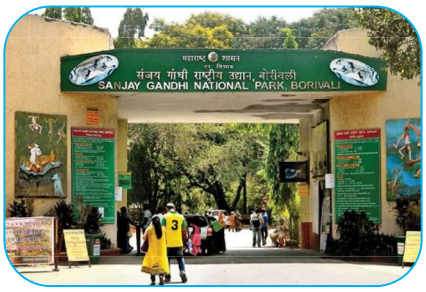
Indian StreamS reSearch Journal
ISSN No : 2230-7850
Impact Factor : 5.1651 (UIF)
Volume - 12 | Issue - 3 | April - 2022

EFFECTS OF DEVELOPMENT ACTIVITIES IN SANJAY GANDHI NATIONAL PARK, MUMBAI ON VIHAR LAKE BODY AND BHANDUP HILLS, MUMBAI

Prof. (Dr.) Surendra C. Thakurdesai
Head, Department of Geography,
R P Gogate and R V Jogalekar College, Ratnagiri.

ABSTRACT:

Large scale developmental activities are planned and ongoing in the Sanjay Gandhi National Park (SGNP) and Aarey Colony area in Mumbai. These are the only remaining hills and patches of forest in Mumbai. The SGNP area is under tremendous pressure by real estate lobby, shanty encroachments, recreational activities, transport network expansion and so on. Some of these factors are associated with the livelihood of native residents but majority of them are kind of additional amenities for the already established segment of the society. Development of cycle track going along the margins of SGNP is one of these.



KEYWORDS: *Large scale developmental activities , Development of cycle track.*

DETAILS OF CYCLE TRACK PROPOSED –

The cycle track is proposed from Jogeshwari Vikroli Link Road (JVLR) to Mulund West. Initially it will start from JVLR near Powai lake Jogeshwari side and continue along the lake shore and at places over the water body, passing from backside of IIT campus it will cut through the hills and enter Vihar lake catchment, follow the Vihar lake shoreline slopes till Bhandup pumping station. Further it is proposed to continue till Mulund.

The construction is already in progress in Powai - Bhandup segment. It involves a concrete road, paved footpath and storm water drain with pillars to support weather shed and protective net. Some part of the track passes along shore of Powai lake near Hotel Renaissance where water body is filled with debris and track is built. Then as it moves into hills; cutting of hill slopes is undertaken. Material removed is used to create embankments in stream channels cutting across and joining Vihar Lake. As protection measure to check slope failure gabion walls are put. For their construction hills are cut further up. Near Vihar lake shores the water supply line is dismantled and put underground. Work is going on in all this section at rapid speed.

METHODOLOGY

The report is based on Geo-tagged photos taken on site in last Two months and site visit done from Powai to Bhandup. Onsite measurements were taken where cutting and filling is going on. Detailed site photographs were taken to know the scale and nature of changes brought into natural slopes. Also the Google Earth image is used to demarcate catchment, identify Land Use and Land Cover in the area. The demarcation of watershed is finalized using extract of Survey of India Toposheet of the region. Maps of Mithi river catchment published by MMRDA are referred in this study. For this study Sentinel 2 Multispectral satellite data from European space agency is used. This data is of 10 meter

spatial resolution, 5 day temporal resolution and 12 spectral resolutions in visible spectrum. This data is apt to be used to understand changes in vegetation in a given area.

FINDINGS AND DISCUSSION

Vihar lake is on Mithi river and is part of Borivali/Sanjay Gandhi National park which is North of city of Mumbai in India. Being on urban peripheral there is stress on the lake and the surrounding vegetation due to urban activities. As shown in the satellite image Vihar lake has human habitations within a kilometre distance. It is natural for humans to create settlements near to water bodies and entire city of Mumbai on the coast. Given the stress on environment it is also very important for us to plan urbanization in a sustainable manner. This lake and the surrounding eco system acts as a very good carbon sink and can protect Mumbai from pollution if the park and lake are not disturbed. This report points out some construction activities in the periphery of the lake using satellite data and field survey.

The area lies within the boundary of SGNP. The developmental works mainly consists of digging, leveling, material dumping and change in natural slope of the area. The work done is within the catchment of Vihar Lake / reservoir. The actual site is in close proximity of the Vihar lake body/ water line. The network of streams flowing in the region is already disturbed by the encroachment by settlement and compound walls constructed in the area. Slope of the region is gentle to moderate at places. Digging and all other activities are carried out at multiple places. Also the debris removed is lying at site only, may be to use for construction of embankment in project itself.

1. There are different parts around the road where vegetation is cleared.
2. These areas cumulatively are about 1.5 to 2 acres.
3. The field observations match with the changes observed in the satellite.

The study area lies in heavy rainfall region of India and the average annual rainfall figures are more than 3000 mms. The rainfall is torrential in nature as the number of rainy days is generally 80 to 100, mostly in Monsoon period. The amount of water flowing as sheet flow is more particularly in Mumbai because of very low rate of percolation owing to denudation and surface modification. Therefore the energy level of water flowing within stream channels as well as over the surface is very high. The high energy flow is capable of eroding sediment / debris in large volumes as well as of larger particle size. Lakes, reservoirs in any area act as base level and are places for deposition of sediment as water is stagnant in here.

The site visit reveals the nature of changes brought about and the destruction caused by the construction activity. Following photograph shows the placement of track over the slope segment. It clearly indicates that the track is neither at top nor at foothills. Thus it is inevitable to undertake cut and fill activity to create flat surface for track construction.

As there is cut and fill activity it is bound to create a steep slope which will be vulnerable to failure. The vulnerability is high especially due to high rainfall regime. To protect these newly created steep slopes gabion walls are constructed. The height of wall is indicator of the extent of cutting done at site. Following photograph shows the retention structure in form of gabion wall and the original slope marked on it.

Even if the slope cutting is denied by the authorities following photographs clearly show the cutting activity going on. The slopes are modified up to bedrock level and there are exposures of bedrock layers over the fresh slopes. Following photo shows freshly cut and exposed bedrock.

The bedrock is further cut and boulders are removed. These are used to construct gabion structures and at some places as landfill material. Excess material is removed at many places and the gaps between cut slope and gabion wall is filled with mucking generated. For this roads are constructed over the cuts as seen in following photograph.

The utility of artificial lakes created for water supply depends on the water holding capacity of the reservoir. In India the siltation of such reservoirs is grave problem accepted by scientists as well as the government agencies. The rate of siltation is aggravated in urban areas due to enhanced anthropogenic activity.

The changes brought about by the authorities in the catchment of Vihar Lake, are classic example of the scenario described above. The debris is lying in loose state in vicinity of the reservoir. The area is in catchment of the reservoir and so it will reach the reservoir through water induced stream and sheet erosion for sure. The high rainfall region over the modified land surface will also cause rill erosion over the slope adding to the volume of material going into lake body. The total volume can be estimated in further investigation. As the Vihar Lake is a small water body the effect of this additional volume shall be notable. Also the addition of debris shall affect the water quality both physically as well as chemically.

Large scale changes in the hill slopes are a cause of concern as they are likely to trigger chain of effects in the whole catchment. Cutting of slopes for widening of track is major change brought about. The cutting has created steep slopes with angle as high as 80^0. The fresh slope cuts have exposed the bedrock upper loose regolith and bedrock. Loosened material is sliding along the steep slopes even in dry spell. The sliding is definitely going to increase with monsoon rains. Gabion structures are used to

arrest such sliding of material. There is hollow behind these gabion walls which are expected to get filled up with debris sliding down in monsoon. What is to be alarming is that many dry spring lines are visible where the gabion structures are still to be assembled. It is likely that these are perennial springs dried up during cutting, filling. They will be rejuvenated in monsoon and will carry lot of water which will be dammed at walls. It will create tremendous pressure over the walls and it is likely that they may collapse and complete slope will flow down the slope. These kind of incidences shall be responsible for large scale siltation in Vihar lake body.

Also the stream channels that lie in cutting region are steepened and they are nearly vertical adjacent to cycle track. It is well known fact that such steepening initiates head ward cutting by the streams. Thus the slopes will be dissected by stream and will be susceptible to failure. Such activity creates caving which undermines the toe slope. If it happens the cycle track itself will sink down in these hollows. Even it appears that the streams are not extensive and there catchment area is small the energy of water flowing in full spate is very high. Such changes are also responsible for the loss of springs. As the region is full of wild life springs are the safer sources water for smaller animals compared to Vihar lake proper. Spring drying will be responsible for drying up of moisture loving species in the nearby vegetation.

Therefore, it can be concluded that the developmental activity reported is harmful for the Vihar Lake catchment and water quality morphologically as well as chemically. There need to be urgent action to stop this and initiate repairing measures for the changes already done.

REFERENCES

1. Normalized Difference Water Index (NDWI) https://deltas.usgs.gov/fm/data/data ndwi.aspx
2. An effective modified water extraction method for Landsat-8 OLI imagery of mountainous plateau regions by H Gao, L Wang, L Jing, J Xu, Key Laboratory of Digital Earth Science, Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences, Beijing, 100094, China.
3. Combining Water Indices for Water and Background Threshold in Landsat Image by Tri Dev Acharya, Anoj Subedi, In Tae Yang and Dong Ha Lee
4. Normalized Difference Vegetation Index (NDVI) https://deltas.usgs.gov/fm/data/data ndvi.aspx
5. Using NDVI to measure precipitation in semi-arid landscapes Journal of Arid Environments By: Amy N. Birtwhistle , Melinda Laituri , Brian Bledsoe , and Jonathan M. Friedman https://pubs.er.usgs.gov/publication/70175897
6. A Modified Soil Adjusted Vegetation Index by J. Qi, A. Chehbouni, A. R. Huete, Y. H. Kerr, and S. Sorooshian
7. Normalization of satellite imagery https://ntrs.nasa.gov/search.jsp?R=19900064323
8. A MODELING-BASED THRESHOLD APPROACH TO DERIVE CHANGE/NO CHANGE INFORMATION OVER VEGETATION AREA by Y. Hu, S.M. de Jong and R. Sluiter http://giscience.hig.se/binjiang/geoinformatics/files/p647.pdf
9. Histogram stretching https://en.wikipedia.org/wiki/Histogram-equalization
10. Edge detection http://www.ics.uci.edu/~majumder/DIP/classes/EdgeDetect.pdf
11. Connected components https://en.wikipedia.org/wiki/Connected-component-labelling