

Geoenvironmental Challenges in the Indo-Myanmar Kaladon Multi Transit Transport Project

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Abstract—Mizoram is one of the Seven Sister States in North Eastern India. It shares land boundaries with the states- Tripura, Assam, Manipur and international borders with countries Bangladesh to its west and Myanmar to its east. Mizoram, along with Tripura, have only connection with the mainland India, through the very long and tedious journey of nearly 2000 kms, through chicken neck corridor. Alternatively the distance between Kolkata and Sittwe port in Myanmar, is just 600 km,” through the sea route. This geographic advantage is the key factor the future growth of this region.

In an ambitious effort in this direction, “Kaladon Multi Modal Transit Transport Project” was signed, between India and Myanmar in April, 2008’. The aim is to establish a border trade centers at Zowkhathar in Mizoram and Avakhung in Nagaland in addition to the existing centers at Moreh in Manipur,” India is developing the Sittwe port in Myanmar at a cost of Rs.5.4 billion and the port on the Kaladon river as a gateway for the northeastern states to the rest of the world. In addition, the new 100-km highway, from Lawngtlai in eastern Mizoram to Myanmar border at an estimated cost of Rs.650 Crore, is coming up on NH-54, to provide linkage to the under-construction Sittwe port in Myanmar. The “Kaladon Multi-Modal Transport Project”, is expected to be commissioned by end of 2012.

In view of the connectivity of Mizoram Rivers with Barak –Brahmaputra to the north and with the Bay of Bengal to south, the drainage systems of northerly flowing Tlawng and Southerly flowing Kaladon rivers, can be vital water resource to strengthen the Multi Modal Transport system in the hitherto landlocked region. Barak River has already become a part of National Waterway-6 (from Laxhipur to Bagha).

The Kaladon River, throughout its course flows in the hilly terrain (600-1500 mts.) amidst the dense “Sub Himalayan Semi Evergreen forests” and “mixed forest”. The southern part in the lower course is dominated by bamboo forests. Geologically the entire river course is dominated by sandstones and shales of Oligocene-Miocene period. The top layers of the soils are young, immature, loose clayey and loamy. It is highly acidic and contains low K and P. The lower layer is rich in nitrogen and accumulated organic matters.

This huge project involves certain environmental challenges that need to be addressed very sensibly. As per the IWAI report, 5, 61,954 cubic meter of dredged material will be excavated from the approach channel and the port areas of the Sittwe port. The dredged material from the approach channel will be dumped in the sea for

the reclamation of 48,000 sq m land. To facilitate the passage to large vessels, the river Kaladon will be dredged on at least 35 locations excavating a total of about two million cubic meters of sand, pebbles, boulders and rocks. This exercise will lead to massive land degradation in the region.

Further, for the development en route, large scale deforestation and widening of the river channel is obvious that will lead to the reduction of dissolved organic matter (DOM, CPOM & FPOM) as well as a reduction in the nutrient cycle of the river.

As a matter of fact, a stream with a “tighter spiral” or shorter spiraling length is more efficient at using and recycling its nutrient resources. Such streams have a higher “stream metabolism index (SMI)”. A reduction in the SMI will lead to weakening of the river recycling capacity, thereby causing deficiency in a number of major ions in river water, such as calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), chlorine (Cl), the macronutrients nitrogen (N), phosphorus (P), and dissolved organic carbon (C).

As a combined effect of all these developmental activity, the erosion on the hill slopes will be more pronounced. It must be remembered that average rainfall in Mizoram is 254 cm, and that exceeds even 350 cms in the southern part of Mizoram, in the Kaladon Basin. The soil erosion is vigorous during monsoon and post monsoon season. Enhanced erosion of the slope will lead to the excess of silts in the river bed. Excess Silt will smother the bed of the river and reduces the aquatic insect populations and spawning success of fishes, on one hand and will hamper the navigation on the other.

The solution lies in maintaining the equilibrium between development and environment. Sincere care is needed to disturb the “river continuum” in the least possible manner. Some of the effective control measures are – (a) Intense vegetation in the “Riparian Zone” to check the channel bank erosion; (b) Lay in shrub and timber like trees to create living revetments to protect actively eroding areas of river bank. (c) Create “silt traps” close to the banks, where existing farm tracks adjoin the river to improve regeneration of grasses. (d) Install coarse woody debris to create living and dead soft revetments in areas of actively eroding river banks (e) Coppice and canopy lift a proportion of the riparian trees, principally multi stool alders to increase the light penetration to the banks. (f) Fence livestock out to protect the coppice regrowth and remove grazing pressure from the river banks to allow the regeneration of grasses and native perennial species.

Fortunately, the geo-climate conditions, bless the region, with rich natural growth of Bamboo. Bamboo is rightly called “seed of hope” as it is one of the fastest growing grasses and a great source of oxygen and also a great measure to prevent soil erosion and landslides.

A modern technique of application of “Dirt Glue Polymer” is also proving to be a good “green erosion control” measure. It is a nonhazardous, nontoxic high tech bonding material with incredible bonding strength. It provides a three dimensional protection against erosion of the slopes in any environmental condition without any adverse effect on the people, animal and aquatic life.

Regional development is the need of the day in the wake of socio-economic growth of any nation. The wheel of progress cannot be stopped and should not be, provided it does not crush the pristine environment. By all means, it has to be a careful, balanced and eco-friendly drive.

I. GENERAL INFORMATION ABOUT MIZORAM

A. Location and Accessibility

Mizoram is located in the North-eastern India, bordered to the east by Myanmar and to the south by Bangladesh. It covers an area of about 21,087 sq. km having population of 10, 98,827. It lies between latitudes 21°56'N and 24°31'N and longitudes 92°16' E and 93°26' E. (Figure 1)



Fig. 1

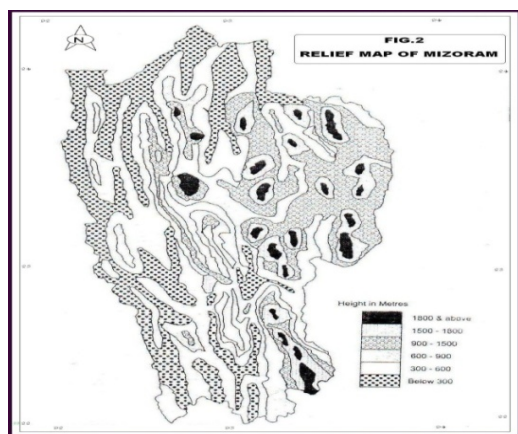


Fig. 2

Aizawl, the capital of Mizoram (92°60' E longitude and 23°58' N latitude), Lunglei, Lawngtlai and Saiha are connected by NH 54 to Silchar, Shillong, and Guwahati. Beside link by roads, Aizawl is also connected by air service with Kolkata, Guwahati and Imphal.

B. Climate

Mizoram enjoys a moderate climate. The winter temperature ranges from 7°C to 20°C. The summer temperature is usually between 17°C to 30°C.

Mizoram comes under the heavy influence of monsoon. Maximum rainfall is received between May and September. Mizoram has annual rainfall of 254 cm. The northwest parts of the state get maximum rainfall (over 350 cm.). The southern parts also get high rainfall over 250 cm.

C. Geological Setting

Geologically, Mizoram is a part of Tripura - Mizoram mio-geosyncline which constitute a part of the Assam - Arakan geosynclinal basin. The Mizoram Hills (Lushai Hills) have been considered to be forming an integral part of the mobile belt constituted of very tight, elongated asymmetrical, N-S trending anticlines alternating or en-echelon with broad saucer shaped synclines showing slightly arcuate and convex westward trends[1-2].

D. Geomorphology and Physiography

The physiographic expressions of the state are imparted by approximately N-S trending steep hill ranges. The difference of elevation between valley floor and hill tops greatly varies from east to west. The steep hill ranges are more towards east than towards west.

All the rivers in Mizoram are Monsoon fed and they attain maximum volume in the Monsoon and post monsoon period. In the north, the Tlawng (Dhaleswari), the Tuirial (Sonai) and the Tuivawl start from the middle of Mizoram and flowing north and meet Barak River at the northern fringe of Mizoram. In the south, the Karnaphuli flows north from the southern tip of the state and near about the middle it flows to Bangladesh where it has been tapped for a huge hydel project. The Kaladon River enters Mizoram from Myanmar and flowing south it enters Myanmar again.

II. THE KALADON MULTI-MODAL TRANSPORT NETWORK

India's infrastructural initiatives with ASEAN neighbors actually provide a strong development impetus to the land-locked northeast region of the country. The chicken's neck or the Siliguri corridor is a narrow stretch of land, which connects mainland to the northeast of India. This distance is over 1,600 km which is not just long but infested with geological perils and security threats.

On the other hand, the distance between Kolkata and Sittwe port is only 600 kms. With the development of link between Kolkata and Sittwe port, aided with the interlinked road and waterways, can break the land lock between mainland India and northeastern region of the country.

Subsequent to the India and Myanmar agreement to open a border trade centers at “Zowkhathar” in Mizoram and “Avakhung” in Nagaland in addition to the existing centers at “Moreh” in Manipur,” India is developing the Sittwe port in Myanmar at a cost of Rs.5.4 billion and the port on the Kaladon river as a gateway for the northeastern states to the rest of the world.(Figure 3).

In addition, the new 100-km highway, from Lawngtlai in eastern Mizoram to Myanmar border at an estimated cost of Rs.650 Crore, is coming up on NH-54, to provide linkage to the under-construction Sittwe port in Myanmar. The “Kaladon Multi-Modal Transport Project”, is expected to be commissioned by end of 2012.



Fig. 3

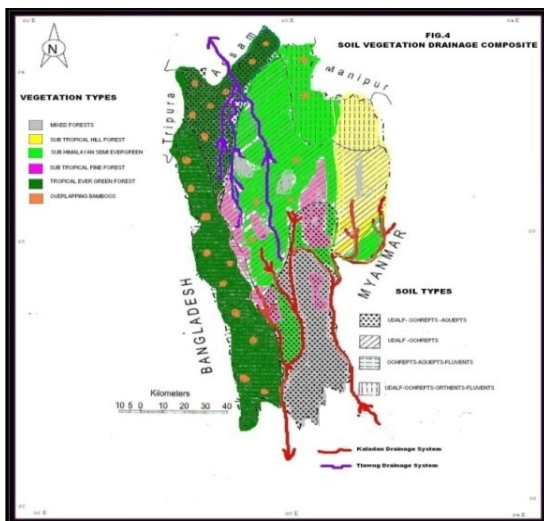


Fig. 4

III. GEO-ENVIRONMENTAL CHALLENGES

A. mGeo-Climatic Factors

Geologically the entire river course is dominated by sandstones and shales of Oligocene- Miocene period of Surma Group. These sedimentary rocks are highly prone to erosion. Previous geological investigations in the region reveal that the rocks of Aizawl have a mixed provenance of acid igneous and high grade metamorphic rocks, probably, the Mogak Group consisting of Gneisses, schist, and Kalibag Granite of northern Myanmar [3].

The geochemical analyses of the rocks of Aizawl show higher concentration of Ni, Cr, U, Th, Pb, Ga. These heavy metals are finally adding to the ground water through intense soil erosion.

The top layers of the soils are young, immature, loose clayey and loamy. During most of its course Kaladon river flows amidst Udalf-Ochrepts-Aqueptus soil terrains. These soils have loamy texture and have moderate to high acidity with pH value ranging from 4.5-6.5 and contains low K and P. The lower layer is rich in nitrogen and accumulated organic matters. The average rainfall in Mizoram is 254 cm, and that exceeds even 350 cms in the southern part of Mizoram, in the Kaladon Basin. Such a heavy average rainfall in this region (>300 cm), causes massive loss to the immature soil. The average discharge of Kaladon River is 40 cusec/seconds that is capable enough for active lateral erosion as well.

The Kaladon River, throughout its course flows in the hilly terrain (600-1500 mts.) amidst the dense “Sub Himalayan Semi Evergreen forests” and “mixed forest”. Only in the southern part in the lower course, the right bank is dominated by bamboo forests (Figure 3).

B. Environmental Factors

As per the IWAI report, 5, 61,954 cubic meter of dredged material will be excavated from the approach channel and the port areas of the Sittwe port. The dredged material from the approach channel will be dumped in the sea for the reclamation of 48,000 sq m land. To facilitate the passage to large vessels, the river Kaladon will be dredged on at least 35 locations excavating a total of about two million cubic meters of sand, pebbles, boulders and rocks. This exercise will lead to massive land degradation in the region. Intense dredging from the down shore area will aggravate the problem of erosion of the slope.

C. Stream Mobilization Factor

Further, for the development en route, large scale deforestation and widening of the river channel is obvious that will lead to the reduction of dissolved organic matter (DOM, CPOM & FPOM) as well as a reduction in the nutrient cycle of the river.

As a matter of fact, a stream with a “tighter spiral” or shorter spiraling length is more efficient at using and recycling its nutrient resources. Such streams have a higher “stream metabolism index (SMI)”. A reduction in the SMI will lead to weakening of the river recycling capacity, thereby causing deficiency in number of major ions in river water, such as calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), chlorine (Cl), the macronutrients nitrogen (N), phosphorus (P), and dissolved organic carbon (C). [4].

As a combined effect of all these developmental activity, the environmental degradation will be more pronounced. The soil erosion is vigorous during monsoon and post monsoon season. Enhanced erosion of the slope will lead to the excess of silts in the river bed. Excess Silt will smother the bed of the river and reduces the aquatic insect populations and spawning success of fishes, on one hand and will hamper the navigation on the other.

IV. COMBATING THE CHALLENGES

The solution lies in maintaining the equilibrium between development and environment. The main task is to maintain the “river continuum”. Some of the effective control measures are:

- Intense vegetation in the “Riparian Zone”. Healthy riparian zones provide a variety of ecosystem services including (a) sediment filtering, (b) bank stabilization, (c) water storage and release, and (d) aquifer recharge. In addition, riparian zones provide important habitat for wildlife.
- Lay in shrub and timber like trees to create living revetments to protect actively eroding areas of river bank.
- Create “silt traps” close to the banks, where existing farm tracks adjoin the river to improve regeneration of grasses.
- Install coarse woody debris to create living and dead soft revetments in areas of actively eroding river banks.
- Intensify “bamboo plantation all along the slopes in the Kaladon basin, as bamboo is a great source of oxygen and also a great measure to prevent soil erosion and landslides.
- Coppice and canopy lift a proportion of the riparian trees, principally multi stool alders to increase the light penetration to the banks.

Intensify “bamboo plantation on the slopes as bamboo is a great source of oxygen and also a great measure to prevent soil erosion and landslides.

- Fence livestock out to protect the coppice re-growth and remove grazing pressure from the river banks to allow the regeneration of grasses and native perennial species.
- Application of “Dirt Glue Polymer” as a “green erosion control” measure. It is a non-hazardous, non-toxic high tech bonding material with incredible bonding strength. It provides a three dimensional protection against erosion of the slopes in any environmental condition without any adverse effect on the people, animal and aquatic life.

V. CONCLUSION

Fortunately, the geo-climate conditions, bless the region, with rich natural growth of Bamboo. Intense “Bamboo plantation” along with other suggested measures can effectively control the land and environmental degradation. However, in a more scientific approach, estimation of “Soil Erosion Rates” can be decisive in the control measure.

Regional development is the need of the day in the wake of socio-economic growth of any nation. The wheel of progress always moves forward, and every development takes a toll on the nature. However, utmost care is needed to protect the pristine environment. By all means, developmental activities must be in accordance with the regional environment and it must be an “eco-friendly drive.

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