes, the type of floor of the beneficiaries was found to have improved from mud and bamboo to wood in majority cases. More than one third of the beneficiaries of IAY had floor of their house made up of bamboo and less than one fifth had mud floor before the implementation. After the implementation

more than three fourth of the houses had wooden floor. As regards the PMGYGA beneficiaries more than one third of the houses had wooden floor before but after it increased to three fourth of the houses. On the whole, the shift from the bamboo and mud to wooden floor type was observed in majority cases.

Improvement in the type of house post of the beneficiaries of both the schemes has not very distinct before and after. Both before and after the implementation of the IAY and PMGYGA predominant type of house post was wood. Yet, the percentage of beneficiary houses of IAY with wooden house posts had increased from 84 percent to 94 percent while it had increased from 89 per cent to 93 percent houses of PMGYGA beneficiaries. On the whole the beneficiary houses with wooden post had increased from 87 percent to 93 percent as a result of the implementation of housing schemes.

Because of the implementation of the housing schemes improvement in the type of walls was also observed. A shift from predominantly bamboo to asbestos houses was observed. On the whole, more than two thirds of the beneficiary houses had bamboo walls before the implementation while more than one half them had houses with asbestos walls after. Two thirds of the IAY beneficiaries houses had bamboo walls before the implementation of the schemes while after the implementation two third of the beneficiary houses were with asbestos walls. As regards the PMGYGA beneficiaries three fourth of the houses had bamboo walls before the implementation while two thirds of them after implementation of the scheme were having asbestos walls.

Type of roof is another indicator of housing condition taken up for analysis. Though no shift in the type of roof of the houses was observed, noteworthy improvement could be observed in case of the beneficiaries of the both the housing schemes. On the whole three fourth of the beneficiary houses had corrugated iron roof before while cent percent of the houses had corrugated iron roof after the implementation of the housing schemes. More than two thirds of the houses of the IAY beneficiaries had roof with corrugated iron before the implementation of the scheme while all of the beneficiaries had houses with corrugated iron roof after the implementation. As regards the PMGYGA beneficiaries more than three fourth of the beneficiaries had corrugated iron roof before the implementation but after the implementation all of their houses had roof with corrugated iron.

Beneficiaries' Suggestions for Improved Implementation

For better implementation of the housing schemes, beneficiaries of the two schemes had given the suggestions like enhance amount, reduction of the charge on name plate, proper selection of beneficiaries, reduction of time taken for processing, improved monitoring of house construction, bridge gap between fund allocation and release, and avoidance of repeated selection. As the respondents were asked to rank according to importance, to obtain a comprehensive picture transmutation of ranks into scores Garrett's procedure was used with an appropriate modification (Garrett 1966:328-332)³. Using Garret's procedure the ranks were transmuted into scores and the mean scores of the beneficiaries of IAY and PMGYGA were

obtained. They were ranked so as to prioritise the suggestions (see table 8).

The three prominent suggestions emerging invariably from beneficiaries of both the schemes were enhancement of loan, reduction in the charges on nameplate, and proper selection of the beneficiaries. These three suggestions obtained the top 3 ranks from above in the case of both IAY and PMGYGA beneficiaries.

Enhancement of loan amount was the suggestion ranked first. It could also be observed that three fourth of the beneficiary respondents as a whole (75%) had suggested enhancement of amount sanctioned. Almost all the beneficiaries of PMGYGA (89%) and more than two thirds of the beneficiaries of IAY suggested enhancement of the amount under the schemes. Here it is noteworthy to mention that IAY beneficiaries on an average reportedly spent 53 percent in excess to the amount released while PMGYGA beneficiaries reportedly spent 85 per cent of the amount released from the scheme on the other hand. On the whole 67 per cent of the amount released was spent in addition to the amount released from both the schemes by the beneficiaries on house construction. Though the contribution of beneficiaries can be considered as a positive indication, it is indeed a burden on the finance of the poor and very poor households. It was revealed during the interviews to the researcher that many could not repay the loans borrowed for construction.

Reduction in the charges on nameplate obtains second rank and has been suggested by a significant proportion of the beneficiaries. It was suggested by more than one fourth of the beneficiaries as a whole (28%), nearly half of the PMGYGA (46%) and one fourth of the IAY beneficiaries made this suggestion. During the interviews with the beneficiaries it was revealed that the implementing authorities at block level charge Rs. 150 towards making nameplate indicating the list of the beneficiaries of the scheme in the office. The beneficiaries being poor felt this as somewhat burdensome. Here it is noteworthy to mention that earlier it was shown that Rs. 430 were spent on the officials and it was Rs. 336 by the IAY and Rs. 539 by PMGYGA beneficiaries for the officials to get the amount sanctioned and released. Hence, it is necessary to heed to this suggestion of the beneficiaries.

Conclusion

Rural housing schemes have been implemented successfully in the state of Mizoram for the benefit of the poor tribal households. The results demonstrate the success of both IAY and PMGYGA schemes in terms of identification of BPL households, and improving the housing conditions both quantitatively and qualitatively. The success of the schemes is not only due to the effective working of Village Council Presidents (VCPs) as well as well linked rural development functionaries but also the people's enthusiastic aspiration for owning a good house. Our field observations indicate the active support of neighbourhood, kin and social networks in supplementing and complementing government aid in the house construction by poor households.

Implication

In the light of the above findings of the present study, the following suggestions were made for social work practice and policy.

Social Work Practice

Housing is one of the basic need and social workers working in the rural community need to concentrate on effective implementation of rural housing schemes at community level and their effective utilization at household level. They need to work with Village Council, BPL families, and Block level rural development officials. The social workers can play a vital role in identifying the needy poor at community level and help them in availing the benefits of the ongoing housing scheme. As the beneficiaries know the information on the schemes mainly from the VC council, social workers can act as catalysts in generating awareness on the housing schemes among the houseless poor.

The present study indicates a strong support of neighbourhood, leaders of community-based organisations, and kinship in house construction under both the schemes. This community cohesiveness, solidarity or social capital omnipresent in local Mizo communities need to be harnessed by social workers effectively to implement other poverty eradication and rural development programmes.

The results of the study emphasises the need for advocacy role of social workers to increase the amount sanctioned under rural housing schemes by at least 80 percent. At policy making level they need to emphasise the periodical revision of the amount sanctioned under both IAY and PMGYGA.

Social Policy

The results of present study show the success of both the schemes in improving the housing conditions of the tribal poor. In addition, to reiterating the three prominent suggestions prioritised by IAY and PMGYGA beneficiaries viz., enhancement of amount, reduction in the charges on nameplate, and proper selection of the beneficiaries the following suggestions for improving the rural housing conditions in the tribal context of Mizoram has been made.

The major say in implementation of rural development schemes in Mizoram rests with the Village Council President at present. The concentration of power with VCP alone prevents people's participation in implementation of rural development schemes especially identification of beneficiaries. Hence, empowerment of Gram Sabha as in other parts of the country is the immediate need. In the state of Mizoram there is an urgent need for decentralisation of power to rural local bodies especially empowering the Gram Sabha in ratifying the beneficiary selection for implementation of rural development schemes.

The results of the study indicate the poor access of people to the government officials

and extension agencies implementing the rural development programmes. The extension agents like village level workers, extension officers and block development officers need to come closer to the poor people so as to implement the schemes more effectively.

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Notes

¹ *The Indira Awaas Yojana (IAY) aims at providing dwelling units free of cost to the rural poor living below poverty line. IAY was launched during 1985-86 as a sub scheme of Rural Landless Employment Guarantee Programme (RLEGP). IAY therefore continued as a sub scheme of Jawahar Rozgar Yojana (JRY) since it's launching in April 1989. But after restructuring of JRY, IAY became an independent centrally sponsored scheme providing shelter for rural poor. The IAY benefits have been extended and the prioritisation of beneficiaries is in the order of free bonded labourers, SC/ST households, families / widows of personnel from defence servicing paramilitary forces, killed in action, non SC/ST households, physically and mentally challenged persons, ex-servicemen and retired members of the paramilitary forces, displaced persons on account of developmental projects, nomadic, semi-nomadic, and de-notified tribes, families with physically/mentally challenged members, subject to the condition that these households belong to the below poverty line category.*

² *The Pradhan Mantri Gramodaya Yojana: Grameen Awaas (PMGYGA) is generally, based on the patterns of the Indira Awaas Yojana (IAY) and is implemented in the rural areas throughout the country. The target group for houses under the scheme will be the people who are living below the poverty line in rural areas, belonging to Scheduled Castes / Schedule Tribes, freed bonded labourers and non SC/ST categories. Not more than 40% of the total allocation during a financial year can be utilized for construction of dwelling unit for non- SC/ST BPL families, while funds to the tune of 3% will be earmarked for the benefit of BPL disabled persons.*

³ *Henry E. Garrett (1966) had suggested a procedure for transmuting the ranks into interval scores so that they can be further subjected to analysis. According to his procedure the ranks are first converted into percent position by means off the following formula.*

$$\text{Percent position} = 100(R - 0.5)/N$$

Whereby R is the rank of the individual or item in the series and N is the number of individuals or items ranked. Secondly, with the help of Garrett's table the corresponding scores of the ranks are obtained. The scores are used for further analysis.

In the case of situations like the present one where a number of respondents were asked to rank a number of items (constraints/suggestions) all are not ranking all items. To obtain aggregate comprehensive mean score Garrett suggests computation of average only by including the number of

persons who ranked the particular item. This is suitable to the situations like that of Garrett gives whereby the judges are always do not aware of all the persons whom they are supposed to rank. In the present context both the number of persons ranking as well as their ranking need to be given weightage so as to obtain priorities. Giving weightage to only the ranks neglecting the number of persons who chose the particular item will mislead the policy maker. Hence, instead of obtaining mean transmuted score by dividing the sum of transmuted scores by the number of persons ranked the particular item, the average was obtained by dividing the number of persons.

GEOGRAPHICAL PERSPECTIVE ON PREVALENCE OF MALARIA IN MIZORAM

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Abstract

(Malaria is generally endemic in the tropics. In spite of the strenuous effort of the Government to curb and control malaria, it continues to be a serious health problem in Mizoram located in the tropical region. The present study is an attempt to provide macro level understanding of the spatial patterns and prevalence of malaria in Mizoram. Regionalization of the disease on the basis of morbidity data available at different levels of spatial aggregation provides an insight in to the spatial variation of the occurrence of malaria in the State. It appears that the magnitude of malaria infestation differs from place to place in relation to the difference in altitude and variations in climate.)

Introduction

Malaria is termed as a parasitic disease of communicable nature caused by certain protozoa living and multiplying in the human red blood corpuscles producing parasitic fever associated with anaemic enlargement of spleen (Park, 1997, 194). The malaria parasite, a Protozoa of genus Plasmodium is transmitted to man by certain species of the infected female Anopheline mosquitoes. In Mizoram Plasmodium *vivax* and Plasmodium *falciparum* are two dominant parasites. The Plasmodium parasites are highly specific, with man as the only vertebrate host and Anopheles mosquitoes as the vectors.

Malaria is generally endemic in the tropics, with extensions into the subtropics. At present, at least 300,000,000 people are affected by malaria globally, and there are 1,000,000 to 1,500,000 malaria deaths per year (WHO). In India, no disease has taken toll of such a large number of human beings as malaria. Moreover it saps the vitality of millions of people and forces them towards poverty (Pacholi, 1993). In India, malaria is a serious health problem in forest covered areas, particularly in the North Eastern states, Bihar, Orissa, Gujarat, Maharashtra and Madhya Pradesh where 40% of the cases are *P. falciparum*. Foci of malaria *falciparum* resistant to chloroquine and S-P have been found in N-E states and in Karnataka. Around 2,500,000 lab confirmed cases are reported at Slide Positive Rate of 3% annually (WHO: 2000)

Study Area

Mizoram, an isolated hilly state in the North-eastern corner of India enjoys a moderate climate. The Tropic of Cancer, i.e. 23°30' N latitude divides the state into two almost equal parts. The region falls under the direct influence of south-west monsoon. The climate is therefore, humid tropical, characterized by short winter, long summer with heavy rainfall. The moderate temperature, high humidity condition and pronounced seasonal variations that characterize the general climatic condition of the state, broadly corresponds to the optimum temperature for the development of both malaria vector (mosquitoes) and the malaria parasites,

P.vivax (*P.v*) and *P.falciparum* (*P.f*), the dominant species in India and the state as well. The phenomenon of water logging during and soon after rainy season, on the ground, in the forest woods and bamboos engender ideal breeding grounds for mosquitoes. In an area fraught with hovering mosquitoes, Malaria continues to remain one of the leading causes of morbidity and mortality in this state.

Source of Data and Methodology

The study is based on data available from secondary sources. Morbidity data maintained at the Epidemiology Cell, Directorate of Health Services Mizoram, Malaria related Mortality and Morbidity data maintained by the District CMO office Aizawl West, Aizawl East, Lunglei, Lawngtlai and Saiha; Malaria Eradication Programme (NVBDCP) section Mizoram; and Registrar of Deaths and Births, Directorate of Economic & Statistics, Mizoram records regarding causes of deaths constituted the main secondary sources of information. The analysis of the data based completely on secondary sources hence have to be read with caution, though in spite of the limitation, they do provide the only source for a macro understanding of spatial patterns and prevalence of malaria.

The study is undertaken by using conventional geographical methods of analysis. An attempt is made to identify the general magnitude of morbidity and mortality due to malaria in Mizoram. Attempt has also been made to identify male-female differences in reported cases of malaria. The study also tries to understand the spatial manifestation of malaria at the different levels of spatial aggregation, hence regionalization of the disease. Maps, tables and simple arithmetic computation are utilized for presenting and analyzing the data.

Morbidity and Mortality at the Aggregate Level

The State Epidemiology Cell and Malaria Eradication Programme (under the umbrella of NVBDCP) under Directorate of Health Services, Mizoram maintain morbidity data for malaria independently. Records maintained by the State Epidemiology section is pervasive and includes probable or clinically diagnosed cases i.e. patients who are suspected to have malaria based on clinical signs and symptoms and who receive treatment for malaria but not confirmed by laboratory diagnosis. Laboratory diagnosis consists of either slide microscopy or a rapid diagnostic test (World Malaria Report). Malaria Programme Unit on the other hand includes only laboratory diagnosed cases. It is obvious therefore that malaria data furnished by the two units are quite different and even a magnitude of three fold difference is noticed.

Mizoram State Epidemiology Cell record on disease burden, April 1996 – March 2001, shows that malaria topped the list for all the five reporting years. As per the record of the Economic and Statistics Department of Mizoram, Cancer has overtaken malaria as the leading cause of mortality in the state in the calendar year 2004. However, Malaria remains the second leading cause of mortality and registered as many as 359 medically certified deaths in that year.



It can be Inferred from table 1 that the number of malaria cases recorded by the State Epidemiology which includes clinical malaria is more than three fold the cases registered by the Malaria Eradication Programme. It should be borne in mind when analyzing the State Epidemiology data that it includes only confirmed cases, therefore, it is likely that actual incidence and deaths due to malaria would have been much higher than this record.

Incidence and Deaths

Morbidity and Mortality patterns of Malaria in Mizoram for five consecutive years have been tabulated as below.

If we compare the Annual Parasite Incidence/Index (API or incidence per thousand persons) of the year 2000 (10.35) with that of 2004 (8.60), there seems to be a significant decline in the rate of malaria incidence (Table 2). However, in between these two years the API tend to fluctuate so much so that there is no stability in the reduction trend of malaria incidence. The peak year for malaria incidence as shown by the table is the year 2001 (12.30) and then significantly gone down until 2003, but slightly rose again in the year 2004.

Table 2
Mizoram: Incidence and Deaths due to Malaria (Laboratory Confirmed Cases)

Year	Population	BSE	ABER	API	Pf %	Death per '000 Patients
2000	783712	197481	25.19	10.35	59.20	4.07
2001	806845	204492	25.34	12.30	59.97	4.33
2002	813639	219522	26.98	9.65	50.03	4.45
2003	905689	203188	22.43	8.05	57.14	6.58
2004	905689	217316	23.99	8.64	53.25	9.19

Source: State Malaria Eradication Programme, Mizoram.

- Population = Counted / Estimated by Malaria Control Unit
- BSE = Total Blood Slide Examination
- ABER = Annual Blood Examination Rate
- API = Annual Parasite Incidence or Index /Per thousand persons

The *P.falciparum* percentage to total confirmed malaria cases i.e. Slide Falciparum Rate (SFR) is higher than 50 percent consecutively for five years. The year 2001 records the highest SFR i.e. 59.97 percent but abruptly declined to 50.03 percent in the subsequent year i.e. 2002. However, resurgence of the parasite Pf is noticeable in the next two succeeding years, in 57.15 percent and 53.25 percent respectively for the year 2003 and 2004. The high incidence of malaria due to the parasite Pf in the state needs to be given special attention as almost all deaths due to malaria occur due to the malaria parasite Plasmodium *Falciparum* (Pf).

It is disheartening to note that incidence of deaths per thousand patients for malaria has continuously been increasing since the year 2000 till 2004. The high mortality due to Malaria in the State may be attributed largely to the predominance of the parasite Pf. The parasite *P.falciparum* is comparatively fatal and may cause complication and death unless the patient receives medical help in time.

District Level Patterns

The analysis of districts level morbidity and mortality data of malaria is expected to reveal certain underlying processes involved in the spatial patterns of malaria occurrence in the state.

1) *Male-Female Divide*

It can be inferred from table 3, that malaria is a male dominated disease. In 2003, all the districts of Mizoram have recorded comparatively higher percentage share of malaria cases for males when compared to females. If we compare male-female divide in percentage shares of positive cases and *P.falciparum* cases, Champhai district and Mamit district, in that order, display excessive male dominance, 74.60 percent and 80 percent Pf and 67.34 percent positive cases and 38.07 percent Pf cases respectively. Kolasib district lying in close proximity to Mamit however exhibits the lowest gender difference in malaria positive cases. It is interesting to note that Saiha district exhibits a rather unique situation wherein the proportion of males 58.09 % is significantly higher than that of females 41.91 % in respect of Malaria positive cases. In stark contrast, the proportion of *P.falciparum* for females 54.86 % unlike other districts is considerably higher than that of males 45.14 %. Malaria which has emerged as a male selective disease from a close scrutiny of the district level data may be attributed primarily to the more frequent outdoor exposure of males than females subject to their occupational patterns and life styles. As Park (1997) puts it “Malaria is predominantly a rural disease and is closely related to agricultural practices.”

2) *Spatial Variation*

In order to assess the spatial manifestation of malaria, morbidity data for three consecutive years (i.e. 2002, 2003, and 2004) at the district level has been combined and mapped (Fig.1). The percentage share of *P. falciparum* cases to total cases has also been mapped in Fig.2. The high incidence of Malaria *P.falciparum* is considered a matter of serious concern and as it is so fatal that the main cause of mortality due to malaria relates to the genus *P.falciparum* parasite.

Figure 1 displays broad spatial patterns of Malaria incidence in Mizoram. Kolasib district (part of the undivided Aizawl district) situated in the northern most part of the state at a comparatively low altitude zone near Assam, emerges as malaria hyper-endemic area as it exhibits an excessively high API i.e. an average 26.76 per thousand persons for the three index years.

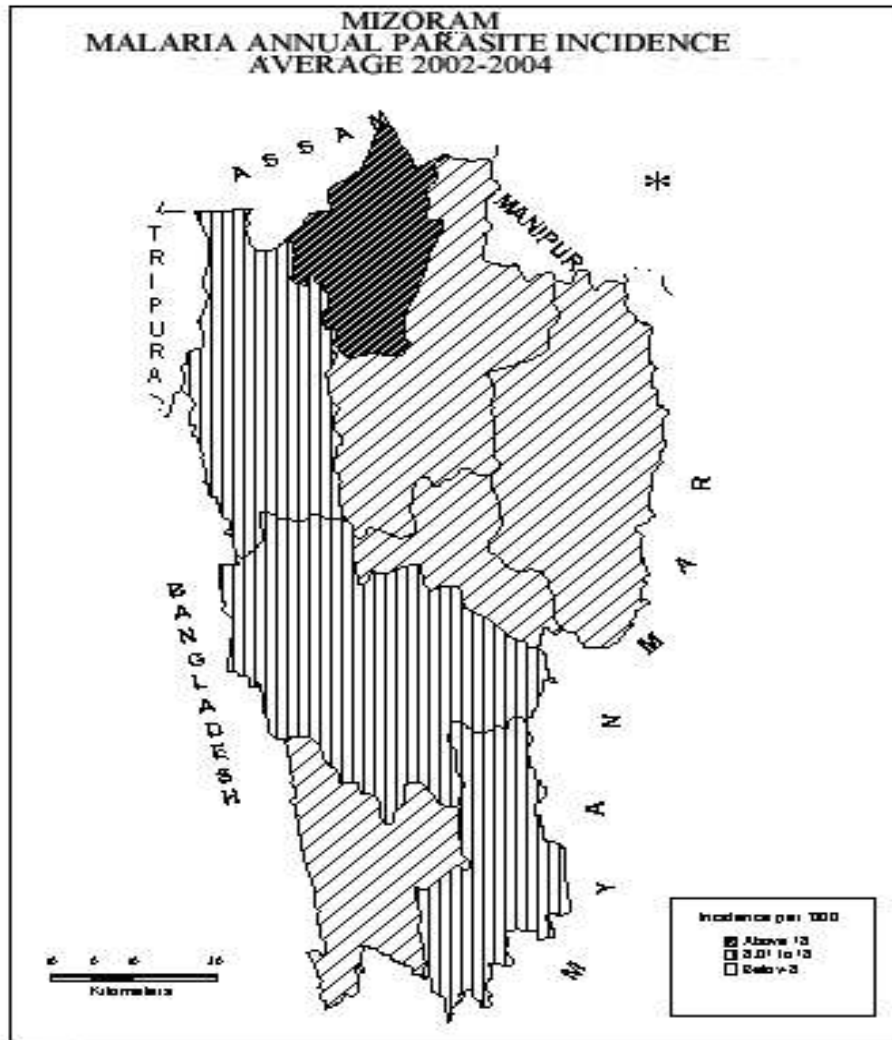


Fig. 1

MALARIA 2002 & 2003

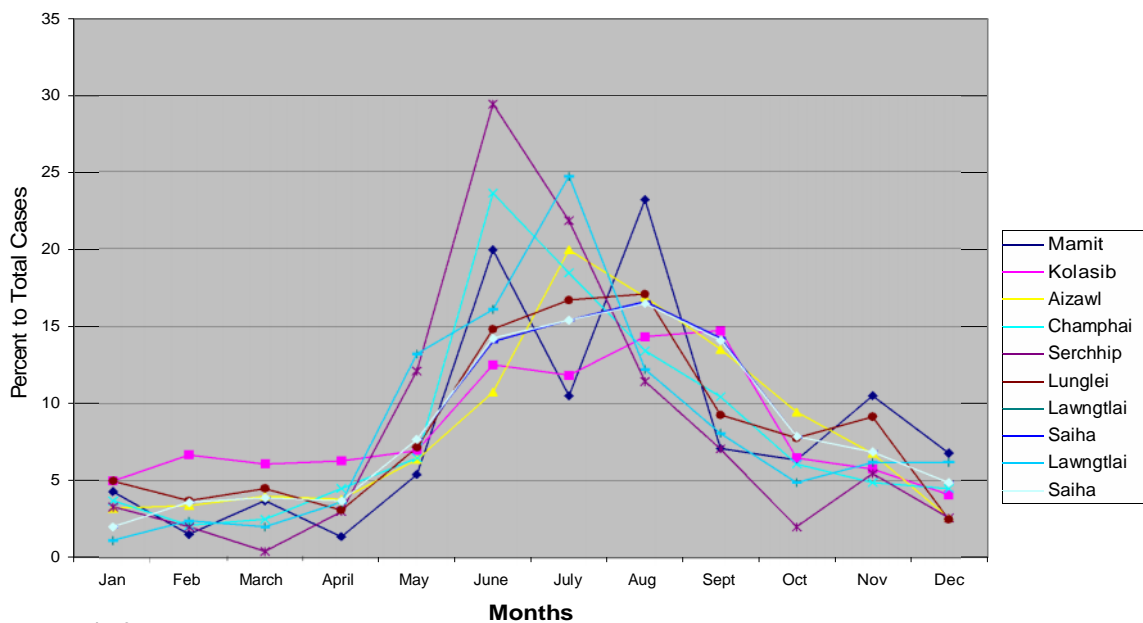


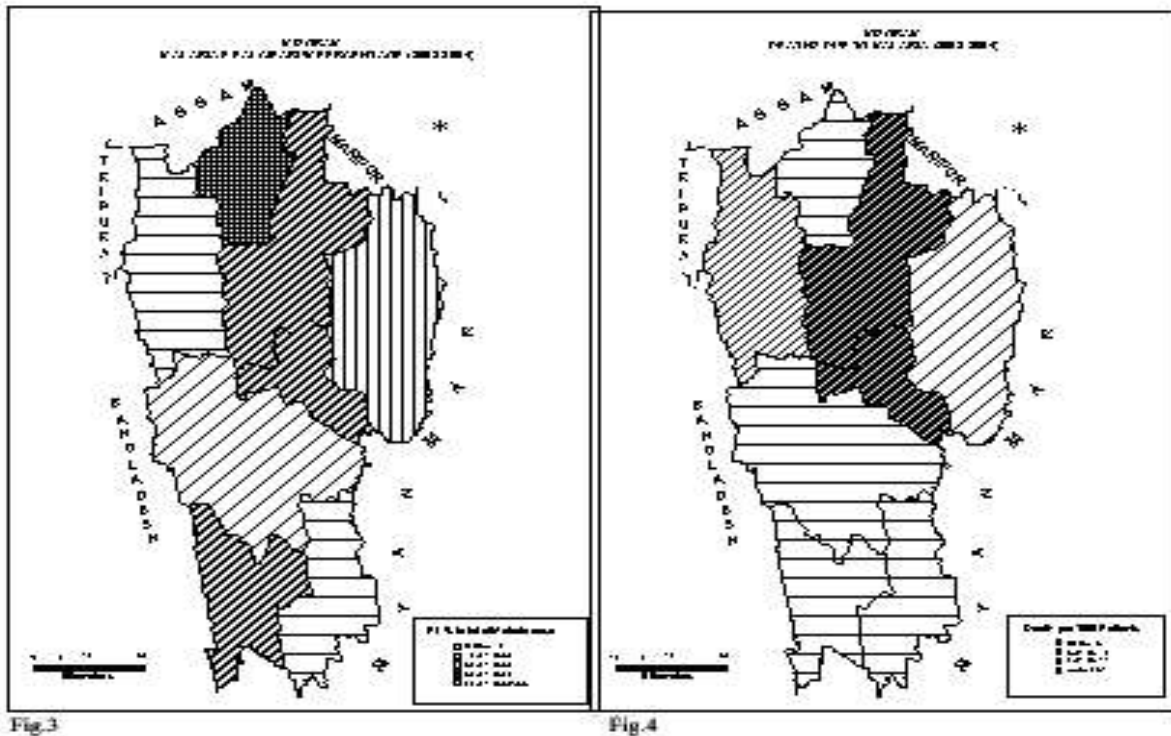
Fig.2

Three districts, viz Mamit district (formerly part of the undivided Aizawl district) spreading in the western part of low altitude zone of the state, bordering Tripura and Bangladesh, Lunglei district half of which lies in the south western comparatively low altitudinal zone and is bounded on the west by Bangladesh, Saiha district lying in the south eastern mountainous province near Myanmar border constitute another malaria endemic belt of medium intensity. Aizawl district, Serchhip district and the eastern most district of the state Champhai (all formed part of the undivided Aizawl district) registered API lower than the state average (8.75 per thousand persons) and together forms a low endemic belt of malaria. The general pattern observable at the district level is that districts lying in the western low altitude zone generally depict higher incidence of malaria positive cases when compared with the districts in the eastern comparatively high mountainous region. In stark contrast, Lawngtlai district (part of former Chhimtuipui district) situated in the south western low relief region of the state near Bangladesh border represents low endemic belt of malaria.

As evidenced by the month wise percentage share of reported cases of malaria plotted in graph (fig.2) malaria has a well defined peak season in Mizoram i.e. the monsoon or rainy season (June –September). Even though malaria cases have been reported in every district in each and every month throughout the year, majority of the reported cases occur during the monsoon seasons in each district.

Figure.3 depicts the patterns of malaria *Pf* occurrence at the district level i.e. Slide Falciparum Rate (SFR) represented by the percentage share of *Pf* to Total positive Cases. Mamit district (part of undivided Aizawl district), which exhibits the highest API, again surpasses all other districts in the percentage share of malaria *P.falciparum* to total cases (SFR 89.33). The three districts, Aizawl, Lunglei and Champhai which form low endemic belt of malaria interestingly record SFR higher than the state average (53.39 %) and together represent the second highest malaria endemic belt. The low-lying region bordering Bangladesh viz Lawngtlai district, Mamit district and some parts of Lunglei district have registered the lowest SFR.

The *P.falciparum* cases are more pronounced in the north and eastern higher altitudinal region of the state. The only exception to this however is Saiha district which lies in the highest relief region of the state but records very low SFR.



3) Death per thousand Patients

Institutional death per thousand patients might be considered an important index of assessing the effectiveness of health care services in treating malarial patients. It should be borne in mind, however, that all patients confirmed positive by the examination of blood slide in health centre do not necessarily get treatment in the health institutions thereby causing under enumeration of institutional deaths. It is possible that while the system of treatment available in the health institution is quite effective, late detection and delay in treatment due to the ignorance of the patient may raise the institutional death rate of malaria significantly. It can be seen from table.4 that average death per thousand patients calculated for the three index years is the highest in the district of Aizawl and Serchhip i.e. above 31 per thousand patients followed by Mamit district (7.76 per thousand patients).

The districts of Champhai and Kolasib record 4.99 and 2.40 deaths per thousand patients respectively. Lunglei district registered a very low mortality rate of 0.79 persons per thousand patients. It is surprising to note that Lawngtlai and Saiha districts both situated in the southern most part of the state do not record any confirmed cases of death due to malaria (Fig.4). Although one finds it difficult to explain such a contradictory situation as regard the district level pattern of confirmed cases of deaths due to malaria, it is true that mortality rate in each district can not be taken as a satisfactorily explanation of the efficacy level of the available health care services. Where as Aizawl district that contain the biggest and best equipped hospital in the state (Aizawl civil hospital) records a very high mortality due to this disease another district Lunglei where the second biggest hospital Civil Hospital is established records a very low mortality due to malaria. In another instance, where as Kolasib district records the highest API and *P.falciparum* percent records a very low rate of

deaths per thousand patients (2.40), Serchhip district that records comparatively lower incidence of malaria and *P.falciparum* percent exhibits a very high mortality as high as 31.58, even though the status of hospital and other health facilities in the two district is more or less the same. The district wise pattern of mortality due to malaria suggests that there are some hidden social or cultural processes involved in the nature of delivery of malaria treatment and consequently upon which confirmed/institutional deaths due to the disease is very low for some of the districts that record strikingly high malaria incidence.

Table 4
Mizoram: Incidence and Deaths due to Malaria, Annual Average (2002-04)

Name of District	API (per '000 persons)	PF %	Death per '000 Patients
Mamit	17.17	33.96	7.76
Kolasib	26.76	89.33	2.40
Aizawl	2.60	63.34	31.29
Champhai	1.72	54.58	4.99
Serchhip	5.74	68.32	31.58
Lunglei	17.50	41.69	0.79
Lawngtlai	3.73	66.04	0
Saiha	17.55	11.43	0
Mizoram	8.75	53.39	6.74

Only Laboratory Confirmed Cases.

Source: Compiled & Computed from Mizoram State Malaria Eradication Programme Record.

Block Level Patterns

Block level morbidity data might strengthen the spatial pattern already observed at the district level or a completely different picture might emerge when the data is scrutinized at the block level. In order to examine the trend of malaria incidence over space the (SPR) and (SFR) for each block have been mapped for the year 2001. As stated by Park (1997) “the slide positive rate and *falciparum* rate are useful parameters. They provide information on the trend of malaria transmission.” For the purpose of malaria regionalization the north eastern part of the State.

The severity of malaria is related to the species of the parasite. The malaria parasite of genus *Plasmodium falciparum* (henceforth *P.falciparum*) needs be given special attention because almost all mortality due to malaria is related to this parasite and accounts for more than half the cases of malaria in the state i.e. Slide *Falciparum* Rate (SFR) 53.39 percent to total positive cases. It is evident from figure 6 that the entire hyper-endemic *P.falciparum* zone (above SFR 80 %) is to be found in the northern half of the state. High *P.falciparum* infested region of 60-80 percent spreads in the north eastern part of the state near the border of Myanmar and Manipur. A belt of medium *P.falciparum* endemic region with SFR 40-60 percent and low endemic region 20-40 percent SFR are constituted by the blocks situated mostly in the western comparatively low lying areas of the state bordering Bangladesh. The least dramatic *P.falciparum* province marked by SFR of below 20 per cent is formed by the two blocks situated in the extreme south-eastern part of the state characterized by towering mountainous ranges.

Interesting patterns have been observed in the relative dominance of *P. vivax* and *P. falciparum*, the blocks that registered high API value usually record lower rate of *P. falciparum*

occurrence (SFR). This indicates that areas dominated by *P.vivax* usually record comparatively lower percentages of *P.falciparum* rate. The only exception to this rule is Thingdawl block of Kolasib district (part of former undivided Aizawl district) that exhibits the highest API and SFR value at the same time. As opposed to the observations made by Pacholi (1993, 63-93) in Madhya Pradesh and Mukherji (2004) in Meghalaya, in Mizoram the relative dominance of *P. vivax* over *P.falciparum* cases are found in the lower altitude regions of the western part of the state bordering Bangladesh. In Madhya Pradesh the *P. vivax* species occupy the higher altitude regions of colder climate (Pacholi, 1993). In stark contrast, the higher altitude region of colder climate appears to be dominated by the *P.falciparum* in Mizoram.

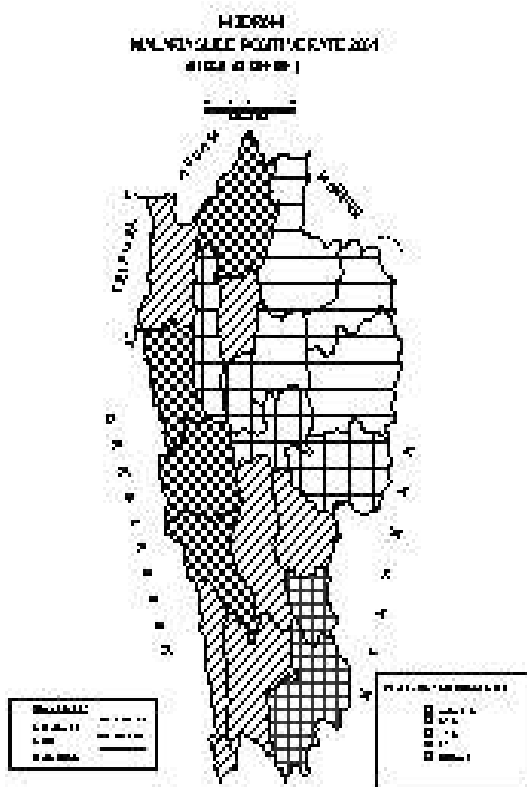


Fig. 5

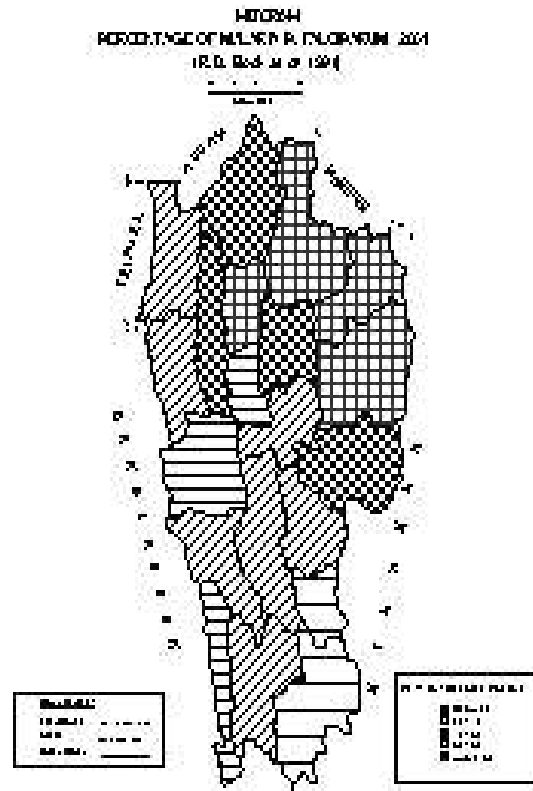


Fig. 6

Conclusion

Malaria continues to remain one of the leading causes of morbidity and mortality in the state. However, launching of Malaria Intensified Programme under the National Vector Borne Diseases Control Programme from 1st April 2005 in Mizoram may be expected to significantly reduce malaria burden. The main goal of this programme is to reduce malaria morbidity by 30 % and mortality by 50 % in five years. Under this programme opening of community based Drug Distribution Centre (DDC) / Fever Treatment Depot (FTD) at least one in every village is one of the strategies to combat malaria prevalence. The main aims and

objectives of the Programme as specified by the Health Department include early diagnosis and treatment, malaria transmission risk reduction, enhance awareness about malaria control and promote not only community participation but also NGOs participation to combat malaria incidence. The programme has its target to collect blood smear from all fever cases, with administration of presumptive dose to them. It is true that the success of malaria programme largely depends on community participation and co-operation.

In order to properly combat malaria prevalence it appears that special attention needs be given to some specific areas as significant variation in the occurrence of malaria in different parts of the state is observed. It has been observed that malaria hyper-endemic belt broadly corresponds to the area lying close to Indo-Bangladesh border in the west and areas close to Assam border in the low altitude North West part of the state. The relative dominance of *P. falciparum* and *P. vivax* strain of malaria parasite in relation to altitude in Mizoram is found to be just the reverse of the situation in Meghalaya and Madhya Pradesh. In these two states the *P. falciparum* usually dominates lower altitudinal zone but in Mizoram preponderance of *P.falciparum* in a relatively higher altitudinal zone, i.e. eastern higher altitudinal region of the state is noticeable. This indicates the high adaptability of the *P.falciparum* parasites inside the vector Female Anopheles Mosquito. The occurrence of malaria is found to be higher among males than females in the study area.

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NEEM (*Azadirachta indica* A. JUSS.): A PROMISING MULTIPURPOSE TREE FOR MIZORAM

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ABSTRACT

(The neem known as Azadirachta indica A. Juss. Neem are often world growing scattered trees in the crop fields with least harmful effect on crops, therefore, it is an ideal tree for agroforestry management system. It is a unique tree for agroforestry as wind breaks and as single scattered trees. As study revealed that sorghum intercropped with neem showed increased height and dry matter production. It is also indicated in the studies at the National Research Center for agroforestry, Jhansi, that among the red and black soils, the neem's performance is better in black soil as compared to red soils. Neem is one of the important tree components of 'taungy system'. In many parts of India including arid and semi-arid tracts and Shiwaliks, the scattered trees of neem are protected and maintained to provide the smoothing effect to adjoining crops. Neem leaves are very useful during drought and scarcity period.)

INTRODUCTION

Neem (*Azadirachta indica* A. Juss.), the *Kalp Vriksh* is held in great esteem in India from time immemorial and is variously called as "Nature bitter flow", the "wonder tree", "Nature's gift to mankind", "The tree that purify", "the tree of the twentieth century" and "the tree for solving global problems" (Saxena, 1993). The neem tree / margos/ India lilac botanically known as *Azadirachta indica* A. Juss. belongs to the family Meliaceae. The name of the genus, *Azadirachta* is derived from the Persian name of the tree i.e. Azad-darakht-i-hindi. Botanically, the name was established by Antoine Laurent dc Jussieu, a French botanist in 1830 with *Melia azadirachta*, Linn. as the only species, which he later named *Azadirachta indica* A. Juss. In India neem occurs in tropical dry deciduous and thorn forests (Champion and Seth, 1968) and in the drier parts upto 1500m. Its natural origin is variously mentioned. Brandis (1906) believed it to be native to upper Myanmar (Burma). Duthie (1903) and Troup (1921) believed its occurrence in the forests of Siwalik (Uttar Pradesh) as natural. Besides this it also inhabited in South-East Asia, Andamans, Pakistan Bangladesh, Shri Lank, Thailand, Nepal, Malaysia, Indonesia, Japan, tropical USA, South America, Australia and Africa. Neem

is cultivated throughout India except in high and cold regions and is a cosmopolitan avenue and economically important tree. It is moderate-sized to large, usually evergreen tree with a fairly dense rounded crown. The bark is moderately thick, furrowed longitudinally and obliquely.

ROLE IN AGROFORESTRY

The trees play a dominant role in the various agroforestry systems for increasing productivity and economic return. Since ancient time neem trees are often found growing scattered in the crop fields with least harmful effect on crops, therefore, it is an ideal tree for agroforestry management system.

It is a unique tree for agroforestry as wind breakers and as single scattered trees. It is compatible with many crops, through its canopy management by pruning at critical stages of crops to provide them adequate sunlight. Its deep root system avoids competition for soil moisture and nutrients with agricultural crops; therefore, farmers plant neem trees in or around the crop fields (Ram Prakesh and Hocking, 1985). Neem plantations in rows 4-6 m apart allow satisfactory growth and yield of various arable crops (Anonymous, 1981). Bioassay studied with its leaf extracts has shown stimulatory effect on the shoot growth of wheat, suggesting that neem could be useful in agroforestry (Alam, 1990). Sorghum intercropped with neem showed increased height and dry matter production under the tree canopy as compared to open (Rai and Suresh, 1998). In silvopastoral system neem forms a promising combination with perennial grass like *Cenchrus ciliaris*, *C. setigerus*, *Dichanthillum annulatum* and *Panicum antidotale* (Paroda and Muthana, 1979).

In Rajasthan desert besides Khejri (*Prosopis cinerari*) and Jharberi (*Zizyphus nummulari*), the *Acacia* and neem trees are most important top feeds because the importance of neem tree is widely accepted (Harsh, *et al.*, 1992). Under semi-arid conditions, the grassland productivity can be increased by introducing tree species such as *Azadirachta indica*, *Albizia amara* and *Acacia tortilis*. In studies at the National Research Center for agroforestry, Jhansi, on red and black soils the neem gave better performance in black soil as compared to red soils.

Neem is one of the tree components used in 'taungya system'. In Maharashtra, neem is grown along with *Acacia* in lines in combination with agricultural crops such as cotton, sesamum, arhar *etc.* Here the neem is used as a buffer to check the insect attacks on *Acacia* (Tewari, 1992). Neem tree is also planted on farmland in Karnataka, Andhra Pradesh and Tamilnadu. In many parts of India including arid and semi-arid tracts and Siwaliks, the scattered trees of neem are protected and maintained to provide the smoothing effect to adjoining

crops.

Neem has been found to be very effective as windbreaks/shelter belts in drier areas, particularly on sandy soil to protect the crops. Neem is known to increase the soil fertility and water holding capacity, as it has a unique property of calcium mining, which changes the acidic soil into neutral ones. Neem leaves are a good source of protein, calcium, carotene and some, minerals. They contain adequate quantity of trace minerals except zink. Neem leaf is a good fodder and is fed to livestock mixed with other fodder. This constitutes a traditional feed in several parts of the country. In Andhra Pradesh farmers feed neem leaves to cattle and goats immediately after parturition for increasing milk secretion. Neem leaves are very useful during drought and scarcity period.

MEDICINAL VALUE

The strong decoction of leaves can be used as a mild antiseptic. The hot infusion is used as anodyne for fermenting swollen glands, bruises and strains. A paste of neem leaves is useful in ulceration of cowpox. The fresh and mature leaves of neem and seeds of *Psoralea corylifolia* are used to prepare medicine for leucoderma. The leaves are used as an insect repellent and in control of nematodes. Bark is also used for refrigerant, anthelmintic and anti-periodic. It is useful in some slight cases of intermittent fever and general debility. Fruit pulp is edible and the fruit is recommended for urinary disease, Piles, intestinal worms, leprosy, etc. Oil of its seeds is also used for various purposes. The use of its oil and, derivatives is in soap making and preparation of toothpaste and in pharmaceutical industry. The oil is used in some chronic skin disease and ulcer. The oil possesses antifertility, antiseptic and antifungal properties.

It has a common external application for rheumatism leprosy and sprain. The warm oil relieves ear troubles. It also cures dental and gum troubles. Few drops of oil taken in betel leaf provide relief in asthma. Hair oil containing margosa is reported to prevent baldness and graying of hair. Atal and Kapur (1982) reported that air dried root bark yields nimbin and nimbidin, these compounds have an anti-protozoal, anti-allergic, anti-dermatic tendency and also cure dental disease and anti-fungal activities. The use of different parts of neem tree in Ayurvedic and the Unani systems of medicine to cure constipation, diabetes, indigestion itches, pyorrhea, insomnia, stomachache, ulcers, skin disease etc. is well known. Recently, there is much interest in the use of neem oil as a cheap contraceptive and in the management of secondary hyperglycemia.

Neem oil is spermicidal against human spermatozoa, both in *vivo* and *in vitro*. It has anti-implantation effect on pre- or post-mating OR pre- or post-implantation, intravaginal

application and exhibits anti-ovulators activity in both the reflex and spontaneous ovulators. Its oral administration causes male sterility activity with no interference in spermatogenesis. In females, both oral and intravaginal oil application cause anti-fertility effects due to the fetal resorption. Neem oil contraception is reversible. A stem volatile, odorous fraction of the oil, coded as Nim-76 is considered responsible for its spermatocidal effect (Riar, *et al.*, 1990).

OTHER USES

The wood of trees is moderately resistant to fungi and repugnant to most borers but difficult to impregnate with preservatives. It is used for making furniture carts, axles, yokes, naves and fellocks boards and panels cabinet bottom of drawer, packing cases ornamental ceiling ship and boat building, helms. oars and toys. The neem tree provides good fuel wood particularly in arid zone of India. Some time oil is also used as fuel for burning lamps. Besides the leaves, which constitute the major biomass produced by the tree, are also a useful source of energy and are burnt for various purposes.

CONCLUSIONS

Neem is a very valuable and demanding tree of Indian sub-continent and thrives successfully on all types of soil. Its root system has an unusual ability to absorb nutrients and moisture even from highly leached sandy soils. Neem tree has ability to grown in a wide range of climatic conditions. Leaves provide nutritious fodder to the livestock. Therefore, the state of Mizoram is blessed with undulating hills, often susceptible to high erosion. Besides. the soil of the state is reportedly poor in nutrient content where many good multipurpose tree species may not thrive well. The neem tree has a versatile use and wider ecological amplitude as far its survival strategies are concerned. Therefore. this tree may be planted in afforestation program in large scale and can be an amazing tree in agroforestry system which not only would solve the biophysical problem of the site but also can help the people of the state obtain their basic medicinal needs.

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IMPACT OF INSURGENCY ON MIZO SOCIETY – AN OVERVIEW

R. Ramthara

ABSTRACT:

(The tribal people of India living in inhospitable and hostile environment and without exogenous impact have traditionally adjusted and adapted to their habitats amicably with a symbiotic relationship with their environment. The natural resource base had permitted a precarious balance with which the tribal population deals with the environment most effectively. Such relationship expresses itself in their economy, settlement structure and population distribution etc. However any change be it climatic or technological or external pressure changes this symbiotic relationship had its implications for the tribal communities. Thus, the insurgency that broke out in Mizoram from 1966 and adopted measures to counter the insurgency in Mizoram had immense impact in every walk of life. The present paper analyses such impact on Socio-Economic-Political structure of Mizo society as a whole.)

INTRODUCTION

When Insurgency broke out in Mizoram from 1966 initiated by Mizo National Front (MNF) movement, the MNF volunteers captured almost the whole of Mizoram within a few weeks. In order to pacify the underground movements, various measures were taken up by the government of India through introduction of various Rules and Acts and deployment of specially trained military forces in Mizoram. Widespread misery and agony, cases of arsons, lootings and all kinds of atrocious activities were experienced by the people of Mizoram. However, in spite of all these action and deployment of military personnel, the underground MNF government still controlled many interior villages. In order to put an end to this, the scheme of grouping of villages was recommended and introduced from 1967 onwards. The introduction of grouping of villages was found very effective by the government, which carried it out into four distinct stages or categories. Hence, village groupings became the main measure to counter the underground MNF movement. It had tremendous impact in Mizo society as compared to other counter insurgency measures taken by the government of India. Thus, emphasis in the present study has been given to the impact of operation of grouping scheme in Mizoram. The introduction of grouping scheme had tremendous impact on Mizo society and to assess this, it may be better to study into its political, social and economic impacts.

IMPACT ON POLITICS.

On political front, even before the outbreak of insurgency, the MNF party inculcated nationalism in terms of Mizo nation and insurgency strengthened this ideology. When counter insurgency measure was taken up by introducing village groupings, many villages were grouped together into one village by force. This shattered individual village loyalty and when a better channel of information sources in the grouping centres came into being, the disharmonized village solidarity gave way to group cohesiveness at tribal level which created ethnocentrism and consequently group identity giving rise to tribal sub-nationalism due mainly to the many

hardships faced by the people in such group of centers. Thus, ethnocentric attitude to the non-group members could be so strong at times that a strong feeling of ethnicity prevailed which called for group cohesion. This kind of group sentimentalism or group feeling can be observed whenever there is a high degree of group homogeneity. This fact has been recorded by Coser when he says that, “the greater is the group nationalism and ethnocentrism, the greater is the group homogeneity of attitudes, beliefs, language spoken and way of behaving; the greater is the group cohesiveness and the greater the pressure for homogeneity and cohesiveness”.

Another important effect of counter insurgency on the political front was the gradual shift in political loyalty towards the MNF movement. Military occupation in the grouping centres and other villages and the harassment to the people reinforced the already negative evaluation of the dominant group and consequently on an increasing stress on tribal identity. In the early stage of insurgency, mistakes and deplorable activities of the MNF underground had resulted in internal conflict and enmity between the Mizo culminating in the dwindling popularity of the MNF among the people. However, the atrocious activities of the security forces like burning of houses, taking properties by force, large-scale killing and harassment of innocent people, rape and other tragic occurrences acted as stimulant to group cohesion and minimized the MNF mistakes. It is because of this that majority of the people had hostile attitude towards the security forces while they gave moral support to the MNF underground. Thus, even the Mizo Union leaders did not outwardly criticize the MNF movement for fear of losing peoples support. Hence, after normal political activities were resumed since 1970, all the political parties and all the political leaders professed themselves to have an understanding with the MNF underground.

Besides, due to the atrocious activities of the security personnel on duty in different villages especially in the grouping centres, they arouse the tribal suspicions and have drawn them together in an increasing enmity with the plain peoples. This naturally increases group cohesiveness and hostile attitude towards the out-group and opinion differs from tribal movement become branded as treasonous. Thus, political articulation largely confines to the emphasis on having understanding with the MNF movement in all Assembly elections before 1987. Thus, it gave widening gap between in-group and out-group and had risen to the rejection of the dominant culture because intergroup culture is a function of ethnocentric valuation of glorification of one's own group. Thus, in Mizoram, other political movement competes without much success with the emphasis on group identity.

The political organization in Mizoram had never been entirely based on kinship system as was found in other segmentary tribal system. Villages were not solely based on kinship because of the operation of horizontal marriage system cutting across village groupings where a person's political associate and political unions were those who belong to his own local groupings. Besides, territorial groupings and clan divisions had not coincided in the case of Mizo people. Members of each clan have been dispersed in different territorial settlements and each local grouping had been on the basis for political and social organization. Thus, political loyalty was based more on local contiguity than on kinship ties among the Mizo².

The tribal level political articulation was stressed due to the dispersion of local groupings as a result of the introduction of grouping scheme which shattered the traditional social and political organizations. It is due to this that political articulation stressing tribal identity in terms of Mizo tribal group become more relevant for the newly emerging leaders of the Mizo society than in any other tribal areas of India. Thus, grouping of villages, which resulted deterioration of local level solidarity, strengthened tribal identity in terms of Mizo tribal groups.

IMPACT ON SOCIAL LIFE

The socially accredited group procedures and practices from an imbedded part of tribal life are often scrupulously observed as right mode of conduct. It goes without saying that customs mould tribal convictions and loyalties creating common tendencies in dispositions and characters, and at the same time motivating people of cherished fundamental values embodying the solidarity of the groups. The evolutionary content in customs is strengthened by common acceptance thus unleashing a compelling and integrating force in social relation³.

In the olden days and till 1956, Mizo society was ruled by their chiefs or *Lal*. The chiefs were independent and each village was ruled by their own chief which was like the ancient Greek city state. The villagers, thus, lived their life like a big family in which they used to look after the needy families. The give-and-take policy was practiced in the village till the outbreak of insurgency in the state. This insurgency leads to deterioration of solidarity and harmony in Mizo society. In any society, impact of modernization can be observed in their social relations. In Mizo society also, the emergence of political consciousness facilitated gradual modernization on their social relationships. However, the sudden introduction of grouping of villages, without proper planning, mainly to counter the underground MNF activities, brought about changes in the solidarity of the people, values, way of life, relationship among the village people and their social practices.

Shifting of remote villages into a larger unit as counter insurgency measures brought about tremendous changes in the structure of relationship among the villagers. Based on tradition, social solidarity were shattered and the grouping centres were now exposed to a network of social and economic relationship linking different centres with the nearby towns. In these circumstances, the traditional village harmony and homogeneity gave way to different structure of relationships. With the emergence of new occupations, the structure of relationship becomes much more complex than what it was before. Villagers became a part of wider society, which in turn was a part of still wider national society. It became a part of ever-growing process of modernization and gradually lost its distinctive community traits.

In traditional society setting, the village harmony was largely based on agricultural work which bound the villagers together as occupationally and economically homogeneous communities. Agriculture meant Jhumming, and jhumming meant a way of life rather than a mere economic pattern⁴. The agricultural work of the Mizo was largely based on agricultural work-partnership. It was mostly confined especially among the unmarried youths and it also

did not reflect the status of the member of the working party. It was a reciprocal give-and-take form of agricultural work. Youngmen and women paired themselves and would perform agricultural work reciprocally on two or more plots of land at alternative days or week. In this way, a group of young people might form a bigger agricultural work-partnership and for Youngman, it was like dating a girl in modern society and demand was accordingly high for beautiful girls for work-partnership.

In the olden days, agricultural work-partnership was highly cherished by the Mizo and old people earnestly retold their youthful days in relation to their work-partnership of the past, which brought them with happy memories of their youthful days. For young people, work-partnership was the main attraction to agricultural works. So far as the Mizo experience was concerned, agricultural works and agricultural land had a sentimental values and not merely a material product, but a kind of romantic attachment and fascination. This was mainly due to the social interaction, which had taken place at the agricultural land, and during agricultural works particularly among the agricultural work-partners.

The social interactions in the agricultural land were by means of perfect cooperation. The relationship of interaction between the agricultural work partners might take various forms, as members might not too conscious to fulfill the expectations of others. But in agricultural land, among the agricultural work groups, mutual adaptation and perfect cooperation governed the relationship. Thus the method of jhum cultivation had provided the ethos necessary for the villagers to experience the feeling of oneness. This feeling of oneness has resulted in common sharing of the village land in a uniform way. The practice of jhum cultivation does not permitted permanent land holding system and any individual villagers considered the village land as their own belongings. So the sentimental attachment to jhumland materialized itself in the affectionate adaptation to the whole village territory resulting in the solidarity of the village communities. The jhum cultivation cycle was usually eight to nine years. In this way, the whole village land was connected with agricultural sentimentalism since many cycles would take place in one's life time. Therefore, it appears that the solidarity of the village was the effect of the system of agricultural work and agricultural land. Any dislocation in traditional agricultural system would, thus, result in disharmony in the village solidarity and the whole social structure.

The sudden introduction of grouping of villages, without proper planning, purely for the purpose of counter MNF activities, had tremendous consequences on the traditional system of jhum cultivation and consequently on the traditional social organization. People are now unable to work full-time in the jhum field because of the regular checking and hardship created by security personnel and the dwindling yields of jhum cultivation in the grouping centres. Thus, the people have to supplement agricultural work with some other subsidiary occupations. Consequently, a large number of people left jhum cultivation for other occupations whatever and wherever they could find. Hence, the emergence of new occupations with greater emphasis on monetary value diversified homogenous village communities in the grouping centres. In the process, the influential persons were those who make their livelihood in other occupations and jhum cultivation was left to poorer families who were unable to make in other occupations. However, in the pre-insurgency period, the influential persons were

largely those who exploit successfully the agricultural works and made some profit out of it. Thus, jhum cultivation in the pre-insurgency situation was a way of life rather than a mere means of earning livelihood. Moreover, the gradual emphasis on cash economy as a source of wealth restrained people to retain the traditional sources of village harmony not only in the grouping centres, but also in other ungrouped villages. As a result, the traditional system of work-partnership has become a dying custom and agricultural work cannot revive its traditional importance as a source of value orientation. Thus, the structural consequence of village grouping has been transformation of the relatively undifferentiated, simple village communities into the relatively differentiated village communities⁵.

The sudden and forced nature of changes in the traditional system caused difficulties to many villagers. They could not adjust themselves in the new villages due to the new situation, which resulted in tension, anxiety, inter-village feuds and insecurity. Capital crimes like murder and theft, which were hardly known to Mizo society before insurgency, have become common phenomena in Mizoram especially in the grouping centres. Moreover, greater emphasis on monetary economy gave rise to the immediate monetary profits, which in turn, resulted in widespread misappropriation of developmental funds at all level. In the process, malpractice of government funds and large-scale practice of corruption become popular in Mizoram.

The introduction of development through Test Relief (TR) and Employment Generation Scheme (EGS) programme met the immediate needs of the people by providing wage labour for the constructions of jeepable roads, playgrounds, Community Halls and others for the benefit of the village people discouraged the traditional Mizo tendency to offer free services.

The settlement in the grouping centres, which followed the method of concentration of member of any particular village in one block or street, retained their original loyalty and identity. This resulted in deterioration of grouped village solidarity. Members of the village council in the grouping centres virtually complained the existence of village sub-group rivalry within the grouping centres in matter relating to the administration of the church, politics, school management and so on.

On the other hand, village grouping, consequent upon the insurgency, acquired better conditions of modern facilities like schools, medical facilities, living standard, offices and transport network. Since easy supply network is needed for the army personnel and easy accessibility is necessary to pacify the underground MNF activities.

The villagers in the grouping centres were interested in education and sent their children to schools due to the availability of educational institutions in the grouping centres and also mainly due to the contact with the outside world. Even the poorest families have the desire to educate their children as high as they could afford. Other facilities in the grouping centres also inspired the people to educate their children. It is also due to the competitive mindedness which made the people to pursue higher education. The interaction with other world also plays

an important role for their education which makes them in their every walk of life.

IMPACT ON THE ECONOMY

The economic structure is that aspect of society which deals with man's exploitation of nature for production of material surplus that ensure social evolution. In this explanation, both man and nature participate and man organizes his exploitation in terms of technology and institution. From the light of the above statement, it can be stated that Mizoram is one of the poorest states among the Indian states. The only exploitation through nature is the old aged traditional jhum cultivation which is primitive subsistence occupation.

After the outbreak of disturbance in 1966, many villages were grouped together into a few chosen centers as counter insurgency measures. It was suddenly introduced within a short time and hence people had to make a fresh start under the limited condition .when operation was carried out , they had lost all their belongings and burnt down their houses and also had to live in a congested areas under strict supervision of security forces. Moreover, the original inhabitants of the regrouped villages were unable to work fulltime in the jhum fields due to the constant supervisions and harassment by the military personnel. those who come home late in the evening from the jhum fields were accosted with the charge of supporting and helping the underground MNF movement which caused great hardship to cultural workers . In the later years, the concentration of agricultural workers in the grouping centres soon exhausted the available land and the already short cycle of jhumming had to be further shortened. This had been reducing agricultural yields incredibly and only few families in those grouping centers were able to harvest paddy large enough to sustain themselves for the whole years. Thus widespread famine condition naturally followed the introduction of grouping scheme.

Due to this near famine condition and in part fulfillment of the objectives of the scheme, i.e., developmental work, the Employment Generation Scheme (EGS) the Test Relief (TR) had been introduced to meet the immediate needs of the people by providing wage labour for the construction of jeep roads, playgrounds, community halls etc, for the benefits of the village people. The schemes were thus purely an interim arrangement and normally did not provided adequate wage labour for the needy families. Besides, free ration was given for one year only in the first category. The other stages of grouping did not receive any kind of assistance received by the first stage. Thus, almost in everywhere, the situation was deteriorated since their crops were failed in the next two three years. Even after normalcy returned in the state, the villagers hardly produced sufficient food stuff. Thus, the introduction of village grouping, without proper planning, leads insufficiency of food production in the future.

On the other hand, while there are many disadvantages due to the introduction of grouping of villages, there are also some advantages that brought village grouping. Firstly, there was improvement in transport and communication system. When insurgency broke out in Mizoram, most of the far-flung areas and interior villages were still connected only by footpath. However, due to the introduction of village grouping, almost all the grouping centres were well

connected by jeepable roads whether they were located in the peripheral areas or internal parts of the state. Besides, the grouping centres are also become marketing centres for the surrounding areas.

Another important impact of insurgency was diversification of occupations. When people were grouped together, the available fertile land for jhum cultivation was soon exhausted since the land can not sustain the huge population. Therefore, many of the villagers were compelled to accept for other types of occupations due to the declining productivity and unreliability of jhumming. Income through employment in the government sponsored schemes and other subsidiary occupations like opening petty shops, casual labouring, gardening, establishing small scale and cottage industries have been introduced. Ultimately, these resulted in rapid progress, high standard of living, alleviating poverty, solving employment problems to some extent in the grouping centres and also to other nearby villages. Thus, the emergence of new occupations with greater emphasis on monetary values diversified village economy especially in the grouping centres.

Hence, Insurgency and counter-insurgency, while bringing about numerous modifications in the structure of relationship, could not bring about structural changes.

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A STUDY OF PHYSICAL CHARACTERISTICS OF POTABLE WATER OF AIZAWL CITY, MIZORAM

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INTRODUCTION

There is a huge quantity of fresh water on our planet, almost 1,500 million cubic km (Penman, 1970), but most of it is useless for us because it contains too much of salts. Water is needed in almost every sphere of human activity. It is required for direct consumption or indirectly for washing, cleaning, cooling, transportation and even for waste disposal. The amount of water drawn for human use has never been used up completely. A large fraction is returned to the surface deposits or stream flows often in a polluted state, which can be used again as such or after treatment by removing its impurities. Out of the total quantity drawn (3,500 cubic km), the amount of water irrecoverably consumed was estimated to be about 2,200 cubic km. (L'Vovitch, 1979). Water carries germs of several diseases and the supply of polluted water may cause epidemic in towns and cities.

Aizawl is capital city of Mizoram state. It is located at 23° 43'N latitude and 92° 43'E longitude at the height of 950 m to 1155 m above the mean sea level. Aizawl city is spread over the top of hilly terrain, the water tables in different areas are far below the surface and not reachable for dug wells. The main source of water for domestic use in the township is through the supply maintained by Public Health and Engineering (PHE) Department, Govt. of Mizoram, but this water supply is not enough to meet the daily requirement of the people of the city. A large number of people of the city fetch water from rivers and streams using tank lorries and portable containers for their domestic purposes. One of the prominent sources of domestic water is 'tuikhurs' *i.e.* water seepages accumulated in artificially fabricated tiny ponds.

The present paper embraces the physical examination of potable water collected from tuikhurs of Aizawl city with a view to assess the quality of water, people are using for their drinking and cooking purposes. For this study, the samples were tested for the determination of colour, pH, turbidity, electrical conductivity and total dissolved solids (TDS).

GEOLOGY OF THE AREA

The Geology of Aizawl consists of the rocks of Surma Group. They include thickly bedded sandstones, shale and mudstone of various thickness and alternation (Tiwari and Kumar,

1996). There are also compact siltstones belonging to Bhuban Formation. The sandstones are often observed as intercalations with shales. The rock beds strike N-S and dip towards East in the northern area of Aizawl, while dip is due west in the southern portion of the city.

The thickly bedded sandstones of the Aizawl are traversed by a number of cracks and joints, which are vertical or highly inclined in nature. Joint patterns together with relatively high dip are exaggerating the problem of rock failure in the region. South Hlimen Quarry has suffered a tragic incidence in the past destroying the life and houses at the foothill villages (Kumar *et.al.* 1997).

Bands of argillaceous materials are present within the sandstones, near the upper levels of slopes. The siltstones are generally gray in colour and massive in appearance. They are hard & compact in nature exhibiting well defined bedding planes. The Shales are thinly bedded showing laminated & splintery patterns. The joints are generally tight and widely spaced except in Shale bands.

The rivers flowing through the State are in fact, coming from the crystalline rocks of Myanmar. They include igneous and metamorphic rocks, while the rocks of Mizoram are Sedimentary in nature comprising of sandstones, shale and siltstones. Their intercalation constitutes the hilly terrain in and around Aizawl. These soft rocks ultimately get converted into soil, giving rise to possibility of growing crops and vegetables.

MATERIALS AND METHODS:

Sampling has been done in the post-monsoon session *i.e.* in the months of October, November and December 2005. Water samples were collected from 9 tuikhurs located in the areas namely Bawnkawn, Zemabawk, Ramhlum N, Ramhlum S, Ramrikawn, Luangmual, Chawlhmun, Kulikawn and Tlangnuam. These areas evenly represent the city of Aizawl (Fig. 1). All the samples were collected in 250 ml sterilized poly-bags, which were thoroughly washed with distilled water followed by rinsing twice with the sample water itself. Analyses were performed in the laboratory following the standard methods (APHA, 1998) at the Department of Geology, Mizoram University, Aizawl.

The pH values for all the samples were measured on a digital pH meter (335 Systronics). The Nephelotubimetric method was employed for the determination of turbidity of the samples

using Formazin as standard. Photo-electric Colorimeter (112 Systronics) with 8 filters of different wave-lengths was used to determine the transmittance of the samples under different colours. Electrical conductivity and total dissolved solids play an important role in ascertaining the quality of potable water. The values of both parameters were measured on a Conductivity/TDS Meter (307 Systronics).

RESULTS AND DISCUSSION:

The values of percentage transmittance (% T) of colorimetric studies are presented in Table-1 and pH, EC and TDS and Turbidity are presented in Table-2 . The data exhibits that except filter no. 5 (510-590 nm, wave-length), colour of all the water samples are acceptable. The high value of % T at filter No.5 may be attributed to some elemental impurities present in trace amount within the rocks, which host them in the area. The values of pH, which is a test of acidity/ alkalinity of water in area show that they are within the permissible limits standardized by World Health Organization (WHO). They vary from 6.5 to 8.0, averaging 7.0625 feebly alkaline. The values of EC and TDS (Fig.2) are consistently on lower side and are well within the specified range of WHO.

Water samples from Tlangnuam (in south) and Zemabawk (north-east) show slightly high values of turbidity (Fig.3) with 1 NTU standard prepared in the laboratory, which may be attributed to some greasy materials present as impurities, developed due to primary sources i.e. rock impurities or more probably due to secondary sources. Being the outskirts of the city the secondary sources of impurities seems to be more probable.

CONCLUDING REMARKS:

Although, the physical examinations of the samples show that all the water samples representative of various sources in the city are well within the stipulated guidelines established by the WHO for potable water, yet the chemical and bacteriological studies will further strengthen the findings.

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Table -- 1

Location/No.	Filter 1 (% T)	Filter 2 (% T)	Filter 3 (% T)	Filter 4 (% T)	Filter 5 (% T)	Filter 6 (% T)	Filter 8 (% T)
Bawngkawn*	102	112	105	101	112	119	104
Zemebawk	100	110	100	101	132	112	102
Ramhlun N*	101	108	100	99	105	120	100
Ramhlun S*	100	112	106	107	106	120	104
Ramrikawn	95	106	97	96	105	120	99
Luangmual	100	104	97	105	99	107	101
Chawhmun	104	94	98	107	96	109	100
Kulikawn	100	101	100	116	108	114	100
Tlangnuam	98	101	105	120	105	119	103

Tabel 2: Analyses of pH, EC and TDS and Turbidity

Location	pH	EC	TDS	Turbidity		
				1 NTU	5 NTU	10 NTU
Bawnkawn*	6.9	177	124	7.1	0.4	1
Zemabawk	6.7	165	115	7.2	0	2.9
Ramhlun N*	6.8	149	110	8.9	0.9	0
Ramhlun S*	7.1	125	85	8.7	0	2.9
Ramrikawn	7.2	185	155	8.4	0.3	1
Luangnual	7.4	121	90	8.6	1.7	0.5
Chawhmun	7.5	258	160	8.5	1.4	0.2
Kulikawn	6.9	208	144	10.4	0.3	2
Tlangnuam	6.8	198	140	10.2	1.4	0

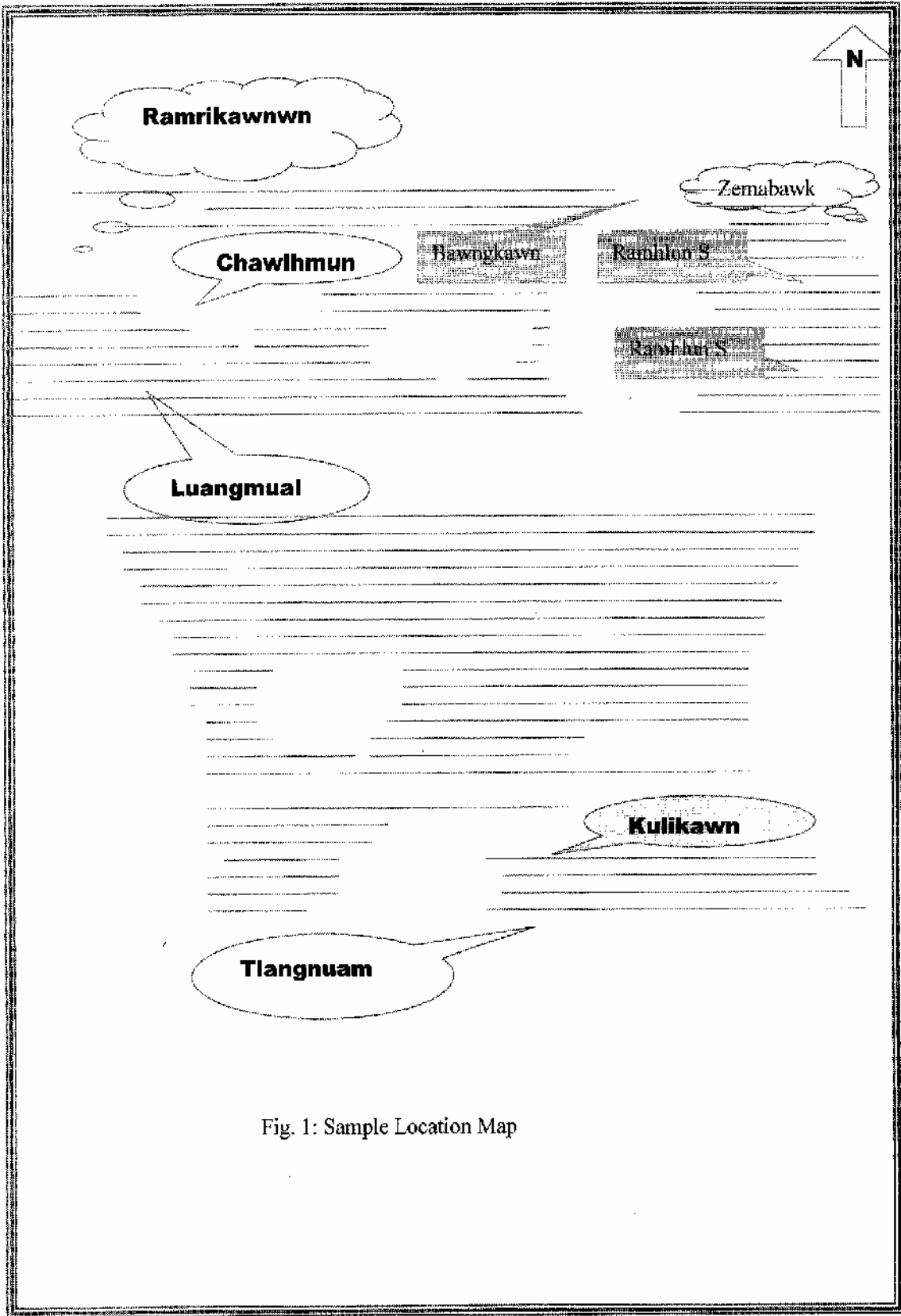


Fig. 1: Sample Location Map

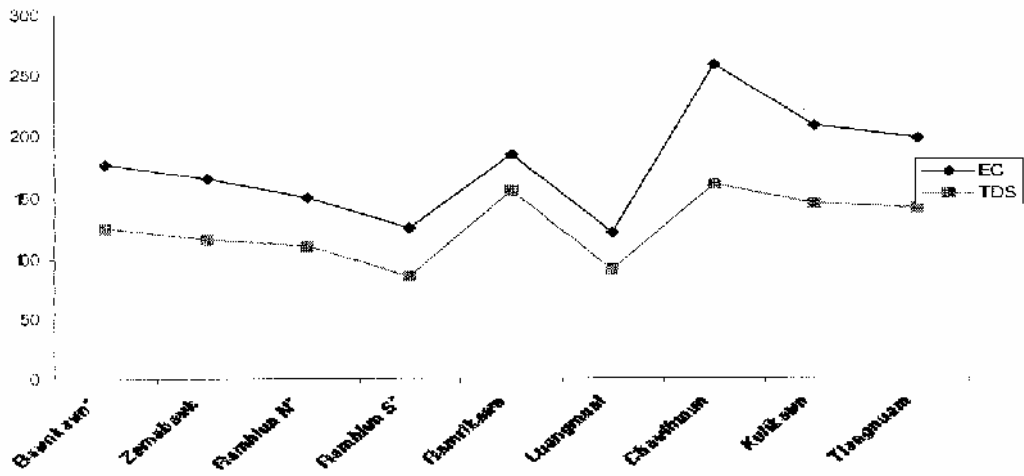


Fig. 2: Plot showing Electrical Conductivity (EC) and Total Dissolved Solids (TDS)

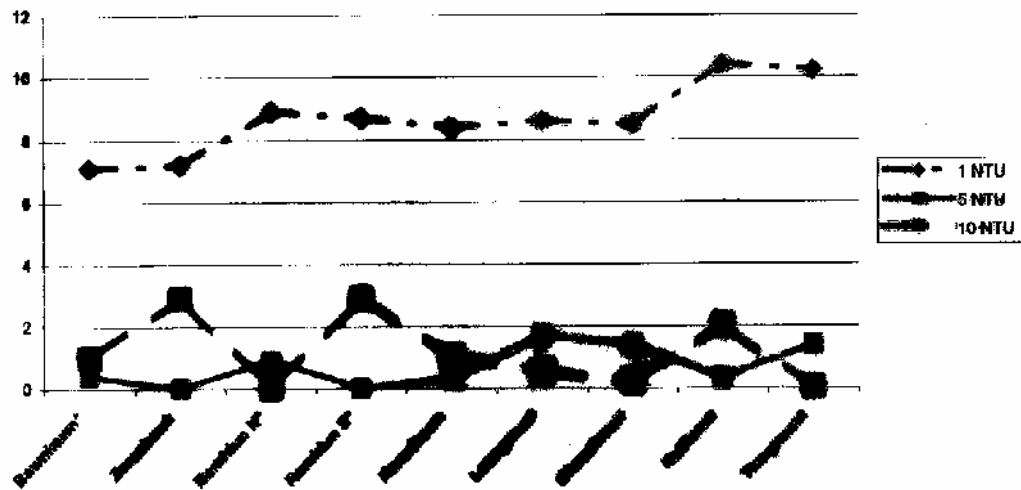


Fig. 3: Turbidity at various strengths

**POTABLE WATER STATUS IN AIZAWL CITY, MIZORAM STATE, INDIA:
AN APPRAISAL**

Shiva Kumar, K. B. Singh, V. K. Bharti

ABSTRACT

(Water has undoubtedly proved to have an important role in the development of every civilization. The availability of potable water in every city is to be assured sufficiently up to the mark in quality as well as in quantity. The problem of domestic water supply in the Aizawl city, the capital of Mizoram State, is undertaken with a view that it is too meager to meet the requirement on one hand and little is known about the quality on the other hand. Rivers flowing over the rocks all along the hilly terrain is the only source of potable water, here in Aizawl. The processing prior to supply is preliminary which hardly makes any change in the original contents of the water.

The aim of the present paper is to assess the probable toxicity that could be attained in the potable water of Aizawl city in the light of average petrochemical data available in the literature for igneous, metamorphic of Myanmar and the sedimentary rocks of Mizoram. Further, they are discussed vis-à-vis Indian and WHO Standards.

The results of the present study are not indicative of any alarming situation so far. Instead, the need to be aware of implementing suitable processes before the supply is made, to meet new inferences, which may also go adversely, since the studies for detailed pre- and post-Monsoon conditions of water are undergoing.)

Key words: Potable Water, Tuikhurs, Toxic Elements, Granitic Rocks, Stratigraphic, Neogene, Coliform, Hazards, pH

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1. INTRODUCTION

The area under study is the Aizawl city, which is the Capital town of Mizoram State, India. Mizoram constitutes one of seven sister states North-Eastern (NE) India. It is located between 21°58'N and 24°85' N latitude and 92°30'E and 92°60'E longitude attaining a height between 950 m to 1155 m above Mean Sea Level (MSL). It is approachable by Road through National Highway NH 54 from Guwahati and Silchar in Assam and by Air from Kolkata, Imphal, Shillong and Guwahati. Its regional position in the Map of India is shown in Fig. 1 along with the latitudes and longitudes. Highways and other road net-works of the State of Mizoram are presented in Fig. 2

Aizawl was ranked second fastest growing city next to Guwahati among NE India by 1991 census (Table – 1). Further, the processes of rapid urbanization continued and put Aizawl city at top in 2001 census. These facts themselves are indicative of the difficulties in meeting the requirements of potable water supply in the city. Different plans for Aizawl city have been prepared from time to time to maintain a consistency in the supply of potable water.

The supply of water in the city through Government agencies is possible by lifting it from Tlawng River flowing in western vicinity. The basement available for river to flow is nothing but the hilly terrain, which consists of igneous, metamorphic and sedimentary rocks. The established chemical analyses for the rocks of Myanmar region is taken as the indirect source of contamination for this potable water available to the city of Aizawl. Again, the sedimentary terrain, making base for shallow hilly rivers in Mizoram, further add to the contamination level of the water reaching to this region. Only little is know regarding chemical analyses of the Mizoram Rocks. Duhawma (2006) has analysed the sandstone, siltstone and shale rocks of Middle and Upper Bhuban Formation exposed in the vicinity of Aizawl.

The scope of the present work embraces the probability of contaminations that could be reached due to flowage of this river water persistently over the hilly terrain in Mizoram. The whole exercise is in order to facilitate the selection of suitable processes prior to supply of water to the residents. Further, an attempt has been made to provide various norms set of potable water by World Health Organization (WHO) and the Government of India to assess the present status of quality of domestic water consumed in the township.

2. GEOLOGY OF THE AREA TRAVERSED BY THE RIVERS

The state of Mizoram is located in the southeastern corner of Northeastern India bordered in the east by Myanmar and in the south by Bangladesh. Plain land of Bangladesh is sharply converting into beautifully elongated north-south trending anticlinal hills and synclinal valleys, draped by luxuriant forest resplendent with colourful orchids. The rocks of Mizoram *i.e.* Bhuban formation of Surma Group is supposed to have a source of crystalline rocks. The crystalline rocks include igneous and metamorphic rocks. The researches in the field of parental source of Bhuban formation in particular, is still continuing and there are fairly good

chance of toxic elements to be present in the basement of surface water in Mizoram. Though there are some evidences that crystalline rocks of Meghalaya were the parent rocks for Mizoram sedimentary rocks, still Myanmar crystalline rocks may also be considered as source of these rocks. The potable water in city of Aizawl is coming from the surface of the nearby rivers; therefore, it seems mandatory to have some discussion on the rock types and their chemistry also.

2.1. Geology of Indo-Myanmar Belt

The Patkoi-naga-Manipur-Chin Hills-Arakan Yoma region forms a westerly convex arcuate belt, which is NW-SE trending at its southern extreme and ENE-WSW trending at the northern end. This arcuate belt representing Outer Arc Ridge is an arc-trench setup comprises Eocene-Oligocene flysch and sub-flysch scraped off from the leading edge of the Indian plate along with narrow strips of older Palaeozoic-Mesozoic sediments, patches of metamorphics and intimately associated but dismembered ophiolites. These occur along the Eastern Boundary Thrust (EBT) zone.

To the east of the Eastern Boundary Thrust (EBT) occurs the 200 km wide and 1400 km long Palaeogene-Neogene Central Myanmar Sedimentary Basin which is bounded in the east by the N-S Shan-Sagaing fault and the Sino-Myanmar high land. This basin is medially traversed by a westerly convex Volcanic Arc and divides the basin into western forearc and eastern backarc basin.

At the close of Oligocene, two well known molasse basins (Tipam and surma basins) is believed to have developed on the foreland side of the Indo-Myanmar tectogene. The Tipam molasse sequence (4100 m) have developed near the northern extremity in Upper Assam, where the belt is ENE-WSW trending; thus, the Upper Assam foredeep, in front of the raised outer arc ridge, is wedged between the Indo-Myanmar belt and the northeastern protrusion of the Indian shield producing imbricate thrust structure. The fold belt generated the sub-flysch-molasse (4000 m) of the Surma basin on the other hand, developed in a relatively open basin lying south of the Meghalayaya Plateau. Sediments in both the basins were deposited with a pronounced unconformity at the base.

Chin Hills, a mountainous district of Upper Burma. It lies on the border between the Lushai Hills (Mizoram) and the plains of Burma, and has an area of 8000 sq. m. It is bounded in North by Assam and Manipur, South by Arakan, East by Burma, and West by Tripura and the Chittagong hill tracts. The Chins, Lushais and Kukis are to the north-east border of India what the Pathan tribes are to the north-west frontier. In 1895 the Chin Hills were declared a part of the province of Burma, and constituted a scheduled district which was administered by a political officer with headquarters at Falam. The tract forms a parallelogram 250 m. from N. to S. by 100 to 150 m. wide. The country consists of a much broken and contorted mass of hills,

intersected by deep valleys. The main ranges run generally N. to S., and vary in height from 5000 to 9000 ft., among the most important being the Letha or Tang, which is the watershed between the Chindwin and Manipur rivers; the Imbukklang, which divides the Sokte tribe from the Whenchs and sheds the water from its eastern slopes into Upper Burma and that from its western slopes into Arakan

The chemical analyses of major, minor and trace elements of Myanmar and Thailand are presented in Table 2 & 3 (Lehmann et.al. 1994).

2.2 Geology of Mizoram

The general depositional events in the Surma basin consist of a repetitive succession of mainly, Neogene, arenaceous and argillaceous sediments known as *rhythmites*, with thinning upward sequence. Continental type fluvial deposits of Dupi Tila followed the rhythmites of marine origin later and Quaternary-Recent river deposits in the topographic and structural lows. The sediments are generally of Miocene-Pleistocene age. They were originally classified into the Surma, Tipam and Dupi Tila 'Series' (Evans, 1932; Mathur and Evans, 1964 and Das Gupta, 1977) and were correlated with the European time scale on the basis of scattered fossil occurrences. Extensive work carried out recently by the G.S.I., ONGC, and by the Geologists of Bangladesh, in Cachar (Assam, Tripura, Mizoram, West Manipur and in Bangladesh brought out a wealth of data from the Surma basin.

The Geology of Aizawl includes the rocks of Surma Group. They are thickly bedded sandstones, shale, and mudstones of various stratigraphic horizons (Tiwari and Kumar, 1996). There are also fairly compact siltstones belonging to Bhuban Formation. Sandstones are intercalated with Shale. The rock beds strike N-S dipping towards east in the northern area of Aizawl, while dip is due west in the southern portion of the city. Amount of dip varies from gently dipping strata (8°) exposed at Bethlehem-College Veng to highly dipping (45°) rocks in South Hlimen.

The thickly bedded sandstones of the area are traversed by numerous cracks and joints, which are vertical and highly inclined. Joint patterns together with relatively high dip are exaggerating the problem of rock failure in the region. South Hlimen sandstone quarry has suffered a tragic incident due to rock failure in the past destroying the life and the houses of nearby village (Kumar *et. al.*, 1997).

2.3. Present Supply Status vis-à-vis Consumption

The main source of potable water in the township is through the supply maintained by the Public Health Engineering Department under the Govt. of Mizoram. They procure water from one of the prominent rivers flowing near the city, the Tlawng, The rivers flowing through Aizawl in particular and Mizoram in general, have a strong dependency over the rainfall. For-

tunately, the rainfall in and around Aizawl is fairly satisfactory. Water through secondary drainage system feed the rivers and provide a picturesque view in Rainy Season (Fig. 3). The monthly rainfall data from 1986 to 1997 is presented in Table 3

Another prominent source of domestic water is “tuikhur” i.e. water seepages accumulated in artificially fabricated small ponds. The quality of tuikhur water is more or less same to that of the river water, except the local impurities in tuikhurs. The source of water accumulated at the subsurface level is two-dimensional. On one hand it is reaching subsurface level through settling down wherever soil or soft weathered rocks are found and on the other hand through settling down of surface water in the rivers and again reaching to the level of tuikhurs through cracks and capillary phenomenon.

2.3.1. PHASE DEVELOPMENT OF DOMESTIC WATER SUPPLY:

The water supply scheme for Aizawl was first started in 1964 and completed in 1972 for the 1963 population of 20 thousand at the rate of 15 GPCD (Gallon per capita per day) by pumping water from Tlawng River to a height of 1200 meters (approx.) in seven stages. Further, the source of water is at great distance from the city and restriction in pumping hours due to shortage of power supply, makes it far from satisfactory. Prior to this Aizawl population depended on sources of water, such as transportation of water through big water tanks fitted in lorries, water brought from streams and springs with bamboo water tubes & buckets and also rain water collected from roofed house tops and stored in metal container and cement works.

Subsequently, the level of water supply was augmented during 1983 with the formulation of Aizawl Water Supply Scheme Phase – I, by tapping Tlawng River for a population of 80,000 with the capacity of 2.4 MGD (24,00,000 Gallons per day) and supply at the rate of 135 Litres per head, per day. This scheme has been characterised by the supply of water through a height of 1040 meters, which is second highest in India, next to a similar scheme in Shimla which was commissioned on December 1988. Although the Scheme was originally designed to cover only the central and southern part of Aizawl city, due to the demand of public it covered the entire city, thereby causing a very low water supply level of 35 LPCD, which is very much inadequate.

Again, in 1996, due to constant increase in population, the Government through PHE (Public Health Engineering) Department has explored and formulated Aizawl Greater Water Supply Scheme and designed to cater an additional population of 2.25 Lakhs ultimately covering the entire Aizawl city. The need of improvement in water sources seems to be alarming as the other streams and rain water sources are gradually drying up during the periods and months other than Monsoon.

At present, the responsibility of supply of potable water within Greater Aizawl Development Planning Area rests with the PHE Department. Presently, State PHED is tapping water from the following sources:

- | | | | |
|----|--|---|--|
| 1. | Tlawng | – | 24 lakh Gallons per day |
| 2. | (a) Tuirial through Tank lorries | } | 0.36 lakh Gallons per day
During dry period (Feb to
April) |
| | (b) Tlawng at Sairang through Tank lorries | | |

Water from these sources is directly fed by two main reservoirs located at Tuikhuahtlang and Laipuitlang. While the demand of water supply of Aizawl Urban Agglomeration is about 90 lakh Gallons per day, the actual supply varies from 20-23 lakh Gallons per day depending upon the availability of power supply, which is much below the requirement. With the installation of Greater Aizawl Water Supply Scheme Phase – II, scarcity of water within Aizawl Urban area is expected to be relieved up to some extent.

The water from the above sources and the reservoirs is distributed to various parts of the city through 19 zonal tanks and 667 supply tanks located at different localities from where it is distributed to consumers through pipelines and also through 670 numbers of public hydrants. The total quantum of water available within Aizawl Urban area (24,00,000 Gallons per day) is inadequate even for the present population. The average per capita supply of water in the area served is less than 7 Gallons or 30 LPCD. Out of present population of 3 lakhs only

80% get piped water supply. Due to shortage of piped or tap water about 20% of the population depend on the water from streams, wells, springs and rain water for drinking, cooking purposes *etc.*, which causes incidents of water borne diseases, like Cholera, Diarrhea, Jaundice *etc.* Except VIP lines, none of the localities get 24 hours of water supply and the duration and quantity of water supply varies from locality to locality.

The rate of consumption of water is a function of various factors such as pressure, metered or unmetered supply, standards of living, size of community, existence of sewerage and drainage, climate, habits of the people, quality of water *etc.*

In Aizawl, water is mainly consumed for following purposes:

- | | |
|---|--------------------|
| 1. Domestic (Drinking, Cooking, bathing, washing <i>etc.</i>) | 7 Gallons/ 30 LPCD |
| 2. Trade & Commerce | Nil |
| 3. Industrial | Nil |
| 4. Construction (Building and Roads) | Data not available |

2.3.2. Recommended Standards vis-à-vis Water Borne Diseases

The water supplied to the public has to be ascertained as per norms laid down in BIS: 10500 -1991, the Indian Standard. The Physical, Chemical and Bacteriological quality of water should not exceed the limits shown in Table 6.

(A) Physico-Chemical Standards

The following parameters are required to be tested for their Physical and Chemical analyses:

Colour and Transparency, Odour, Turbidity (N.T.U.), Dissolved Solids mg/l, Calcium mg/l (as Ca), Magnesium mg/l (as Mg), Total Hardness mg/l (as CaCO₃), Chlorides mg/l (as Cl), Ammoniac Nitrogen mg/l (as N), Albuminoidal Nitrogen mg/l (as N), Nitrous Nitrogen mg/l (as N), Nitric Nitrogen mg/l (as N), Oxygen absorbed mg/l, (Tidy's 4 hrs test), Hydrogen ion concentration (pH), Alkalinity to Phenolphthalein mg/l (as CaCO₃)

), Alkalinity to Methyl orange mg/l (as CaCO₃)

4

), Sulphates mg/l (as SO_4^{2-}), Phosphates mg/l (as PO_4^{3-}), Iron mg/l (as Fe), Fluorides mg/l (as F^-) and Specific Conductance (micro siemens/cm) at 25° C.

Even for construction purposes, water quality has certain specifications to be approved through following tests for its suitability:

1. To neutralize 200 ml of sample of water, using Phenolphthalein as an indicator, it should not require more than 2.0 ml of 0.1 (N/10) Normal sodium hydroxide.
2. To neutralize 200 ml of sample of water, using methyl orange as an indicator, it should not require more than 10 ml of 0.1 (N/10) Normal Hydrochloric acid.
3. Suspended matter, Sulphates (as SO_4^{2-}), Chlorides as Cl^- , Inorganic solids, Organic solids Quantity of samples required for testing are as follows:

Drinking Purpose : - 2 litres.

Construction Purpose : - 5 litres.

The Containers used for collecting water samples should be free from any contamination. It is advised to use new plastic container of required capacity as mentioned above.

(B) Bacteriological Standards

I. Water entering the distribution system: Coliform count in any sample of 100 ml should be Zero. A sample of the water entering the distribution system that does not conform to this standard calls for an immediate investigation in to both the efficacy of the purification process and the method of sampling.

II. Water in the distribution system : .E.coli count in 100ml of any sample should be zero; Coliform organisms not more than 10 per 100 ml in any sample; Coliform organisms should not be present in 100 ml of any two consecutive samples or more than 5% of the samples collected for the year.

(C) Water Bourne Diseases

Sometimes the water supplied for domestic purposes may have contamination up to the range so that it becomes yellowish in colour, saline in taste, has a particular odour and rare occurrence of worms. The quality of water from the public hand pumps may also not be satisfactory, simply because these pumps are not bored deeply, as water quality is directly proportional to the depth. As water is not supplied daily in the city, the people have to store water for their domestic usage including drinking. This requires boiling of water at least for drinking purposes. The boiling of water for drinking purposes is not being practiced among large group

of masses, mainly due to ignorance derived from unawareness regarding water borne diseases. Therefore, it seems mandatory to let people be aware of water borne diseases and regarding the degree of disaster, which contaminated water, could cause.

The hazards of using polluted water may be classified into two broad groups (Park, 1997; Singh, 2003), namely (1) Biological and (2) Chemical.

- 1) **Biological Hazards:** It includes the classical water borne diseases caused by the presence of following infective agents:
 - (i) Viral & bacterial agents which may cause various diseases *viz.* Jaundice, Diarrhoea, Dysentery, Cholera, Typhoid *etc.*
 - (ii) Protozoan agents which may cause Amebiasis and Giardiasis, while Round Worm, Whip Worm and Thread Worm may be caused by the presence of Helminthic agents
 - (iii) An aquatic host in water *e.g.* Schistomiasis caused by the presence of Snail and Fish Tape Worm, while Guinea Worm is caused by the presence of Cyclops.
- 2) **Chemical Hazards:** Pollutants like detergents, cyanides, heavy metals, minerals, organic acids, nitrogenous substances, bleaching agents, dyes, pigments, sulphides, ammonia, toxic and biological organic compounds affect people's health both directly and indirectly by accumulating *e.g.* in fish, which is used as food item. The effects of these pollutants are long term and difficult to detect.

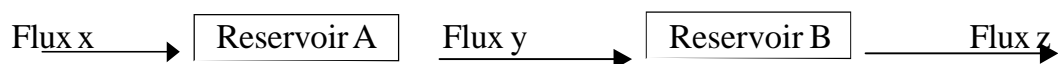
In addition to the above, water is also associated with the following disorders:

- (a) High level fluoride causes molting of the dental health.
- (b) High nitrate content causes cyanosis in infants.
- (c) Inadequate use of water may cause transmission of diseases like, shigellosis, trachoma, conjunctivitis, ascariasis, scabies *etc.*

Some diseases are related to the disease carrying insects breeding in and around water like Malaria, Dengue *etc.*

3. Discussion

It is important to realize that water is in a constant state of reaction with rocks as it moves from one environment to the other. To characterize the change in composition with this movement of water between environments, a model of reservoirs and fluxes of water into and out of the reservoirs can be constructed. A flux is the amount of energy or mass that flows from one place to another in unit time (Walther, 2005)



In the present case the Reservoir A represents the rocks of Myanmar and the Reservoir B represents the rocks of Mizoram and flux x , y and z are supposedly changing because of the different chemical compositions of Myanmar and Mizoram rock types. The steady state and the chemical equilibrium are not same because the amount in the reservoir changes if the fluxes in and out of a reservoir are different.

Chemical analyses for major, minor elements (in percentages) and trace elements (in ppm) are presented in Table- 2, 3 & 4. Such analyses in case of Thailand and Myanmar rocks are presented in Table 2 & 3. They exhibit the facts that the reservoir rocks are having only iron and calcium otherwise, TiO_2 , soda and potash are not observed in erratically higher amounts. While on other hand trace element data of reservoir rocks in Myanmar are suggestive of facts that they are capable of contaminating the water flowing by adding the flux y . The elements, which are of concern, include, Uranium and Thorium. Uranium is ranging from 3 ppm to 15 ppm (in Table 2) and average values in various rocks type present in Reservoir A *i.e.* Myanmar region, from 5 ppm to 31 ppm). While Thorium is ranging from 9 ppm to 88 ppm (in Table 2) and average values in various rocks type present in Reservoir A *i.e.* Myanmar region, from 10 ppm to 43 ppm)

Major, minor and trace elements data of Reservoir B *i.e.* Mizoram rocks are presented in Table 4. They are showing a state of fluctuation in the contents of Calcium, Iron ($\text{Fe}_2\text{O}_3 + \text{FeO}$) and to some extent Magnesium, while exhibiting consistency in case of oxides such as TiO_2 , MnO and alkalis (Na_2O & K_2O). Trace Element data for Mizoram rocks are higher than their corresponding amounts in Myanmar Rocks in case of Zn, Cu, Cr and Ni, consistency or slightly lower side in case of Thorium and decrease in the amount of Uranium. Uranium amount in Mizoram Rocks are noticed around ~4 ppm. This amount is almost double of the uranium content usually found in normal Sandstones. The field studies in the Middle Bhuban formation exposed in Aizawl city reveal the presence of carbonaceous Shale with fossil wood and clay balls is suggestive of strong reducing conditions at the time of deposition. The thickly bedded Sandstones further support this interpretation, which is exhibiting gray colour at places due to the presence of carbonaceous matter, containing organic matter in it and moreover these Sandstones are highly fossiliferous (Kumar and Verma 2006).

The physical appearance and odour can be fairly good criteria for the obvious contamination in the sources of water such as *Tuikhur* (water seepages) and Hand pump, as there is practically no dug wells. The main storage, which supplies water for domestic purposes, seems to be absolutely free from such obvious contaminations. The physical appearance of water of the rivers (Tlawng and Turial) is suggestive of the fact that water is reasonably pure. Therefore, pumps are placed at Tlawng River flowing from South to North in the western flank of the city. Since, the water from Tlawng River is the main source of the domestic supply of Aizawl city, the assessment of this will be given high priority in further studies

The obvious contaminations include silt (turbidity) and hydrogen sulphide, which can be detected by smell. However, the impurities that cause hardness of water, corrosion of pipes and staining of sinks cannot be detected by human sense organs. The detailed analyses are thereby required to detect most of the contaminations in water. They include mainly two types of tests *viz.* Bacteriological and Chemical, which are generally used to assess the water quality. These two tests are separate and distinct and are normally not performed in the same laboratory at the same time. These analyses determine chemical constituents of water for quality control of it.

Following are some conventional tests essentially to be performed on domestic water before and after treatment:

I. DRINKING SAFETY TESTS

- Detect coliform bacteria and nitrates
- Important for babies and small children
- Special containers and sample procedures required

II. DOMESTIC/ LIVESTOCK/ SPRAY WATER SUITABILITY TESTS

Detect pH, conductivity, calcium, magnesium, sodium, potassium, chlorides, sulphates, nitrates, manganese, iron, fluorides, hardness, titratable alkalinity and total dissolved solids

III. IRRIGATION SUITABILITY

Detect pH, conductivity, calcium, magnesium, sodium, potassium, chloride, sulphates, nitrates, phosphorus, boron, titratable alkalinity, total dissolved solids and sodium adsorption ratio

IV. SPECIAL TESTS

- Algae identification, *e.g.*, toxic blue-green types
- Detect turbidity, tannins, fluoride, mercury, lead and arsenic
- Detect trihalomethanes, trace metals, and others

i. COLIFORM BACTERIA

Coliform bacteria are commonly derived from faecal matter. They are found in the tract and in soil & sewage. The presence of a few coliform (values up to 5) may not count, but caution is advised (see Table 5). Many other types of bacteria, some of which may be potentially dangerous, might be present in water.

The weathering of clay minerals in converting the shale into soft shales ultimately into soil thereby opening avenues for growing crops and vegetables with susceptibility of transferring these toxic elements in the edible items. Primarily the highest susceptibility seems to be

in drinking water because it is flowing on the surface taking most of adsorbed materials into it and is used as it is, in raw condition.

. **CONCLUDING REMARKS**

Some consolation of satisfaction is the presence of shale of Surma Group in Mizoram. Clay minerals have by and large the high capacity of adsorption, which could probably be negotiating the toxic component to some extent.

In the light of present study, the facts are suggestive of following recommendations:

1. The situation is suggestive of the strong water literacy campaign among the masses, particularly less aware people of the city. Further, it is felt that a more comprehensive move at war footing is required to strengthen the water quality and domestic water supply status in the city, to safeguard the masses from the problems of water crisis, water pollution and water borne & related diseases.
2. The replacement of old pipelines with new ones as far as possible along with the proper planning for lying of new pipelines. Deep boring of hand pump installation should be preferred and frequency of hand pumps can also be increased. Disposal of domestic wastes through construction of proper drainage system seems to essentially initiated.
3. Growth of the city is expected to accelerate considerably with the expansion of the urban area as Capital of the State. To meet the enhanced demand of water, additional supply system will have to be developed.

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Fig. 1: LOCATION OF THE STUDY AREA

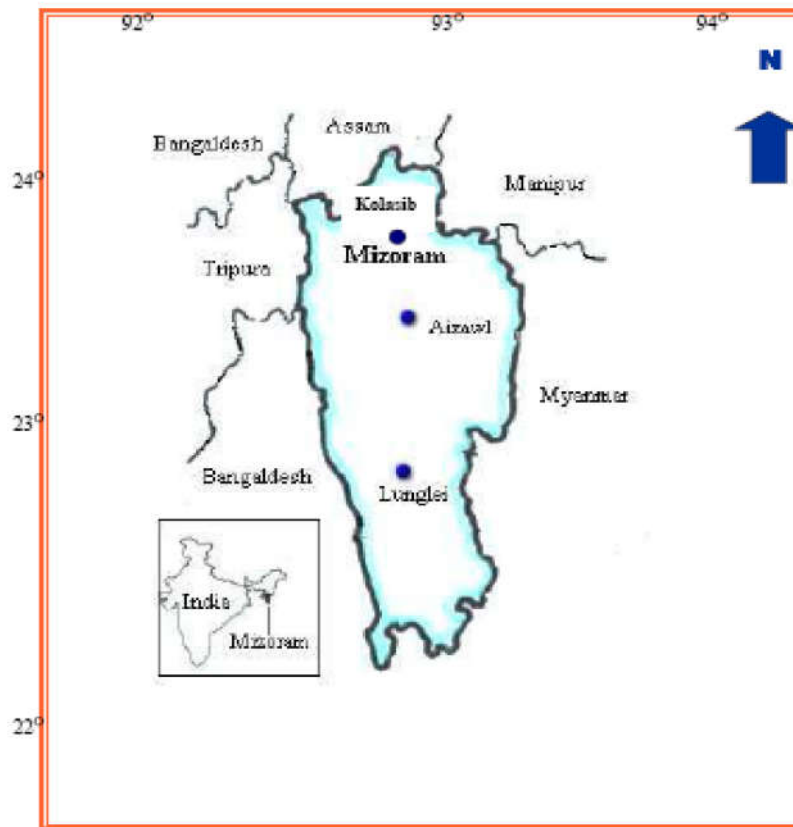


Fig. 2: Plan of Greater Aizawl



Fig. 3: View of Water Fall along Aizawl Airport Road



Table 1: Status of Cities in the North-Eastern Region

Name of Town/ City	Size Km	Civic Status	Populations 1991	Growth Rate % 1971-1981	Growth Rate % 1981-1991
1. Guwahati (Assam)	21500	M.C.	577591	344.33	188.25
2. Aizawl (Mizoram)	11000	C.T.	154343	134.70	107.19
3. Kohima (Nagaland)	21500	M.C.	577591	59.39	54.12
4. Imphal (Manipur)	2957	M	196268	5605	25.31
5. Shillong (Meghalaya)	2557	M.B.	130691	42.32	19.63
6. Agartala (Tripura)	1580	M	157363	31.84	19.25
7. Itanagar (Arunachal Pradesh)	N.A.	N.C.	N.A.	N.A.	N.A.

(Source: Urban Statistics: (A Special Issue on 1991 Census) Town & Country Planning Organization, Govt. of India, Ministry of Urban Development, Jan. 1992, National Institute of Urban Affairs.)

Table 2: Examples of the whole rock geochemistry of the Thai Granites

Sample No.	Eastern Belt Granites				Central Belt Granites				Western Belt Granites			
	T38b	T50	CDH10	T63	90	TL141	43	77	180	34	174	214
Major Elements												
SiO ₂	57.16	65.75	71.27	76.3	65.2	71.26	76.03	77.21	56.01	66.09	71.24	75.83
Al ₂ O ₃	18.25	16.62	14.02	12.4	15.9	13.81	12.39	117.76	16.55	15.15	14.35	13.01
Fe ₂ O ₃	2.34	1.34	1.01	0.67	2.7	0	0.07	0.23	3.87	1.37	0.37	0.65
FeO	4.69	1.41	1.17	0.3	1.5	2.86	1.48	1.16	2.34	2.76	1.88	0.2
MnO	0.14	0.08	0.07	0.03	0.1	0.04	0.03	0.05	0.14	1.53	0.06	0.02
MgO	2.66	1.27	0.81	0.16	0.9	1.58	0.4	0.17	2.05	3.9	0.7	0.12
CaO	6.35	2.75	1.89	0.57	3.8	1.64	0.98	0.92	4.16	-	1.99	0.64
Na ₂ O	3.38	4.07	3.6	2.73	3.3	2.35	2.71	2.68	3.13	2.61	2.9	3.37
K ₂ O	1.47	4.63	4.74	6.29	5.2	4.98	4.72	5.26	8.01	4.19	5.37	5.69
P ₂ O ₅	0.23	0.19	0.11	0	0.1	0.17	0.19	0.04	0.51	0.2	0.12	0
Trace Elements												
Ba	381	1843	933	260	600	908	266	203	4343	744	733	35
Co	27	88	88	45	-	55	30	86	633	55	105	24
Cu	55	90	83	130	-	7	0	0	12	-	5	95
Cr	39	11	8	8	90	253	52	31	0	7	32	10
La	12	49	53	39	59	-	14	40	369	34	53	22
Nb	20	41	39	24	10	0	14	16	38	29	14	-
Ni	0	8	3	6	8	23	7	6	9	3	4	4
Pb	55	59	66	67	25	62	32	46	180	26	34	70
Rb	58	204	234	218	300	320	345	335	295	202	256	279
Sc	18	5	2	0	-	-	-	-	-	-	-	-
Sr	332	1137	288	94	420	158	41	76	5644	390	173	39
Th	9	96	95	53	0	0	16	36	88	23	41	-
U	-	15	12	8	-	-	9	14	9	3	4	-
V	112	41	27	7	-	39	13	7	130	73	28	6
Y	21	24	24	10	10	21	27	28	59	41	16	5
Zn	82	41	30	2	70	42	22	16	116	54	29	0
Zr	191	1831	246	81	160	187	96	120	444	199	203	64

Note (-) not determined

Table 3: Arithmetic means of chemical data for granitic rocks of central Thailand and Burma. Data from Lehmann and Maharwat (1989)

	Loei grano- diorites (n = 7)	Cham- tha-buri granites (n = 29)	Rayong granite (n = 25)	Border range granites (n = 20)	Pilok aplo- granite (n = 17)	Harmyinyi aplo- granite (n = 6)
Oxides (wt%)						
SiO ₂	63.34	70.28	72.60	73.42	76.18	76.00
TiO ₂	0.59	0.41	0.31	0.25	0.03	0.03
Al ₂ O ₃	15.86	14.34	13.80	13.83	13.18	13.83
Fe ₂ O ₃	4.99	3.30	2.05	1.66	0.52	0.59
MnO	0.09	0.06	0.05	0.06	0.07	0.23
MgO	2.20	0.46	0.66	0.35	0.01	0.01
CaO	4.62	2.06	1.26	1.00	0.30	0.50
Na ₂ O	3.43	3.76	2.74	2.89	3.93	3.45
K ₂ O	3.99	3.96	5.00	5.11	4.43	4.38
P ₂ O ₅	0.17	0.09	0.16	0.09	0.04	0.01
L.O.I.	1.22	0.68	0.83	0.68	0.73	0.98
Trace elements (ppm)						
Ba	536	368	476	255	13	33
Ce	45	79	86	85	5	47
Cr	29	< 15	20	< 15	< 15	< 15
Cu	20	15	6	5	30	18
La	< 20	39	26	34	11	61
Nb	7	9	15	24	47	38
Ni	15	9	15	8	9	5
Pb	11	34	49	37	90	81
Rb	99	207	351	442	625	979
Sr	3	7	10	14	27	72
Zr	381	118	81	65	17	4
Th	19	23	24	43	21	27
U	< 5	7	8	19	31	24
Y	109	24	25	19	< 15	< 15
Yb	22	51	42	63	102	190
Zn	49	68	70	47	69	126
Zr	147	256	140	148	53	75
D.I.	64	82	86	89	95	93

Note: Analyses by X-ray fluorescence spectrometry. Fe₂O₃ is total iron. D.I. is 100(F₂-F₁)/F₁ differentiation index. L.O.I. is loss on ignition.

Table – 4: CHEMICAL ANALYSIS OF LOWER AND MIDDLE BHUBAN ROCKS
MAJOR & MINOR OXIDES (in %age)

Oxides in %age	M/31 3	M/37 1A	M/42 2A	M/47 4A	M/62 4B
Rock Type	Sandstone	Silty Sandstone	Brown Sandstone	Shale	Shale
Locality	Chand-Chalt	Champui	Champui	Champui	Company
SiO ₂	68.35	64.32	72.56	71.83	59.46
TiO ₂	0.69	0.68	0.67	0.61	0.81
Al ₂ O ₃	15.38	16.76	13.72	13.54	20.30
Fe ₂ O ₃	5.65	6.38	3.84	4.62	6.07
FeO	-	-	-	-	-
CaO	0.33	0.31	0.21	0.45	0.27
MgO	1.54	2.00	1.23	1.79	1.98
MnO	0.038	0.152	0.033	0.088	0.039
Na ₂ O	1.54	1.22	1.15	1.91	1.05
K ₂ O	2.48	3.10	2.18	2.26	3.66
P ₂ O ₅	0.105	0.100	0.098	0.101	0.103
Total	96.08	95.03	95.69	97.21	93.75
LOI %	4.59	5.1	3.44	3.81	6.27

TRACE ELEMENTS (in ppm)

Element (in ppm)	M/31 3	M/37 1A	M/42 2A	M/47 4A	M/62 4B
Sc	12	12	8	7	14
Co	14	19	8	15	18
Ni	37	48	32	41	72
Cu	25	29	19	23	38
Zn	80	100	254	74	113
Ga	18.2	20.5	13.4	13.6	27.8
Pb	18.1	27.1	29.8	17.8	29.7
Th	15.8	14.6	14.0	9.8	21.5
Rb	108.3	139.3	78.8	91.3	180.7
U	3.5	3.6	3.5	1.9	2.9
Sr	79	84	65	96	95
Y	34.1	32.7	35.3	21.9	38.9
Zr	238	212	413	178	230
Nb	15.7	13.9	12.2	11.1	17.3
Ba	373	527	343	337	352
Cr	103	249	197	188	223
V	89	133	87	87	90

Table – 4: CHEMICAL ANALYSIS OF LOWER AND MIDDLE BHUBAN ROCKS

MAJOR & MINOR OXIDES (in %age) Contd. ...

Oxides in %age.	M/64 5 B	M/69 3C	M/28 1	M/53 1B	M/60 3B
Rock Type	Sandy Shale	Silty Shale	Silty Shale	Gr. Sst.	Br. Sst.
Locality	Company peng	College Veng	Chand-chalt	Company peng	Company peng
SiO ₂	66.02	75.62	74.45	69.14	84.15
TiO ₂	0.65	0.70	0.66	0.70	0.58
Al ₂ O ₃	13.57	11.77	13.10	15.23	7.89
Fe ₂ O ₃	4.54	4.79	4.64	5.62	3.33
FeO	-	-	-	-	-
CaO	4.42	0.29	0.38	0.38	0.22
MgO	1.61	0.99	1.56	1.86	0.75
MnO	0.224	0.077	0.033	0.039	0.030
Na ₂ O	1.46	1.62	1.83	1.54	1.58
K ₂ O	2.61	2.08	2.09	2.90	1.46
P ₂ O ₅	0.104	0.096	0.106	0.088	0.079
Total	95.21	98.03	98.87	97.50	100.07
LOI %	7.18	4.01	3.47	4.4	2.85

TRACE ELEMENTS (in ppm)

Element (in ppm)	M/64 5 B	M/69 3C	M/28 1	M/53 1B	M/60 3B
Sc	11	6	8	10	5
Co	13	13	11	15	9
Ni	33	37	41	51	26
Cu	22	23	23	26	17
Zn	69	66	68	85	46
Ga	14.8	14.6	14.9	19.3	9.2
Pb	19.4	18.3	23.2	25.2	11.5
Th	14.0	16.2	12.7	16.0	11.8
Rb	99.2	91.7	87.8	124.1	62.0
U	2.0	2.2	2.3	4.3	2.9
Sr	109	72	72	85	54
Y	30.1	32.5	30.2	30.1	27.5
Zr	255	361	293	238	326
Nb	13.6	15.8	14.2	14.7	12.8
Ba	369	309	409	313	306
Cr	239	247	483	262	254
V	101	68	97	79	77

Table 5: Monthly Rainfall Report in Aizawl (1986-1997) in mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1986	12	32	50	332	148	342	448	370	347	226	150	-	2486
1987	15	10	38	185	104	465	414	418	415	81	94	12	2257
1988	-	65	64	146	504	304	416	430	257	221	50	4	2461
1989	-	36	51	174	105	495	500	447	424	395	4	10	2641
1990	1	73	270	378	358	371	260	407	204	173	86	49	2622
1991	23	28	109	385	797	300	165	203	152	245	-	37	2444
1992	21	45	19	96	217	374	408	483	460	294	49	19	2480
1993	2	128	52	122	543	550	445	476	332	99	-	-	2749
1994	9	6	193	187	96	183	376	532	168	21	-	-	1721
1995	-	108	245	57	256	555	261	569	293	168	305	-	2817
1996	-	30	303	87	266	283	308	233	584	156	11	-	2255
1997	19	66	146	125	283	259	773	259	397	102	21	83	2553

Source: Department of Agriculture and Minor irrigation, 1997-1998, Directorate of Agriculture, Govt. of Mizoram, Aizawl

Table 6: Chemical Quality Guideline Summary for Domestic Use

Chemical	Range of Concentrations			
	Satisfactory	Poor	Not recommended	Unsuitable
Total Dissolved Solids (mg/L)	up to 1500	1500-3000	3000-4000	over 4000
Hardness (mg/L as CaCO ₃)	up to 500	500-1000	1000-2000	over 2000
Alkalinity (mg/L as CaCO ₃)	up to 500	500-1000	1000-1500	over 1500
Chloride (mg/L)	up to 250	250-500	500-1000	over 1000
Sodium (mg/L)	up to 300	300-500	500-1000	over 1000
Sulphate (mg/L)	up to 400	400-800	800-1200	over 1200
Nitrate (mg/L)	(this is the same as 10 mg/L nitrate as nitrogen)			
Iron (mg/L)	up to 0.30	3-1.0	1.0-7.0	over 7.0
Manganese (mg/L)	up to 0.05	0.05-0.20	2-0.5	over 0.5
pH (hydrogen ion conc.)	7.0-9.5	6-7, 9.5-10	5.5-6, 10-10.5	<5.5, >10.5

Table 7: Water Quality Guidelines for Livestock Use

Parameter	Good Quality	Satisfactory	Caution	Not Recommended
Total Dissolved Solids mg/L	100-1500	1500-3000	3000-5000	5000
Hardness mg/L	0-200	200-500	500	
Calcium mg/L	0-100	150		
Magnesium mg/L	0-100			
Sodium mg/L	0-300	300-500	500-1000	1000
Alkalinity mg/L	0-500	500-1000	1000	
Sulfates mg/L	0-500	500-1000	1000-2000	2000
Nitrates	0-90	100		
pH, units	7-8.5	6.5-9.5	6.0, >9.5	
Iron mg/L	0-0.3	0.3-1.0		

Table 8: Coliform Measurement Chart

Total Coliform Bacteria per 100 ml.	Interpretation
1-5	Values up to 5 may not be significant. Caution, possible pollution. Take another sample.
5-100	Unsafe for drinking. Contamination is likely or consequent results from delay in receipt of sample. Common with new wells before disinfection and shallow dug wells which are not properly sealed.
100	Unsafe for drinking. This water is contaminated and should not be used for drinking under any circumstances.
Coliform immeasurable because of other bacteria	Unsafe for drinking. Harmful bacteria may be present.

Table 9 - INDIAN STANDARD DRINKING WATER - SPECIFICATION (BIS 10500: 1991)

Sl.No	Substance or Characteristic	Requirement (Desirable Limit)	Permissible Limit in the absence of Alternate source
Essential characteristics			
1.	Colour, (Hazen units, Max)	5	25
2.	Odour	Unobjectionable	Unobjectionable
3.	Taste	Agreeable	Agreeable
4.	Turbidity (NTU, Max)	5	10
5.	pH Value	6.5 to 8.5	No Relaxation
6.	Total Hardness (as CaCO ₃) mg/lit.,Max	300	600
7.	Iron (as Fe) mg/lit,Max	0.3	1.0
8.	Chlorides (as Cl) mg/lit,Max.	250	1000
9.	Residual, free chlorine, mg/lit,Min	0.2	--
Desirable Characteristics			
10.	Dissolved solids mg/lit,Max	500	2000
11.	Calcium (as Ca) mg/lit,Max	75	200
12.	Copper (as Cu) mg/lit,Max	0.05	1.5
13.	Manganese (as Mn)mg/lit,Max	0.10	0.3
14.	Sulfate (as SO ₄) mg/lit,Max	200	400
15.	Nitrate (as NO ₃) mg/lit,Max	45	100
16.	Fluoride (as F) mg/lit,Max	1.9	1.5
17.	Phenolic Compounds (as C ₆ H ₅ OH)mg/lit, Max.	0.001	0.002
18.	Mercury (as Hg)mg/lit,Max	0.001	No relaxation
19.	Cadmium (as Cd)mg/lit,Max	0.01	No relaxation
20.	Selenium (as Se)mg/lit,Max	0.01	No relaxation
21.	Arsenic (as As) mg/lit,Max	0.05	No relaxation
22.	Cyanide (as CN) mg/lit,Max	0.05	No relaxation
23.	Lead (as Pb) mg/lit,Max	0.05	No relaxation
24.	Zinc (as Zn) mg/lit,Max	5	15
25.	Anionic detergents (as MBAS) mg/lit,Max	0.2	1.0
26.	Chromium (as Cr ⁶⁺)mg/lit,Max	0.05	No relaxation
27.	Polynuclear aromatic hydro carbons (as PAH) g/lit,Max	--	--
28.	Mineral Oil mg/lit,Max	0.01	0.03
29.	Pesticides mg/l, Max	Absent	0.001
30.	Radioactive Materials		
	i. Alpha emitters Bq/l,Max	--	0.1
	ii. Beta emitters pci/L,Max	--	1.0
31.	Alkalinity mg/lit Max	200	600
32.	Aluminium (as Al) mg/L,Max	0.03	0.2
33.	Boron mg/lit,Max	1	5

STRUCTURAL CONTROL OF DIAMOND MINERALIZATION IN BASTAR

Rahul Verma

ABSTRACT

(The regional structural and tectonic environment is an important factor in a mineralogical province. The localization of all mineral deposits and their mode of occurrence and origin are defined by a specific structural control. The diamondiferous horizon of Bastar Craton is one of the classic example of the structural control. These diamondiferous deposits are mostly located at the intersection of major mega and kimberlitic intrusive dykes express intermediate lineaments and them. Manipur Kimberlite Field (MKF) as intrusive dykes within the Late Proterozoic Indravati and Khariar Group at Tokapal and Manipur are great examples. Their emplacement follows the NW-SE trend of Bhamargarh lineament and E-W trending Garchiroli lineament. The generally high density of major mega and intermediate lineaments in the form of igneous intrusives and faults, mostly following either Mahanadi-Godavari trend or (NW-SE) or Narmada Son trend (E-W), a very rich potential of hidden diamondiferous mineralization is probable in the Bastar region in similar litho-structural environment. An attempt is being made explore such horizons by incorporating both conventional and unconventional methods. The emphasis will be on the evaluation of positive field indications as revealed by conventional methods such as geochemical, geobotanical, geozoological, and geophysical investigations and unconventional methods like historical facts, ancient texts and literatures. Application of thermodynamics may be a vital tool for the appropriation of fertile horizons. As a matter of facts the kimberlite deposits have been reported to occur in clusters in all parts of the globe and that gives us a good reason to believe that the Bastar region is very promising because it lies between the fertile zones on either sides.)

INTRODUCTION

Diamond, being one of the most precious minerals, plays a key role in strengthening the economy of a nation. A well-known example is that of South Africa. This fact makes diamondiferous deposits, highly sought about by every nation.

Diamonds in India were firstly discovered some four centuries ago in the alluvial placers of near Golkunda Fort, from where some world famous diamonds like *Kohe-Noor*, Orloff, Shah, Hope, Dressden, *Regent* and Florentine were discovered. Since the discovery of Majhgawan Kimberlite pipes in 1930, India has earned great recognition in the field of diamond exploration. Later, many new horizons were discovered in Rajasthan, Madhya Pradesh and Karnataka and Chattisgarh.

The common modes of occurrence of diamonds are alluvial placers, conglomerate beds and kimberlite pipes. However, the most likely sites of primary diamond mineralization are kimberlite pipes, igneous intrusives as sills and dykes associated with mantle-derived rocks. These rocks are localized around the weak tension zones such as deep mantle reaching faults and other major lineaments. These fault/lineaments provide favourable environment for the rise of kimberlite bearing magma.

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The southern Bastar region falls in a very remote location in the southernmost part of Chattisgarh. The nearest railway connection is Raipur, the Capital of Chattisgarh state. It is nearly 300 kms from the study area. The only developed township nearby is Jagadapur that is 60 kms away from the study area. Dense forests and un mixing and mysterious tribal population renders the region, very difficult to study. However, the very first attempt has been made by the author to carry out a detailed mapping and study of mafic dyke swarms of southern Bastar region (Srivastava *et. al.*, 1996; Srivastava and Verma, 1998; Verma., 1998). The research results indicate that Bastar Craton has favourable geotectonic environment for diamond mineralization.

REGIONAL GEOLOGY

Crookshank gave the regional geology of Bastar in 1963, which gives an account of Southern Bastar and Jaypore area from Bailadila Hill Range to Eastern Ghats (Fig.1). The geological succession as given by Crookshank (1963) reveals that sedimentary rocks belonging to the Cuddapahs unconformably overlies the older members, which include various acidic and basic intrusives igneous rocks and Archaean metamorphites. Soils and laterites/ferruginous laterites form the uppermost formation, which overlies the Cuddapahs. The metamorphites are divided into three successively older series viz. Bailadila Series, Bengpal Series and Sukma Series. The three-fold division is purely on local basis and no definite boundaries between these units have been demarcated yet.

The generalized geological succession in South Bastar and Koraput district, after Crookshank (1963), is given in Table.1.

GEOTECTONIC SETUP OF BASTAR CRATON

The Bastar Craton also known as Bhandara Craton is bordered by the Godavari rift on the southwest, the Narmada rift on the northwest, the Mahanadi rift on the northeast and the Eastern Ghat front on the southeast (Fig.2). It is rectangular in shape and is also known as Bhandara Craton or Central Indian Craton (Naqui and Rogers, 1987).

An interesting feature can be revealed from the map that majority of the dykes trend NNW-SSE or NW-SE in correspondence to the major trend of Godavari and Mahanadi rifts viz. NW-SE (Fig.1). This set up has played a key role in the structural control of diamond mineralization.

Bastar Craton is bounded by mega-lineaments, which have bisected the Craton and are also responsible for the preservation of Bastar plateau. Bhate (1980) has described some of the mega lineaments fringing the Bastar Craton and these are NNE-SSW trending Eastern Ghat lineament in the east, Godavari lineament in the southwest and Kotri lineament in the northwest. Northern margin of Bastar Craton is dissected by a major ENE-WSW trending Kondagaon lineament passing through north of Kanker and extending ENE up to Bolangir in Orissa. Another major lineament fringes the southern margin of Bastar Craton, which is al-

most parallel to the Kondagaon lineament. The other significant lineaments are WNW-ESE trending Bodhghat and Darbha lineaments, which are supposed to be responsible for the uplift and preservation of Tulsi Dongar massif. There is a major N-S trending Kotri lineament, which is related with the Bailadila orogeny.

Recently, Rajurkar et al. (1990) have presented a review on the lineament fabric of Central and a part of Western India, based on the study of LANDSAT imagery (Fig. 4). The density of lineaments is generally high over the Archaean basement as compared to over the Bastar plateau comprising of Archaean and Early Proterozoic rocks. Both mega and intermediate-lineaments occur over the Bastar plateau. Distinct lineament pattern, trending NW-SE, occurs across the whole of Bastar plateau and are recognised as the Godavari group of lineaments (Rajurkar *et. al.*, 1990). An interesting feature emerging from the study of lineament patterns is that none of the NW-SE trending lineaments of Godavari group cross the Tapti lineament. They all terminate short, abruptly, at the Tapti lineament. The Godavari lineament represents a group of several mega- and intermediate lineaments. Two NW-SE mega-lineaments, viz. Bhamargarh and Kondagaon, are well recognised (Fig.4) over Bastar plateau. The Bhamargarh lineament extending more than 300 km has an overall NW-SE trend. Other mega-lineaments, recognised over the Bastar Craton, are Kotri (N-S), Garchiroli (E-W), and Sarbari (NE-SW). These three lineaments cannot be considered as lineaments of Godavari trend, as these show a total departure from the NW-SE Godavari trend (Rajurkar *et. al.*, 1990). Bhate (1980) has considered that Bhamargarh-, Kotri- and Garchiroli- lineaments have played a significant role in the evolution of the Bastar plateau and that the plateau owes its uplift to vertical movements along these fault lineaments.

The mafic/ ultramafic intrusives of the Fire Lake formation, Finlayson Lake region, Yukon, Canada (ca. 365–360 Ma) represent variable mixtures of asthenospheric (MORB-type) mantle, subarc mantle wedge, and lithospheric (OIB-type) mantle. Geologic relationships in this region suggest that deposition of the formation and intrusion were controlled by normal faulting (Piercey et. al., 2004)

STRUCTURAL CONTROL ON MINERALIZATION

As we know that the major faults/lineaments are the weak zones representing the common expression of crustal extension. The mafic/ultramafic magma from depths approximately 150 kms upwells from mantle to the upper crust through these tension zones. These up welling magma may host many precious minerals and metals. This magma originates at great depth in very high T-P conditions beneath. Such a high P-T is very likely to favour diamond formation in the mantle. If the magma is of kimberlitic nature, it may be the probable careers of diamond. It is evident that all over the world, majority of the kimberlite intrusives are emplaced in ancient cratonic blocks (Clifford, 1966) or where Archaean basement is underlain by deep lithospheric keels (Haggerty, 1986).

Diamond mineralization is most likely to be localized at the intersection of lineaments. The generally high density of mega and intermediate lineaments in the Bastar Craton

fortunately reflects most favourable geotectonic set up for diamond mineralization (Fig .4).

Recently, diamondiferous kimberlites in Manipur Kimberlite Field (MKF) as intrusive dyke within Late Proterozoic Indravati and Khariar Group rocks have been discovered at Tokapal and Manipur (Datta Manikar *et. al.*, 1999). These supra-crustal Cratonic basins are incontact of the Eastern Ghat Mobile Belt. A major tectonic corridor has developed around the prekimberlitic Sandur Fault and its parallel associates. Due to the tectonic activities of the Eastern Ghat Mobile Belt (EGMB), a criss cross arrangement of lineament fabric has developed obliquely. These lineaments are intruded by numerous basic and acid intrusives, hence represent a zone of high permeability. Number of transverse lineaments have also developed parallel to the Garchiroli lineament and are intruded by numerous basic and acid intrusives as well. Overlying Middle to Late Proterozoic sedimentary basins have augmented favourable geological conditions for kimberlitic emplacement. The criss-cross arrangement of lineament fabric has a highly permeable mineralized zones that is related to the intersective relation of NW-SE trending Bhamargarh lineament and E-W trending Garchiroli lineament.

Five more diamond bearing kimberlite pipes in Raipur District have been found in area located 150 km SE of Raipur town. Two are found at Payalikhand West and Payalikhand East (Latitudes 20°9'45' and Longitudes 82°20'20"E; Toposheet No.64L/8). Other three are at Jangra (20°11': 82°19'), Kodmali (20°11'35": 82°14'; 64 L/4) and Barhadih (20°13': 82°12'; 64L/4). Kimberlites bodies occur as intrusives in Bundeli Granitoids and contain fragments of basal Khariar Group of sediments. Recently three kimberlitic and few other ultramafic and ultrapotassic bodies were discovered in Bastar Craton (GSI- CR News, Mishra *et. al.*, 1997; Acharya, 1997) These kimberlite bodies were reported at Tokapal (BC-1), Dungapal (BC-2), Bhejripodar (BC-3) and Parikot (BC-4). These pipes are located between latitudes 19°00' to 19°03' and longitudes 81°51' to 81°54' and are contained in the toposheet no.65E/16. All these findings are very strong evidence of structural control of diamond mineralization.

CONCLUSION

Few diamondiferous kimberlite discoveries have inspired the researchers to scan the entire Bastar Craton to demarcate similar litho-structural environments in the region by using most modern means of remote sensing data and LANDSAT imagery aided by detailed exploratory methods of geophysical, geochemical, geobotanical, geozoological, prospecting. The pre conditions of diamond mineralization are mainly.

The author has carried out a first hand study of the petrological and geochemical specifications of the mafic dyke swarms of the Bastar Region and successfully divide them into two distinct swarms. Older BD1 (low-Ti, Fe-rich olivine to quartz tholeiites) swarm consisting mainly of amphibolite dykes, and the younger BD2 ((high Fe-Ti quartz tholeiites) swarm comprising amphibolite, dolerite/meta-dolerite and minor diorite dykes.

Geochemical characteristics, particularly negative Nb anomaly, of mafic dykes and

several regional field observations suggest that southern Bastar mafic dykes are emplaced in the rift setting tectonic environment.

On the basis of results obtained from the petrogenetic modelling together with other data, it is concluded that mafic dykes of the southern Bastar (i.e. BD1 and BD2 dykes) are derived from 10-30 % batch melting of a lherzolite mantle source at depth of about 100-125 km.

All petrological and geochemical evidences such as generally high REE enrichment of elements such as Ni, Cr, V, Sr, Zr, positive geobotanical growth, favourable geotectonic environment and suitable P-T and depth conditions of these dyke swarms of the region, indicate a fair chance of discovering more diamondiferous horizons in the region.

The region being mostly unexplored with such an objective has ample scope of further search and research of rare and precious metals and non-metals. So, it is high time that sincere efforts are made in this direction. Any new discovery will be a valuable contribution in the country's economic growth.

ACKNOWLEDGEMENTS

The author is thankful to Deptt. Of Geology, Royal Holloway University of London and Deptt. of Geology, University of Portsmouth, for facilitating the Major, Trace and REE analyses of the representative samples of the study area. Finally the author extends his heart felt thanks to Prof. P. O. Alaxander for his invaluable guidance, support and advice on the problem dealt with.

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TABLE.1 (Geological Succession in South Bastar and Koraput (after Crookshank, 1963)

Purana	Limestones, Shales, Slates Sandstones and shales, quartzite, grits, Conglomerates
-----Unconformity-----	
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Dolerite, Pegmatites Charnockite Series	
Igneous Rocks	Granites Greenstones Granitic gneisses and pegmatites
-----Unconformity-----	
--	
Bailadila	Banded haematite quartzites (BHQ) and iron ores, grunerite quartzites, chloritic ferruginous phyllites, carbonaceous shales
Iron-Ore Series	White quartzites
-----Unconformity-----	
--	
	Ferruginous schists, schistose conglomerates, Basalts and tuffs
Bengpal Series	Andalusite phyllites, schists, gneisses and quartzites Grunerite- garnet schists, BHQ, granet- andalusite quartzites sericite quartzites and sandstones
-----No clear dividing line-----	
	Sillimanite quartzite
Sukma Series	Magnetite quartzite, grunerite schists Diopside gneiss Hornblende schists