

5th VC Batch : 1988-90

Special project reports

VCMSR-5

1. (Miss) Mary Swapam Mankekar } ECOLOGY OF POWAI LAKE
2. Rajeev Prakash : Documentation of proportion and structure in NIRNAYASAGAR Typefaces.
3. (Miss) Arlene Rajabhooshan : Documentation of slide talks in print media
4. Punyashlok Mishra : Order and Chaos ~~at~~ in thinking.
5. (Miss) Pratima Rawat : Color and composition in Indian miniature art.
6. S.K. Mohanty : Documentation of Text and images from rare books, 2pts
7. (Miss) Smita Sawai : Literacy.

* Others not received till 16-6-93 when bound.

* Prof. R. Hazra said Sanjay Nirmal & G.R. Reddy's projects are not traceable to him

Loose * ⑧ Raja Mohanty : Investigation into the Semantics of communication. (Recd. in 1992 (2 yrs late) Hence kept loose at the end)

SPECIAL
PROJECT

✓ 5th VC 8890

ECOLOGY : Powai Lake.

(Miss) Mary Swapan Mankekar

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VISUAL COMMUNICATION

(SPECIAL PROJECT)

ECOLOGY - POWAI LAKE

Submitted in Partial fulfilment of the requirements
for the degree of Master of Design in Visual Commu-
nication.

by

Mary Swapan Mankekar

Roll No. 886129

Guide - Prof. M. Patel



INDUSTRIAL DESIGN CENTRE

IIT BOMBAY

MARCH 1990

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VI/VC/88-90

APPROVAL SHEET

The Project entitled

ECOLOGY - POWAI LAKE

by

Mary Swapan Mankekar

Roll No. 886129

Is approved in partial fulfilment of the
requirements for the degree of Master of
Design in Visual Communication.

Guide

Project Co-ordinator

Examiner.

My sincere thanks to my guide
Prof. M. Patel.

My thanks also to Sumant Rao, and all the others
from I.I.T., the Bombay Municipal Corporation
and the Bombay Natural History Society, who
helped make this article possible.

C O N T E N T S

INTRODUCTION

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THE ARTICLE

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I N T R O D U C T I O N

When environmental awareness first started, it was predicted that the world was headed towards doom. It was predicted that things could and would go drastically wrong if environmental abuse continued. What went wrong? Or rather what went right?

But the important thing today is that we are 'aware' of where we stand. Aware of what the future will hold for us if we continue at our present rate of earth - abuse.

In India, the trouble lies between our vast population and growing industrialization. Between the two the environment and ecology suffers.

For centuries mankind has used the water available to him in rivers, lakes and streams. It has

provided both food and drink, been used for recreation, energy, cooling, waste-disposal, etc., Man-made lakes and reserviors have been created, rivers dammed; water-courses altered, canals and equeducts constructed. Inevitably, the quantities of water available have affected what has been done with it. And, equally inevitably, human activities have been had their effects upon the waters.

INTRODUCTION TO
THE PROJECT

The project began in the form of a write-up on environment and ecology. It was to be purely textual without any visuals, in the form of an article with the possibility of being published in a newspaper.

The project was to be in stages - starting with the meanings of the words 'environment' and 'ecology'; then going on to it's scope in a broad world perspective, and then gradually going on to India, then Maharashtra and finally zeroing in on Bombay.

But as the initial stages of the project progressed, it was observed that doing an article with such a broad perspective would not produce anything new.

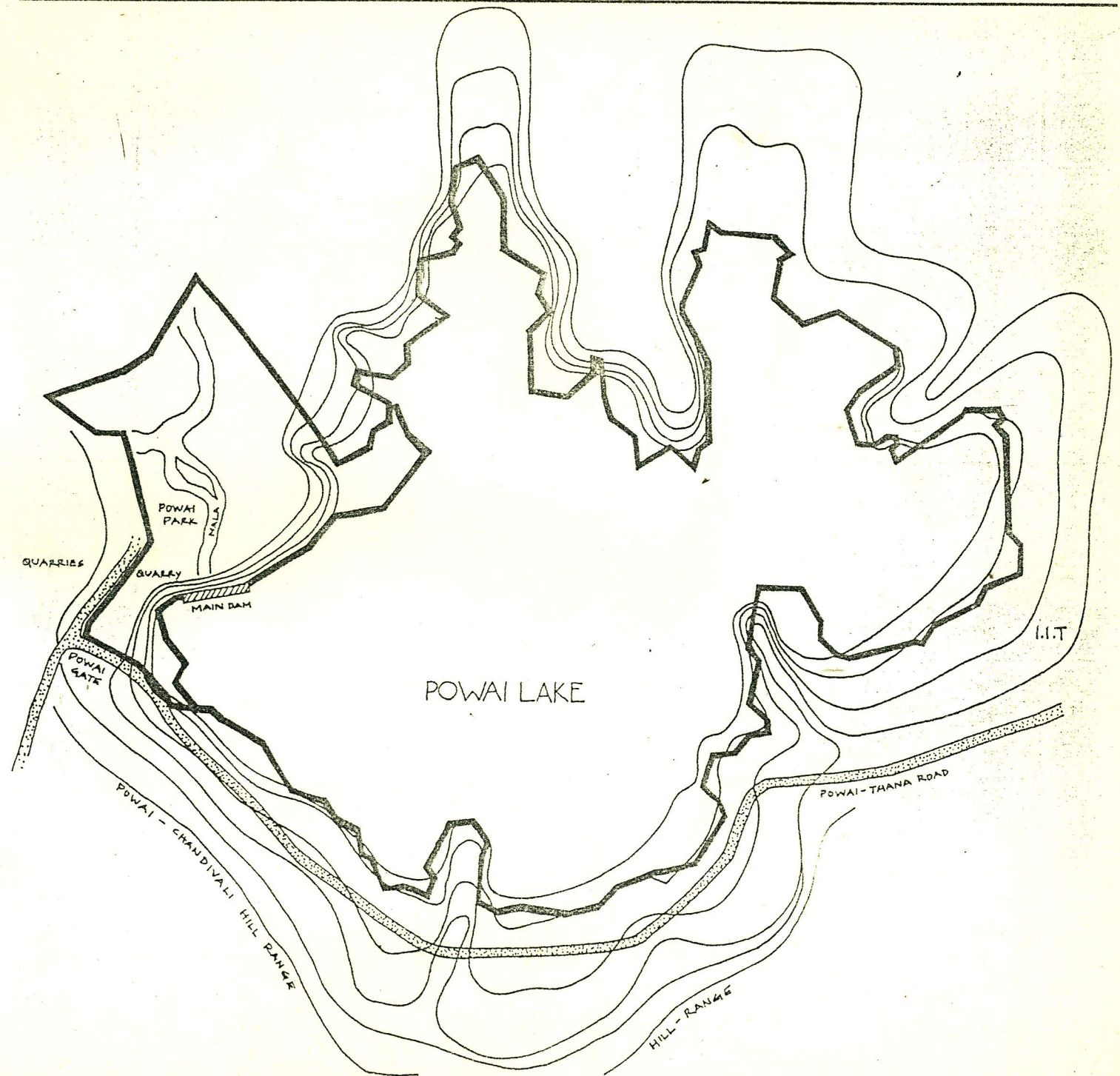
And so, it was suggested that the article be on the same theme, but on a subject which would be more relevant and informative.

Powai lake was chosen as the subject. The article would remain non-visual, except for a simple map of the lake and its surrounding areas.

THE PROJECT

The article on Powai lake speaks about the entire life of the lake - from its creation, till today. It contains a history and description of the lake, its present state of degeneration, why this has happened, who all are responsible, what has been done in the past to salvage the lake and what can be done in the future.

POWAI LAKE



POWAI LAKE

When Bombay started growing as a major commercial port in India, the Bombay Municipal Corporation (BMC), started creating a series of lakes, to provide water for the growing population. The first of the lakes to be made was Vihar in 1858. Then came Tulsi in 1879, and then Tansa. But before the Tansa lake could be completed, in 1889 the probability of a water - famine was so imminent, that the BMC commissioned the Powai Water Works Scheme as an auxiliary to Vihar. This consisted of the construction of a masonry dam to secure the water flowing from 1,700 acres of hilly land. And so, from the waters collected, came into being the lake - Powai.

It was completed in the year 1891, and is situated immediately to the south-east of Vihar lake. The lake is bordered by the Powai - Chandivali hill range. To it's east, covering a large area around the lake is the Indian Institute of Technology (IIT). On the western bank of the lake is the Powai Park and the Maharashtra Angling Association. Along the southern bank runs the Powai - Thana Road and to the north lies forested land.

But Powai lake, from the beginning was unlucky. To start with, it was too shallow to admit good water for domestic purposes. It also happened to be too low to permit a convenient flow to the city of Bombay. And so, on the completion of the Tansa works in 1892, just one year after it's creation, Powai lake was abandoned and has never been used since for potable or domestic purposes.

But the lake, left on it's own became the beauty spot of Bombay. The vegetation surrounding it was lush and green. Powai was in those days very sparsely inhabited, and the lake nestled in the unmarred Powai - Chandivali hill range. It was sellected as the habitat for fresh-water fish and was frequented by a variety of local as well as migratory birds, some migrating from as far as Central Asia and Eurpe. In 1937, the rights of fishing in the lake was sold to the Bombay Angling Association and Powai came to be known as the fisherman's paradise.

But this too was not to last for long. Slowly but surely, the lake was being trampled beyond recognition by man's infiltration. From the early 60's onwards, as the population kept on increasing in Powai, the condition of the lake became more

and more ^{worse} - till it has reached it's present state today.

Powai lake is desperately in need of help. Today it is also known as the dying lake. Though the condition of the lake has kept deteriorating from the 60's onwards, the damage has been accelerated in the past decade on so. And scientists have warned that if the abuse of the lake continues at it's present rate, it won't last for more than another two decades.

The two main offenders have been sewerage released into the lake, and silt-washed in from the surrounding denuded hills with the result that the lake now is shallow, with very polluted waters and sediment.

In the summer months, part of the lake dries up, with water remaining only in the central, slightly

deeper region. Each year, the lake gets smaller and smaller, with the banks receding at an alarming rate. The banks and the shallow parts of the lake have been over-run with two particular weeds - the water Hyacinth and Ipomea, which thrive in the lake and are doing their share of the job in killing it. While the ipomea, a tall shrubby weed, grabs more and more of the land immediately around the lake, the hyacinth grown in abundance floating on the shallow water along the banks. The water hyacinths in fact such a fast growing plant, that a single plant, given the right conditions, can spread over an area of 1 acre in just 8 months. Over 15% of the already dwindling surface of the lake is covered with Hyacinth. This weed, is a perfect breeding place for disease carrying mosquitoes, and so the place immediately surrounding the lake are mosquito-infested. The best

for
growing conditions⁷hyacinth are shallow and contaminated waters, so that the roots can draw nutrients from the lake bed. As part of it's nutrition, the weed absorbs large amounts of poisonous compounds of heavy metals like mercury, which then obviously are present in the lake. The weed, though posing a great threat to the lake's eco-system, is temporarily helping it by absorbing and storing these poisonous heavy metals from the water.

One of the most pressing dangers to the lake at present, is the state of it's water. Powai lake for years now has been used mercilessly as a dump for untreated sewage. Ironically, the biggest culprit is that temple of education, the I.I.T. When IIT was first established it used to release, treated water into the lake. Later, as the population in the institute kept growing, the capacity

of the treatment plant was not enough to treat the entire domestic sewage and so, partly treated sewage was released into the lake, till the equipment in the treatment plant finally broke down, from which time all the domestic sewage from the present population of IIT, goes wholly untreated into the lake. Domestic-sewage contains large amounts of phosphate - nitrate nutrients, which are ideal conditions for the growth of water hyacinth. It also appears, that the waste chemicals and other effluents from the various academic sections of IIT, are allowed to flow into the lake without pre-treatment. Though in itself, it may be small in quantity, it nevertheless does its share of the damage in the long run.

As micro-organisms begin to work on the organic-matter settling in the lake, oxygen levels in the

water get depleted, thus making it very difficult for fish and other water-life to breathe. This process is called Eutrophication.

Powai lake waters also contain metals and poisonous chemicals like lead, zinc, copper, cadmium, Nickel and Mercury, which is a result of atmospheric fall out from the vehicular emissions coming from the very heavy traffic on the Powai Region, and the burning of coal in Industries, of all the chemicals, mercury in the water seems to pose the greatest danger. It either falls directly on the lake through dust and wind, or is washed in during the rains through surface soil. Due to the very large amounts of organic materials in the lake (from domestic sewage), the mercury gets methylated and the resultant methylmercury is a dangerous compound which enters the food chain easily and

raises the

^ concentration of mercury in the chain, such as in fish, duck, kites, gulls, etc. Unfortunately, fish from the Powai lake is also consumed by humans, even though they have deteriorated a great deal in taste and flesh. Upon analysis it has been found that the fish contain large quantities of mercury.

The third contributor towards the deterioration of Powai lake, is silt, which has been steadily settling in very large quantities at the lake bed. The average rate of silting a few years ago was 2 cm. a year. Now it has risen to 10 cm. a year. The silt or top soil gets washed into the lake during the monsoon from the lake's catchment area. Most of this area around the lake is populated and thus large areas are without vegetation. A large quantity of the silt gets washed into the lake from the

Powai - Chandivali hill range bordering the lake, especially to the south, where extensive quarrying is carried out. Almost the entire range to the south has been denuded and cut up. The quarrying raises large amounts of dust into the air and has laid bare and exposed the hills. The lake also has many new building constructions coming around it, and the concrete rubble that get dumped near by also gets washed into the lake during the rains.

With each year's rain, the amount of silt collected in the lake bed keeps increasing. The lake now has become so shallow that each summer more and more of the lake dries up. On the other hand during the rain, the lake gets very easily flooded, sometimes even in just 2 showers. Many areas around the lake have been ^{denuded by poachers, hutment} dwellers who collect wood for fuel, and for building construction.

Since the lake's eco-system has been wrecked havoc with, the aquatic life and other wild-life depending on the lake have also been affected. Till the mid 70s, the lake used to be visited by hundreds of migratory water and land birds every year. Some of the more common water birds were ducks, wagtails, sandpipers, gulls and tern. But in recent years the number of birds, as well as variety of species has been steadily decreasing. 'Waders', which feed on the muddy banks have been deprived as the edges of the lake have been taken over by the ipomea and the hyacinth. Even large numbers of ducks have been a rare sight, as so little of the lake water remains uncovered by hyacinth, especially since the size of the lake keeps reducing each year. Now, at the most, coot and some species of resident water birds may be sighted. Also, the hyacinth has encroached on much of the breeding ground of the

crocodiles which inhabit the lake, and crocodile sightings too have become, rare over the past few years.

The lake waters, though not being used for domestic purposes are being used by the Aarey Milk Colony, Land T, the Powai gardens and two agricultural farms - Annapurna and Chandivali, for cleaning and agriculture. The lake is also used by the Maharashtra Angling Association and the Boat Club.

Despite all the damage being done to the lake, there are people genuinely concerned about it, ironically most from IIT itself, amongst the IIT wildlife club, students, faculty, staff and some independent individuals.

The IIT wild-life club and many others from the institute have made modest but sincere attempts in the past to help salvage the lake, in whatever

little way. In 1983, the club had organized an operation to manually remove some of the hyacinth from the lake. One section of the lake called Duck bay, was cleared to help attract migratory birds. Unfortunately within a short period, the weeds grew back. A second attempts was made by the club in 1986 to clear out the hyacinth through the techniques of bio-control, by introducing weevils, a kind of insect which feeds only on water hyacinth. The insects have spread through out the lake, and their feeding marks can be seen on the plants, but no perceptible change in the amount of hyacinth can be seen. This is perhaps because the amount of silt and pollu-tants pouring into the lake have not been checked.

It must be said here, that though the lake falls under the jurisdiction of the BMC, it has done

little by way of an attempt to save the lake. A few years ago, a seminar was held on I.I.T. on the subject of Powai lake. Those present were the BMC, authorities from the administration in IIT, the wild life club, and others. The lake and its problem were discussed in detail and those in authority made some promises, few of which were fulfilled. Till today, the lake remains undredged, the weeds uncleared and the IIT sewage treatment plant unrenovated. The faculty members of the CESE in IIT proposed a plan incorporating short and long term actions to save the lake. The responsibility was divided amongst the wild life club/ concerned students, the IIT administration and the BMC. Unfortunately the plan was not followed up immediately.

But now again there seems to be some hope for the lake. In the past few years, as the danger to the lake has increased, so has the pressure on the administration and the BMC, to save it. And the next 2-3 years are crucial. Already, on parts of the two small hills in IIT, next to the lake, the club and some other students have taken to tree planting in a serious way. The BMC, finally has plans to start dredging and de-weeding the lake definitely by next year. The IIT administration for its part too has laid out plans. The sewage treatment plant will be renovated ~~enriched~~ and put into effect before this year is out. The BMC is laying a major sewage pipe-line near by, and on its completion, part of the sewage from IIT will be shunted to it. IIT now plans to go a step further and not let any of the treated waste-water into the lake. Instead it will be used for gardening

on campus. Now, IIT administration too wants to cover up the 2 hills in IIT, with trees, by collaborating with the Sanjay Gandhi National Park which adjoins IIT Campus.

On a long term basis, there are a number of steps which would also be taken in future. To start with creating an awareness programme on the lake and the environment around it. Also, some departments in IIT which have the equipment and means, could carry out regular water and sediment sample studies from the lake, to keep a track on the lake's condition, to check further damage and find solutions. Some among the faculty feel the problem should be taken into the class room or included in the curriculum as an excellent 'practical' to all the theory on the environment, etc.

The fact, that emerges clearly from all that we now know of Powai lake, is that the first thing that can save it is taking the initiative on a war-footing - by the student, the administration and the BMC, each group putting in it's own share, within it's priorities and power. The answer then, to the lakes survival lies on 3 main things. The 2 most important being dredging, deweeding the lake, and, renovating the treatment plant so that no more untreated sewage is spewed into the lake from IIT. And lastly, but equally important is land treatment - the extensive planting of tree's and vegetation all around the lake as far as practically possible, to check siltation.

If nothing is done now, as the years go by, and population and pressures on Powai increase, demands on the lake waters and the surrounding environment

will increase too.

It nothing is done 'now', Powai lake will die.

REFERENCES

All the matter in this article has been got from previous writings, reports, the wild-life club file on Powai lake, BMC reports and from conversations with various members of the faculty and students of I.I.T. and library at BNHS.

BOMBAY MAGAZINE

- July 22 - Aug 6 1985

SCAVENGER MAGAZINE

- July - Oct 1988

A STUDY ON ENHANCED LEVEL OF LEAD, COPPER CADMIUM
IN SOIL AND GRASS DUE TO VEHICULAR EMISSION ALONG
POWAI ROAD.

(a student project report)

- Ranjini Warriar

Wild-life club file on Powai lake.

Bombay Municipal Corporation Reports.

BOMBAY GAZETEER

- BNHS.

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