PREVENTIVE ENVIRONMENTAL MANAGEMENT PLAN FOR ECO-FRIENDLY GANPATI FESTIVAL

It is well known that immersion of Ganesh, Gauri, Saraswati, and Durga idols as well as immersion of decorations on these idols and immersion of flowers and puja offerings into various water courses including streams, rivers, nullahs, creeks, ponds, lakes, and dug wells have great environmental and ecological implications. Before suggesting the measures to minimize or eliminate undesirable environmental and ecological implications; it is important to state clearly that it is recognized by the author of this technical paper that the Ganesh festival and many other festivals including Saraswati and Durga pujas and Navratri festivals have served extremely useful social and cultural functions in our country. While all efforts should be made to improve and enhance the educational, social, and cultural aspects of these festivals; one can indeed make sincere efforts to minimize the impact on environment and ecology.

Our approach, therefore, draws from the honest desires and efforts of the municipal corporators, Ganesh Mandals, community leaders, citizens' groups and all the government agencies entrusted with protection and improvement of wholesomeness of our watercourses and natural environment around us. The approach presented in this paper combines technological and social measures with desires of the entire community to improve upon the prevailing immersion practices and achieve the so-called "eco-friendly Ganesh festival".

Ganpati idol immersion and the corresponding environmental and ecological problems can be addressed by answering following three questions:

(a) What could be the eco-friendly material for construction of Ganpati idols?

(b) What could be the eco-friendly paints and decoration for Ganpati idols? and

(c) What could be the eco-friendly management practices for immersion of Ganpati idols?

It must be recognized that these three questions are related to each other and in fact cannot be answered in isolation. However, on yet another plane, the above three questions are independent. Thus, these three questions will have to be thought

through in an integrated manner and answered categorically. There have been several excellent experiments and creative solutions proposed and practiced by several municipalities and communities all over the State of Maharashtra. A lot has been talked about the effectiveness of those measures and what prompted communities and local self governments to support certain measures. Taking a rigorous stock of all those past efforts and analyses, an attempt has been made here to establish a more open framework to solving this problem through the so-called "out-of-box thinking".

ECO-FRIENDLY IDOLS

We have studied primarily the four materials of construction, namely: plaster of Paris (POP), shadoo clay, newspaper pulp, and silt from the Powai Lake. Each idol was placed in an aquarium-like glass tank having 60 to 80 liters water. The idea was to observe disintegration of idols in quiet undisturbed waters as well as to test water samples from the experimental tanks. In addition, field expedition was conducted and water and sediment samples were collected from the creeks around Mumbai-Thane region to identify organic and inorganic pollutants including heavy metals generated from paint and decoration of the idols. Also, we obtained the colour and pigment samples from various idol manufacturers and studied their constituents to focus our attention on the most probable heavy metals.

The results were revealing as expected. The POP idols remained intact in the water tanks for several months! Not only did the idols remain unaffected, but even the layers of paint on their surfaces remained fairly unaffected. After few weeks, the chips of paint got separated from the POP surfaces and accumulated at the bottom of tanks. The thicker cross sections of idols remained reasonably strong but ornaments and thinner sections like fingers, teeth, and ears became brittle and could get broken after application of gentle force. Clearly, the POP idols must be getting disintegrated in creeks or rivers or in the coastal marine environment due to water waves and surface-water turbulence generated by wind-action. The tidal motion of water in estuarine environments (creek) must also be helping in disintegrating idols. Except for the under-water motion imparted by movement of fishes and marine animals; water must be remaining quiet in most of the lakes, ponds and dug wells. May be the idols remain intact in such quiet waters.

The idol made from paper mash (newspaper pulp), once placed in the water tank, became soggy rather quickly and lost structural strength to stay upright within an hour. In the next three hours all the paper layers and pulp sank to the bottom and created a layered pile. Interestingly enough, all the painting on the idol was retained by the layers in the pile and the pile remained intact for two weeks in the quiet waters of the experimental tank.

The idol made from the sediment of the Powai Lake, however, disintegrated relatively more easily because it became soft and delicate after getting swollen in the water environment and disintegrated completely while forming a layer of sediment in the entire tank.

It was quite interesting to observe the idol made from shadoo clay after placing it in laboratory water tank. Thinner sections of the idol (fingers, teeth, ears, *etc.*) absorbed water quickly and the clay started becoming wet in minutes. The wet portions fell from the idol surfaces due to micro-explosions created by swelling. Thus, disintegration of shadoo clay idol was by far the quickest – just in 45 minutes!

It can be argued that the idols made from shadoo clay could prove to be relatively less damaging than the plaster of Paris idols from the point of view of natural aquatic ecosystems because POP, a relatively unfamiliar material and an intruder in the aquatic eco-system, is hard to dissolve and disintegrate when compared with shadoo clay. The sulfate content of POP is indeed dangerous for the water body. Fishes and other aquatic life have to deal with the fragments of un-dissolved POP and polluting properties of dissolved POP for several days and weeks at the bottom of the water body. It is true that the shadoo clay also is not an integral part of a natural water body. However, it is probably less harmful when compared with POP. The paper mash (newspaper pulp) is an organic substance that can be biodegraded by micro-organisms present in natural waters and sediments. As a result, it is capable of creating anaerobic or anoxic environments in water bodies and the dissolved oxygen could go to dangerously low levels in the water body causing fish kill.

ECO-FRIENDLY PAINTS AND DECORATION

Paints, pigments, solvents used for painting Ganesh idols as well as ornaments and decoration materials (including paper, thermocol, and plastics) pose a great challenge

for environmental and ecological management owing to the presence of toxic heavy metals and other inorganic and organic pollutants in these substances. Nowadays, heavy metals are also called as 'trace metals' because normally they are toxic to humans and other living forms, even in extremely small doses. Their safe levels in natural environment are reported in literature in the unit of ppb - parts per billion, which is 1000^{th} part of 1 milligram per liter of water. Sometimes the permissible levels of these toxic metals are reported as one millionth part of a milligram in one liter of water *i.e.* ppt – parts per trillion!

Cycling of these toxic trace metals in nature generates long term impact on all living creatures dependent on the given natural ecosystem. Any natural body of water has disintegrating biomass resulting from the habitat of insects, micro-organisms as well as micro-plants present in the ecosystem. This disintegration process gives rise to the so-called 'natural organic carbon' which has the ability to react with the trace metals present in the water body. Such organo-metallic complexes accelerate transportation and mobilization of toxic trace metals in natural ecosystems. Therefore, it is extremely dangerous to allow toxic trace metals to enter natural ecosystems!

The toxic organo-metallic complexes formed in natural environment are capable of entering cell walls of micro-organisms or micro-plants. These poisoned cells are consumed by small fishes that are further consumed by larger fishes and other aquatic species through the complex food-chain. Thus, the toxic metal and other toxins get accumulated in exponential proportions in large fishes. This process is called as 'biomagnification'. The fats and lipids in fishes as well as the animals and humans consuming the fishes partition the toxic metals, thus, affecting foetuses, brains and tissues in humans. Thus, the only way to save human beings and fishes from toxic metals and other toxins is to stop all the pollution including immersion of Ganpati idols from reaching our lakes, ponds, rivers, nullahs, coasts and creeks.

Now the question is how do we decide what colours, pigments, paints and decoration are eco-friendly? If a small number of idols are going to be immersed in the lakes or rivers or dug wells; probably the natural eco-system will be able to sustain without any noteworthy impact. However, in our cities and towns, we immerse thousands and lakhs of idols every year in every festival. As a result, the pollution caused by them is also equally huge! Therefore, it is impossible to prescribe a "safe limit" for number of idols that can be permitted to be immersed in natural water bodies without damaging the

ecosystem. It is neither practical nor implementable in real life situation. Thus, it appears that forbidding the disposal of painted idols, ornaments, and decoration is the only sure way of protecting our water bodies.

NGO's and citizens working on eco-friendly alternatives seem to suggest that the idols made from shadoo clay or lake silt and decorated with natural substances including haldi, kumkum, gulal, sindur, abir, bukka, rice flour and different grains may be safe for immersion in natural water bodies. We disagree with that position because the amounts of natural organic and inorganic substances entering water bodies would be so high that, there will be a great danger of bio-degradation of those substances in water body and there would be fish kills due to depletion of dissolved oxygen in water.

In addition, it should be remembered that all natural water systems are filled with silt and sediment all over the State of Maharashtra. It has happened primarily due to depletion of top soil by brick kilns, deforestation for building houses or agriculture in peri-urban areas as well as quarrying on the outskirts of the cities. There is a great need for initiating appropriate measures to arrest siltation at all levels of urban management so that this situation can be reversed. In such situation, how can one allow to deposit idols made from shadoo clay or sediment into lakes and ponds?

ECO-FRIENDLY MANAGEMENT OF IDOL IMMERSION

The modern techniques of preventive environmental management (PEM) clearly demonstrate that creation of pollution and then treating it with the help of treatment plants by consuming chemicals and power makes no sense. Instead, efforts should be made to eliminate or minimize the pollution to start with. Avoiding immersion of idols made from any material of construction and preventing the natural water bodies from receiving pigments, paints and decorative materials can by far be the only defendable strategy! Thus, the communities and local self governments will have to manage idol immersion and disposal of decoration materials and puja offering in non-traditional ways. Following six strategies may be seriously considered:

1. As far as possible, one village - one Ganpati, one housing society - one Ganpati, one group of housing societies - one Ganpati and if possible one suburb - one Ganpati should be accepted as the principle by the community. Heights of idols should be restricted by Ganesh Mandals and the race for tallest idol and

decoration should be stopped. Efforts should be made to use idols made from shadoo clay or sediment from rivers or lakes rather than plaster of Paris. The programmes of Ganesh Mandals should be concluded before the prescribed time limit every evening and specific efforts should be made to curb noise pollution, dust pollution during programs and processions. The risk caused by open fires, explosion of fire-crackers, and unsafe structures of pandals should be minimized. Similar efforts should also be made for household Ganpati celebrations and pollution caused by fire-crackers as well as lighting should be minimized.

2. Efforts should be made by Ganpati Mandals as well as house holds to avoid immersion of Ganpati idols into water bodies. In fact, communities and families can perform dry immersion every year. It can be performed in empty pots and trays by sprinkling few drops of water and idols may be wiped and stored for reuse in the following years. If every Ganesh Mandal and family reinstitutes the same idol for five years, the pollution caused will be reduced five times!

3. If idol immersion every year is considered unavoidable, it would be best to worship idols made from shadoo clay or soil from farm (even soil used for potting) or sediments from lakes or rivers. Worshiping smallest possible idols preferably without paints and pigments and disposing them into plant pots, gardens or farms would truly help preserving environment.

4. Inspite of all the efforts suggested above, Ganpati idols will continue to accumulate every year for immersion in large numbers. If the community accepts dry immersion and disposal of such idols, the problem of pollution into water bodies can be solved more economically and easily. For example, all the idols received for public immersion could be received in dry (empty) cement or earthen tanks created adjoining lakes, rivers, beaches. Even the gardens, community halls or school premises may be used to receive such idols. All the collected idols may be crushed and the powdered material can be gainfully used to create bricks, tiles and alternate building materials. Such non-traditional solutions will be accepted by the communities after serious efforts of awareness and education.

5. For the communities that are not ready for dry immersion, the municipal authorities will have to construct concrete or earthen tanks lined with HDPE

polymeric sheets (two layers) to avoid seepage of contaminated water. Such man-made ponds (or tanks) can be constructed adjoining lakes, rivers, beaches. Even the gardens, community halls or school premises may be used to construct such tanks. Either rain water may be harvested into these tanks or water may be pumped from nearby sources into such tanks. After idol immersion into the tanks, the water may be pumped out into tankers and sent for treatment and disposal to nearby paints factory. The sediment at the bottom of tank may be gainfully used to create bricks, tiles and alternate building materials. Once the tanks are made empty, the polymeric liner can be rolled and folded away and stored for use in following years. The dug out material (soil and murum) then can be refilled in the tank pits and leveled. Thus, there would be no need to create any permanent structure for idol immersion and the entire activity of immersion can be isolated from water body.

6. The above mentioned suggestion can be successfully implemented in villages and towns as well. One of the difficulties could be absence of facility for treatment of the wastewater or sediment in the tank. This need can be eliminated by allowing water to evaporate and disposing the bottom sludge after immobilization of heavy metals and other pollutants in it.

In summary, preventing the natural water bodies from receiving any man-made pollution and forbidding the disposal of painted idols (irrespective of the materials they are made from), ornaments, decoration as well as puja flowers and offerings are the only sure and defendable ways of protecting our water bodies. The six strategies suggested above are strongly recommended for implementation. It is recognized that implementation of all these strategies in coming Ganesh or Durga festivals may not be possible in entirety. However, it may be useful to take steps and start the reforms this year and make efforts to also publicize the measures by educating all stakeholders in the government and community. The journey of thousand miles always starts by taking one step in the right direction.

<u>For further information</u>:

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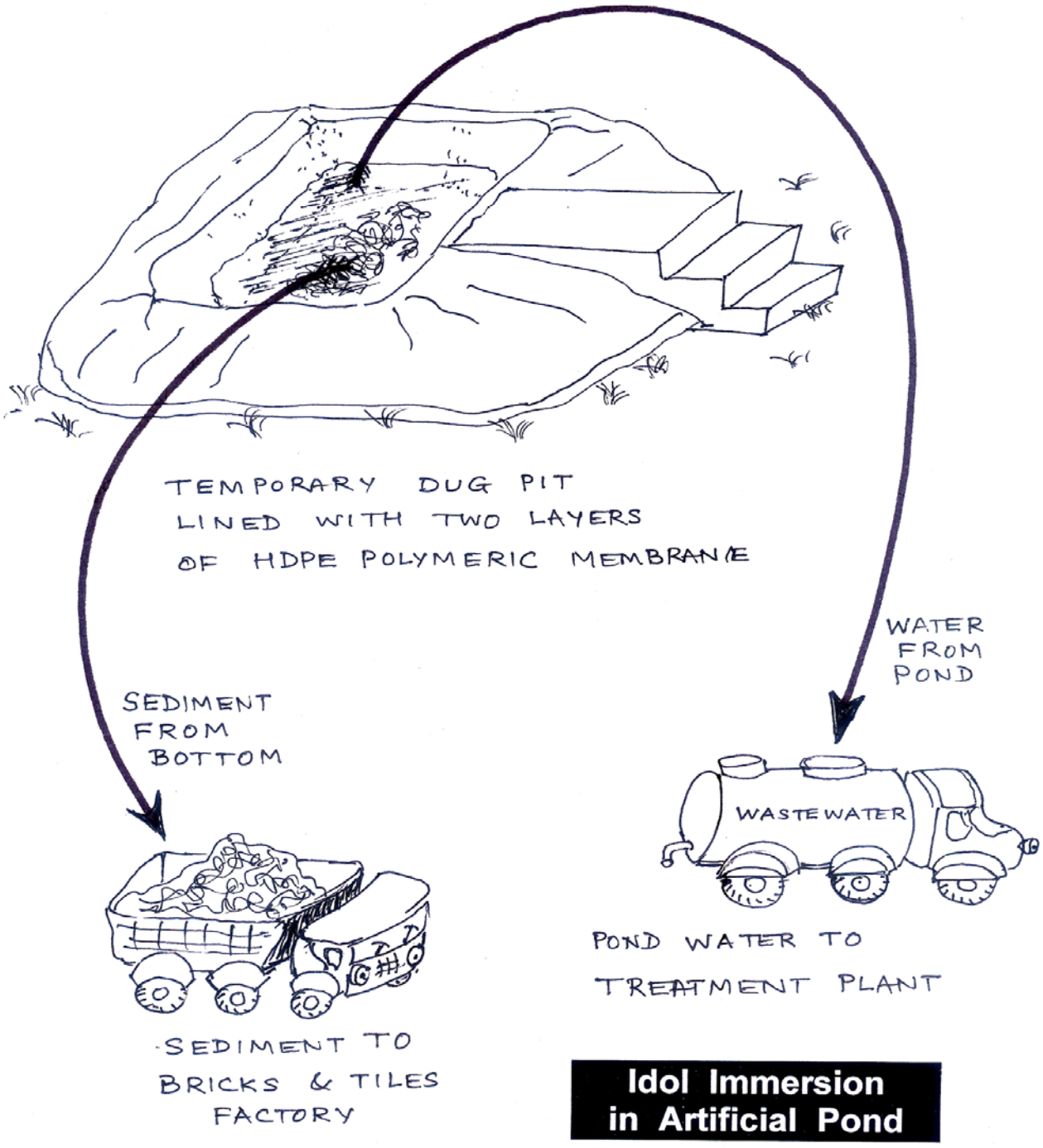
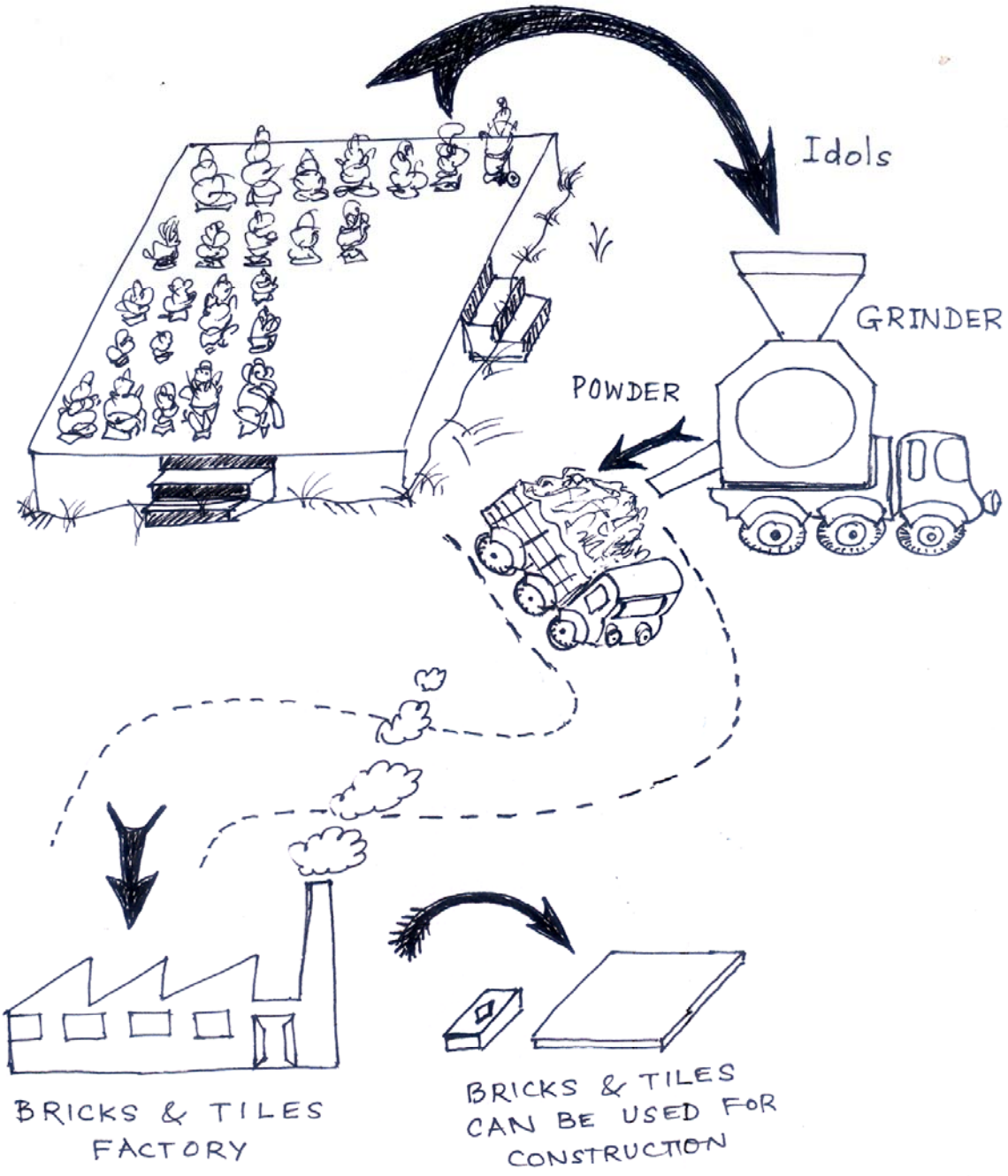

TEMPORARY DUG PIT
LINED WITH TWO LAYERS
OF HDPE POLYMERIC MEMBRANE
WATER FROM POND
SEDIMENT FROM BOTTOM
WASTEWATER
POND WATER TO TREATMENT PLANT
SEDIMENT TO BRICKS & TILES FACTORY
Idol Immersion in Artificial Pond



Dry Immersion Resulting in Zero Emissions