Techno Economic Feasibility Study of SANITATION AND SEWAGE MANAGEMENT FOR PANDHARPUR TOWN

Maharashtra Pollution Control Board
महाराष्ट्र प्रदूषण नियंत्रण मंडळ

by Ecosan Services Foundation

in consortium with seecon international gmbh supported by GTZ

ECOSAN SERVICES FOUNDATION

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"स्वच्छ पंढरपूर
निर्मळ चंद्रभागा" ||

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MAHARASHTRA POLLUTION CONTROL BOARD

Preface

Pandharpur town – a prosperous 'B' class Municipal Council in Solapur district – is famous for ancient temple of Lord Vitthal and has become one of the most important pilgrimage towns in India. Millions of devotees *`warkari`s'* take great efforts to visit the town. Annually about 1.5 crore devotes visit Pandharpur. Maximum pilgrims visit Pandharpur during four wari periods whereas daily visitors' influx exceeds 20'000 per day.

The counter side of the large inflows of the pilgrims is the alarming local sanitary and hygienic conditions originated by the sheer amount of activities of devotees mostly due to inadequate facilities and management failure. Major areas of concern for Pollution Control Board are polluted river, high dust suspension containing pathogens, indiscriminate & unscientific collection, treatment & disposal of Sewage & Solid waste in the town & adjoining areas particularly at the places of halt *(palkhi tal)* including the river bed *(walwant)*. – in short the overall hygienic and ecological situation is turning the darshan in a rather stressful than pleasant experience.

The Maharashtra Pollution Control Board (MPCB) has taken up the issue of improving the situation by initiating the Programme called **"Environmental Improvement Programme at Religious Places in Maharashtra"** in which Pandharpur has been selected as one of the places of the programme. On the basis of a primary rapid assessment of the issue, by MPCB team under the leadership of Dr. Supate, Project Leader, we decided to conduct the in depth study of the issues though M/s. Ecosan Services Foundation (ESF), Pune, and has been assigned task to prepare **"Techno Economic Feasibility Study for the Sanitation and Sewage Management for Pandharpur and the adjoining areas".**

The study is considered essential in the planning of the future devolvement of Pandharpur as a town as well as important pilgrimage place.

The study aims at improving the sanitary situation by offering a sufficient and properly maintained number of sanitary facilities alongside with an effective and sustainable treatment of the wastewater. In order to achieve the objectives the overall management of the pilgrims has to be addressed, such as to decongest the core area of the city, to offer

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adequate staying facilities, decentralizing the pilgrims and the according businesses and waste production – hence actually breaking down the challenge into more controllable units.

The participatory approach with the stakeholders and future beneficiaries of the outlined strategy, especially the Pandharpur Municipal Council and its staff and other local stakeholder representatives have enabled the Team and Partners of Ecosan Services Foundation to carry out the present study, taking into consideration all the essential facts, figures and numbers that shall lead the way to the bright future of Pandharpur Town.

The project findings are being forwarded to the concerned stake holders for further implementation. MPCB is keen to ensure that the projects proposed are implemented in time bound & systematic manner.

I wish to mention the gratitudes to Mr. A.K.Jain, Principle Secretary, Water Supply and Sanitation Department, GoM and Mrs. Valsa Nair Singh, Secretary, Environment Department, GoM & Chairperson, MPCB for their continuous guidance for the project and for their interest and support.

I take the opportunity to congratulate M/s. Ecosan team for having done the wonderful job. I also congratulate Dr. Supate, Project Leader, MPCB for his consistent & rigorous efforts to complete the task in time & for ensuring the usefulness of findings. I also congratulate Mr. Chitale, CO, PMC, Mr. Palande, SDO, Pandharpur & Ms. Palande, E.E., MJP, Solapur for their support & achievements.

Real test will be to ensure the implementation of the plan. Let us all strive to achieve the desired objectives.

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Preface GTZ

Rural and Urban water issues have been addressed by Indo-German development cooperation for several decades and along with sustainable development in general, it can be considered one of the oldest topics covered.

Indo-German joint activities focus on the sustainable management of water resources with due consideration of social and institutional issues. However, the initial rural and urban water programmes had little in common with contemporary challenges, which address the topic "sustainable sanitation" in the context of rapid urbanisation and increased pressure on environmental resources in a holistic way. Today provision of sustainable sanitation is identified as a key-driver for economic development and sustainable development in general. In recent years this has become more and more clear around the globe and had led the UN General Assembly to declare 2008 as the "International Year of Sanitation (IYS)".

The achievement of the Sanitation Millennium Development Goals (MDGs) is one of the major challenges for sustainable development in the next decade. To address this task, business as usual is not enough: we need a paradigm shift towards a holistic view on sustainable sanitation! The GTZ-ASEM-programme, India, and the GTZ-ecosan-programme, Germany, are supporting sustainable approaches to sanitation in India on different levels and with different partners.

ESF (the Ecosan Service Foundation, Pune) is e.g. a focal partner in the Project "Capacity Building for sustainable sanitation in India by setting up a training center (ecosan learning laboratory) for training of local ecosan experts" implemented under the GTZ public private partnership facility.

We are happy to see, that ESF has produced with this "Techno Economic Feasibility Study of Sanitation and Sewage Management for Pandharpur Town" an outstanding example of how we can address sanitation for a whole city in a modern and innovative way. May this study show us the way, how accelerated implementation and large scale role-out of innovative and people driven sustainable sanitation projects can be put into practice on city level in many future projects around the globe!

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GTZ ecosan Programme,
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Executive Summary

1 Introduction

Maharashtra Pollution Control Board contracted Ecosan Services Foundation, Pune to conduct the "Techno-economic feasibility study of sanitation and sewage management for Pandharpur Town" as per Work Order No. MPCB/ZA/EIP/P'Pur/WO/78/08 of 02nd June 2008.

Pandharpur is one of the most prominent pilgrimage sites in Maharashtra. It is located on the banks of the Bhima River, which is alternatively known as Chandrabhaga because of its half-moon-like shape. The town received its name after a merchant, Pandarika who achieved self-realization there. Pandharpur, alternately known as Pandhari, hosts the renowned Vitthal temple on the banks of Bhima. "Vithoba", "Pandurang", and "Pandharinath" are the popular alternate names of the deity, Vitthal, who is regarded in Hinduism as a God form of Lord Krishna, who, in turn, is considered as an incarnation of Lord Vishnu. Rakhumai or Rukmini is Vitthal's consort in Hinduism.

The pilgrims visit all round the year, and during the special occasions of fortnightly full moon days (ekadashi), their numbers are high. The pilgrims come in large numbers on occasions of the ekadashis during the 4 months of the Marathi calendar; Chaitra, Aashadh, Kartik and Maghi. Table 3 provides details on the occurrence of the different festivals and different estimates on the number of visitors on a normal day, on the full moon days and in the 4 special months. Different references have provided different number of pilgrims and accordingly, the table below provides the details from all the references.

Table: Different assumptions on the floating population of Pandharpur Town

Factor	**Daily visitors**	**Religious gatherings**				
		Fortnightly	Maghi	Chaitri	Ashadhi	Kartiki
Period	**daily**	**monthly**	**Jan-Feb**	**Mar-Apr**	**Jul-Aug**	**Oct-Nov**
Duration	1 day	1 day	10 days	10 days	15 days	15 days
Visitors	10,000-30,000	40,000-1.5 lakh	3 lakh – 5 lakh	3 lakh – 5 lakh	10 lakh – 15 lakh	5 lakh – 10 lakh

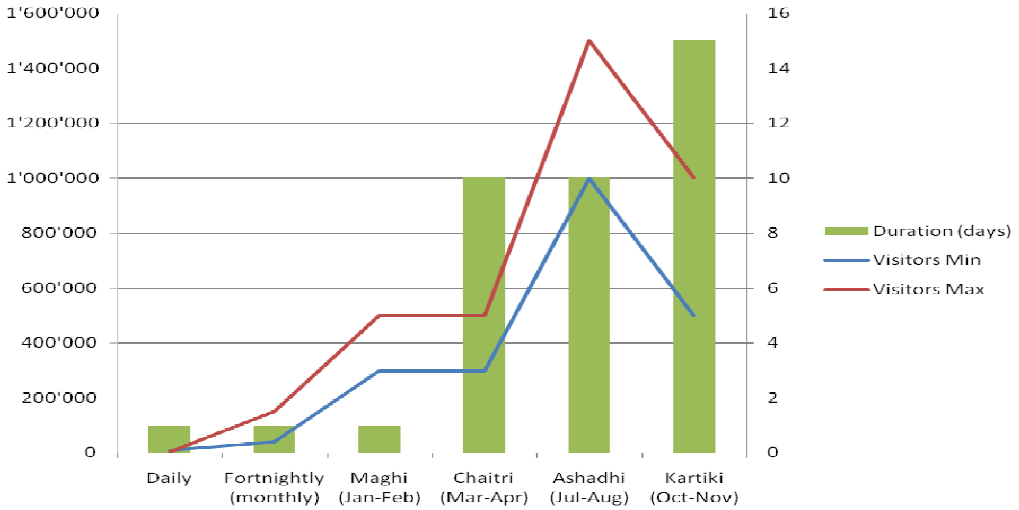


Figure: Number of visitors of Pandharpur in various periods of the year and the average of the duration of their stay.

1.1 *Sanitation scenario*

Several problems create unsatisfactory sanitary conditions in Pandharpur, particularly during waris, endangering public health and degrading the environment. A variety of sanitation facilities exist in Pandharpur, and evidently the overall number is not sufficient to serve the pilgrims. The condition of many of the toilets is poor and unhygienic. The data from the different reports presented in the table below.

Table: Overview of existing sanitation facilities in Pandharpur

Type of facility	**No. of toilets**	**No. of urinals**
	Male + female	**Male + female**
Private toilets connected to sewerage	8,232	–
Toilets connected to septic tanks	589	–
'Latrine per house scheme'	768	–
Total private facilities	**9,600**	–
Community toilets	346	?
Sulabh toilets	293	?
Maths' toilets	715	?
Railway station	40	10
Valmiki awas	30	?
Darshan Mahadab	74	?

Temporary toilets	1,000 + 300[a]	?
Urinals	–	188
Total shared facilities	**2,498 + 300[a]**	**188**

[a] Does not refer to female toilets but to additional toilets provided during Ashadhi

Open sewers represent an obvious health hazard and an unpleasant odour nuisance. Besides attracting mosquito breeding, the open gutters are in many places, predominantly in slum areas, very shallow and located in front of inhabitant's house. Hence, direct contact with wastewater is possible and is of particular concern in the case of children playing. Furthermore, the trenches are prone to overflow during Monsoon, increasing the likelihood for spread of pathogens.

The entire waste water treatment system suffers from poor O&M (operation and maintenance), dysfunctional aerators, grit chamber etc. During a site visit, it was explained that there is no outlet for the sludge deposited in the aeration tank. The sludge drying beds are also out of use. A major problem is that the sump and pump station has a limited pumping capacity of 0.8 ML per hour, whereas during morning peak time some 1.2 ML per hour is generated. Moreover, while the peak period is between 4–9 am, due to the electricity load shedding scheme there is no electricity available between 6 a.m. and 1 p.m., leading overflows directly to Bhima River through Gopalpur Nala. It was estimated that out of 12 MLD of wastewater 3–3.5 MLD is being treated. An additional problem is that the pump house is also located in the flood-prone area.

2 Guiding principles and approach towards sanitation strategy

The Bellagio Principles are a practical set of guidelines for the development and use of sustainable development indicators, and these principles deal with assessing progress toward sustainable development.

1. Human dignity, quality of life and environmental security should be at the centre of the new approach, to suit needs and demands in the local settings.
2. In line with good governance priniciples, decision-making should involve participation of all stakeholders, especially the consumers.
3. **Waste** should be **considered as a resource** and its management should be holistic and form part of integrated water resources, nutrient flows and waste management processes.
4. **Waste** should be **managed as close** as possible **to its source**.
5. **Water** should be **minimally** used **to transport waste**.
6. **Additional technologies** for waste sanitization and reuse should be developed.

In specific, the approach to developing a sustainable sanitation strategy included focused efforts in the following:

1. Understand the **pilgrim demand**, with their socio-cultural requirements
2. Approach to solutions **focusing at resident** population **as well as floating** population
3. Creation of sanitation **facilities** and sewage management facilities with ease of **O&M and reuse** options from PMC`s perspective
4. **De-congestion of sanitation facilities**
5. **Management of pilgrim`s demands**
6. **Innovative** approaches & best sustainable practices

Thus, this executive summary describes the strategies adopted to achieve a sustainable sanitation system for Pandharpur town, and meeting the prescribed objectives of **Clean Pandharpur – Clean Chandrabhaga** vision.

The previous chapters have shown that the situation in Pandharpur, its religious importance and the linked consequences have put a lot of stress on the local conditions. The need of action is undeniable and the measures should be taken as soon as possible.

3 Holistic Approach

Besides providing technological solutions to overcome the sanitary and wastewater related problems, there are many other aspects that are to be considered in order to ameliorate the situation for pilgrims and permanent residents. Technical options are only as good as their success and acceptance by the users and as their continuous smooth operation.

The search for an adequate technological solution should therefore follow a holistic approach and respect and integrate the character of the local conditions which include the basic infrastructure and geographical particularities of the project location (e.g. sewer lines, contour lines) as well as specific data concerning the end-users (wastewater production, common habits). The reciprocal interrelations of these elements – in this case mainly the profile of the typical pilgrim, the status of the sanitary facilities and sewer systems and religious believes - have created the situation we can find in Pandharpur today. If a change shall be effected, then all influencing elements should be considered.

3.1 *Initial Stakeholder Identification*

The following actors have been identified as stakeholder groups which are likely to be affected by the project or those that may affect its outcome, either directly or indirectly:

A. Direct beneficiaries:

i. **General town residents**: They constitute the fixed population of Pandharpur town, and would benefit from clean roads, river banks, water bodies and a healthier environment

ii. **Daily visitors and pilgrims:** The daily travellers will benefit from clean environment and water bodies as better places to relax at, since they are travelling for a day and do not stay in maths or hotels

iii. **Villagers living downstream**

Clean river water will definitely benefit the downstream habitants and can indirectly reduce costs for drinking water treatment

B. Other possible beneficiaries:

Farmers: As sewage farming is common practice in Pandharpur, the farmers can benefit from using treated wastewater instead of untreated sewage. Sludge can be used as soil conditioner.

C. Important and influential actors:

i. **Maths' trustees:** The math trustees can continue to benefit their resident pilgrims by offering better sanitation services and encouraging better sanitation practices

ii. **Temple trustees**

The temple trustees will benefit from better managed pilgrims, less stress and load in the temples and related benefits

D. Actors that may assist in operation/management:

NGOs, self help groups, rag pickers association, social activists

E. Local authorities:

i. **PMC:** PMC is responsible for sanitation and sewage services and this will directly benefit them by institutionalising the approach with better management.

ii. **Panchayat Samiti:** The pilgrims staying in Takli, Wakhri and Gopalpur will be better serviced by Panchayat Samiti

iii. **Other bodies** as Irrigation Department, MJP, Solapur District Authority

F. State authorities: MPCB, Government of Maharashtra

3.1.1 **Assessing stakeholders' Stance**

Plate: ESF team member interviews pilgrims in a math

Assessing the opinion of stake-holders, their understanding of the situation and their willingness to contribute is invaluable to the success of any solution. It is however not an easy task considering the variety of stakeholders and their large number. The opinions of the different authorities concerned, MPCB and PMC as well as different private consultants hired to suggest beautification plans (Shrishtri Eco Research Institute and Archivista Engineering Projects Ltd.) has been discussed in several meetings together with the project team.

On 2nd December 2008, the first stakeholder meeting was conducted in Pune with representatives from PMC and MPCB was conducted. This meeting was focussed at sharing the present status of the study and aimed at collecting key information from the different stakeholders.

On 13th January 2009, the second stakeholder meeting was conducted with representatives from Maths, Temple trustees, PMC officials and other influential persons. This meeting was conducted to discuss the project in Pandharpur and their involvement in the same. The meeting discussed various important issues of management which would influence the sanitation scenario.

Pilgrims and math trustees/managers were approached mostly through surveys and partly by unofficial interviews.

In total 123 out of 372 registered maths were surveyed during the second ekadashi of September (25th – 29th September 2008) and 150 pilgrims surveyed during the recent Kartiki (7th – 14th November 2008). All interviews were conducted in Marathi and recorded in English on spreadsheet for the analysis. The questionnaires used can be seen in Annexure V. Proposals on how to involve and integrate various stakeholders are discussed later in this chapter.

3.2 *Findings of Survey and Interviews*

At the moment only initial findings are available as compilation and analysis of all the surveys is not yet complete. These findings will be validated and supplemented by the final results of the survey as soon as possible.

3.2.1 Findings of Math Survey

All answers of the maths have been aggregated and can be seen in the CD compilation “Collection of Surveys” enclosed to this report. The following results have been gathered so far:

A. 122 out 123 maths (one building is damaged and not in use) stated they accommodate up to 60,000 pilgrims at peak of Ashadhi

B. These 122 maths have 870 toilets and 107 urinals in total

C. 62 maths plan to build new facilities. From those who could mention exact numbers - 347 toilets, 67 urinals and 94 bathrooms in total are planned

D. Almost all respondents stated toilets have water, light and private sweeper for maintenance, but soap is not provided

E. 53 of the respondents have some expectations from PMC or the government, to improve sanitary services and water supply during wari

F. Almost all respondents mentioned different forms of religious teachings (kirtan, pravachan, haripath, bhajan) as their possible contribution to educate pilgrims on sanitation

3.2.2 **Findings of Pilgrim Survey**

The following initial findings have been observed:

A. Many of the pilgrims use toilets at home

B. Most of the pilgrims have expressed dissatisfaction from the sanitary services in Pandhapur, mentioning:

i. Dirtiness and odour problems in toilets, nearby maths and in other places in the town

ii. Lack of buckets/bottles to fetch water for flushing

iii. General poor maintenance of toilets

iv. Toilets are insecure for females

C. Some respondents pointed out pilgrims' own responsibility to keep the town clean

D. Many pilgrims are willing to pay up to Rs. 2 for usage of well-maintained toilets

4 Pilgrim Management Systems

One of the core elements in developing the sanitation and sewage management system in Pandharpur is by addressing the pilgrims, their flow patterns and their need. It is obvious that the main purpose of the pilgrim is to have darshan of the deity. In Pandharpur, the darshan is carried out in three different forms:

1. **Pad Darshan -** Majority of the pilgrim aspire for this darshan, since they get an opportunity to touch the feet of the Lord.
2. **Mukh Darshan -** This darshan consist of having a look at the face of the Lord, from about 6 - 8 meters distance. On an average, 5 pilgrims can do Mukh Darshan against 1 pilgrim that will be able to do Pad Darshan.
3. **Kalash Darshan -** With this Darshan, people can pay respects to the Kalash on the top on the "Gopur" from outside the temple premises. A very small percentage of pilgrims offer their respects in this approach.

During the peak period in Ashadi, 500,000 pilgrims visit Pandharpur of which about 80% of the pilgrims – in other words 400,000 pilgrims - wanting to have Pad Darshan.

In order to elaborate an effective pilgrim management system, following data has been assumed:

- the processing time of an average darshan is 50 pilgrims per min
- an average of 3,000 pilgrims can do a darshan per hour
- a maximum of 72,000 pilgrims can do a Pad darshan per day
  - → Therefore, it will take about 6 days for 400,000 pilgrims, assuming no pilgrim opts to have a 2nd darshan.
  - → This scenario results in pilgrims standing in the queue line for over 8km (upto Gopalpur), for over 42 hours in order to get the darshan.

Further, this has resulted in the following issues:

1. Anxiety and lack of clarity with regard to the darshan.
2. No information with regard to how many pilgrims are in the queue, to the waiting time or about disruptions in the services, if any.

3. The pilgrims' assembly in the temple area, hoping for a darshan, thereby creating congestion.

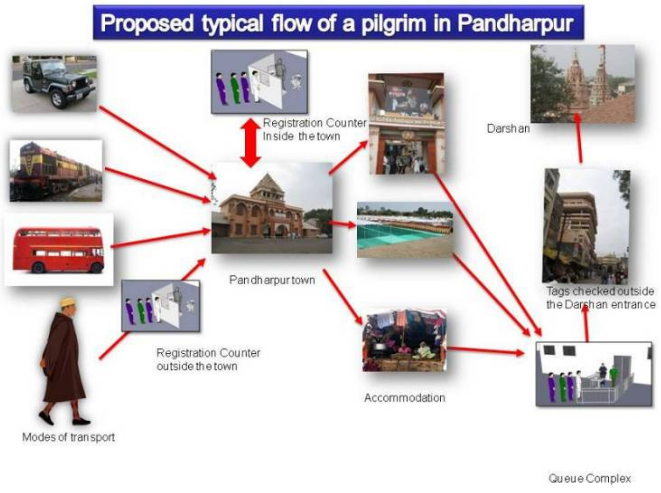
4.1 *Decongestion of Queue*

Queuing, however unpleasant it may be is the most fundamental structure bringing forth the advantage of fairness to the customers based on the order of their arrival – it follows the "*first come – first serve*" approach.

The fact that the target group, in this case the pilgrims, are queued up, has several disadvantages and advantages: the fact that the one has to hold its place in the line results in the more difficult handling of basic needs such as eating, sleeping or relieving oneself. The advantage is, that since the target group is easily reachable in the queue important communications or new initiatives are easy to be placed.

In its most basic form, the decongestion of queue system (earlier called Pilgrim Demand Management) will provide the arriving pilgrim with a time token: the time token will tell the pilgrim his time of the darshan so that he can come later at the provided time slot. This eliminates the need to stand in queue while waiting and the pilgrim is therefore free to enjoy his time in the town and later to attend the short time in the queue hassle-free.

In this way, decongestion of queue systems help to provide comfort as well as fairness to pilgrims, by allowing them to maintain their position in the queue while physically they are not in the queue.



The use of computerized systems for the decongestion of queue has the great advantage that it will help the temple trust and PMC to produce statistical reports on information such as arrival dates and patterns, waiting and service times as well as default and reneging cases. Based on these statistics,

the optimal use of resources can be achieved, helping the trade-off between service quality and service cost.

4.2 *Model Camp sites*

During festival times, Pandharpur Town is over flown by the pilgrims – the effects have to be borne mostly by the residential population. Such effects are for example the hygienic situation aggravated by the massive amount of people on a concentrated spot along with the insufficient number of sanitary facilities, dustbins etc.

The effects reach though beyond the mere problem of hygiene in the town. As the situation can be observed now, the congestion, the stress to queue up for the darshan, taking care of its own belongings delimits the actual economical potential of the pilgrim staying in the town for a couple of days.

In order to enhance the situation for the pilgrim as well as for the local economy an overall strategy and coordination is favourable. As a key element, the decongestion and redistribution of the pilgrims is proposed: with this step, the pilgrim can be provided with adequate and comfortable facilities which offers the local business a variety of new opportunities.

The distribution of the pilgrims during the peak event (Ashadi) is provided in the figure below. The assumptions and pilgrim distribution analysis, based on the survey report, describes the parallel activities and places of stay of pilgrims and the number of pilgrims at each one of these locations. Furthermore the data provides the basis for the development of technological options for the pilgrim distribution schemes and the sanitation and sewage management.

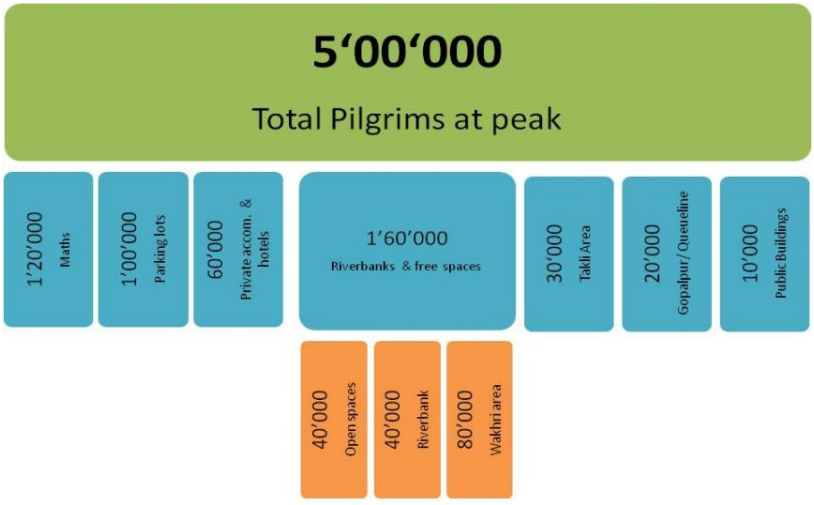


Figure: Distribution of pilgrims during peak event (Ashadi)

The Riverbank and free spaces in the town attract a maximum of pilgrim activity and thus, the number of 1,60,000 is assumed. Breaking this further up, the Riverbanks will have camping possibilities for a maximum of 40,000 pilgrims as well as the open spaces in the town which will accommodate the same number of pilgrims. For the balance of 80,000 pilgrims campsites in Wakhri will be erected to their disposition so that they can stay there and visit the town only for the visit to the temple.

The two main areas where the campsites are proposed are:

A. River banks, for maximum of 40,000 pilgrims

B. Wakhri areas, for maximum of 80,000 pilgrims

If required, the camp sites can be implemented on the other side of the river, which has been ear-marked for pilgrim flow, greater than 500,000 in any season.

Each model camp is designed for 10,000 pilgrims. Two classes of shelter (tents) are provided:

i) Class A are more luxury facilities (not free of charge), providing a space of 1.5m^2 (2m x 0.75m) per person.

ii) Class B (free of charge) are simple tents for the common user, providing a space of 1m^2 (2m x 0.5m) per person.

Sanitation facilities (toilets and shower facilities) allotted over the campsite are maintained by caretakers, ensuring the proper running of the system and therewith the hygienically safe conditions in the camp. In addition to the areas providing shelter, community space for cooking and gathering is as well designed. Fresh water stations to be found all over the camp will provide drinking water to the visitors. Since many pilgrims are travelling by truck to Pandharpur, pre-determined parking lots are integrated in the camps.

The implementation of Pilgrim Demand Management and Pilgrim Distribution Systems enables a close and detailed survey of the essential data related to the pilgrim dynamics such as to pre-designate the number of pilgrims in the different areas or zones – these data allow a detailed planning of the provision of the basic amenities.

Due to these steps the de-congestion of the temple and town area becomes possible: accommodation and basic amenities at different locations can be provided according to the assessed data, which will curb the need for the pilgrims to enter the centre of the town achieving thereby the optimal utilization of the resources.

With respect to the sewage and sanitation management, the adequate facilities can be provided directly to the pilgrim's location of stay, since due to the Pilgrim Management Systems the number of pilgrims for the service utilization can be defined exactly without ambiguity.

The implementation of Pilgrim Management Systems forms the key to the success of better services for the pilgrim in Pandharpur, including the adequate provision and O&M of sanitation services.

5 Proposed collection, transport, treatment and reuse system

The challenge to establish a well designed, smoothly managed and operated sanitation solution for Pandharpur and its surroundings is highly versatile: dealing with high fluctuation in wastewater production, in volume as well as in temporal and spatial distribution – a situation that is not to be handled by a single technology. To get a clear understanding on the sanitary challenge in Pandharpur a system comprising of different technical and social instruments, interlocking and complementing each other, has to be established.

5.1 *Collection system*

Before describing the sanitation strategy adopted, a list of assumptions is provided herewith upon which the design approach is based on.

1. The toilets and the sanitation system should be sufficient to the requirement of a potential influx of 500,000 people max.
2. The ratio of male pilgrims to female pilgrims is taken as 7:3.

The average time (for defecation) in the toilet required for a male is assumed to be 5 min and for a female 8 min; for the number of 500,000 pilgrims these figures sum up to 5 hours for utilization of the toilets, thus making the design requirement at 60 users per seat for male pilgrims and 40 users per seat for female users.

The calculation of the no. of toilets required for the pilgrims is listed below and is based on the assumptions stated earlier.

Table: Toilet requirement, existing and planned

Toilet requirement:	No. of toilets
No. of toilets for male pilgrims	5,833 (for 3,50,000 male)
No. of toilets for female pilgrims	3,750 (for 1,50,000 female)
Total of minimum toilets required	**9,583**
Existing toilets:	
Total no. of existing community toilet seats (some of which may need improvement)	346
Total no. of existing public toilet seats (Sulab style/toilets, some may need improvement)	293 (excluding temporary toilets, deemed inappropriate)
Total no. of toilets in queue complex	74
Total no. of existing Sewer Toilet style toilets	40

Total no. of existing toilet seats in Maths	1,276
Total no. of existing toilets in private accommodations and hotels	1,150
Total no. of existing toilet seats	**3,179**
New toilets:	
New toilets proposed by PMC, (locations identified)	956
New toilets proposed by ESF, (locations not yet identified in detail)	5,533
Total no. of new toilet seats	**6,489**

Table: Distribution of Toilets per District

Zone	Location	Men's toilets [Nos]	Women's toilets [Nos]	Total seats [Nos]
Riverbank	Riverbank	467	300	**767**
District I,II,III	Maths	1,400	900	**2,300**
	Public buildings	117	75	**192**
	Open spaces in town	467	300	**767**
	Parking lots	1,167	750	**1,917**
	Private acc. and hotels	700	450	**1,150**
Takli lake	Takli lake	350	225	**575**
Gopalpur, Dist. I	Queue-line	233	150	**383**
Wakhri	Wakhri (new camps)	933	600	**1,533**
	Total	**5,833**	**3,750**	**9,583**

As far as possible, the further planning for sites lines up with the existing and proposed locations PMC has identified. Furthermore, three different options adopted for new toilet construction are classified as follows:

1. **Integrated Toilets (ITs)**

   In Maths and public locations, toilets will be integrated with the existing building structure;

2. **Public Toilet Centres (PTCs)**

   Planned at parking lots and locations where the pilgrims group during night times (Takli Lake, bigger open spaces in the town and nearby and some at the Riverbank); Type 1, one storied, and type 2 two storied.

3. **Sewer Toilets (SwTs)**

   Semi-permanent toilets are to be placed in model campsites (Riverbank, Wakhri, and Takli Lake area)

The distribution of the new toilet units is as provided in the following table, which is again calculated based on the pilgrim distribution system described earlier.

Table: Distribution of the new toilet units based on the pilgrim distribution

	Already Existing			Already Proposed (PMC)		New Proposed		
Location	**Community toilets**	**PTC sulabh**	**IT**	**PTC**	**IT**	**PTC**	**SwT**	**IT**
	seats	seats	seats	seats	seats	seats	seats	seats
Riverbank						80	700	
Maths			1276		365			659
Public buildings					118			74
Open spaces in town	200	150		293		120		
Parking Lots	146	143		100		540	1000	
Private Acc & Hotels			1150					
Takli lake area	40			80			460	
queue line		74				300		
Wakhri new camps							1600	
Total	**3486**	**367**	**2426**	**473**	**483**	**1040**	**3760**	**733**
		Total Existing	**3179**	**Total Proposed**	**956**		**Total New Proposed**	**5533**
							Total Proposed	**6489**

5.2 *Strategically approaches for sanitation systems*

The sanitation and sewage management approach adopted by the project team is developed based on the field visits, formal and informal meetings, and insights from local authorities and feedback from different experts. The sanitation strategy requires zoning of the different areas in Pandharpur.

The entire area is divided into different zones:

A. **District I** – The main temple area and commercial buildings, Maths and residences. This area has existing sewer network system and serves the fixed population and the floating population, visiting temple as well as the pilgrims staying in Maths in this area.
B. **District II** – The fast-growing area in Pandharpur next to District I.
C. **District III** – The outskirt area of Pandharpur, adjoining District II. This area is also called Isbavi area.
D. **Takli Lake area** with a catchment area with fixed population of about 1270 families (as per the Takli Lake beautification plan's waste quantity of 700 cu.m).
E. **Riverbank** – area between District I and Bhima river.
F. **Wakhri Area** –area where pilgrims gather before entering the town during wari period.

Based on the above classification of different areas, the following sanitation strategies are developed:

1. Decentralized Approach A and B
2. Centralized Approach

5.2.1 Decentralized Approach A

Decentralized approach A, as well as the approach B, tends to decentralize the wastewater treatment and to reuse as much that is possible and reasonable. District II and III, which have no sewer network yet, will be supplied by Decentralized Treatment Systems (DTSs) at adequate locations spread over the two districts. The wastewater produced in the new model camps at Wakhri are to be discharged by a vacuum sewer line to District II where it is treated in a DTS of sufficient capacity (1.6MLD) or else distributed to many smaller units.

The wastewater produced in District I will flow by the existing gravity sewer network to both the existing and a new pump well at Vishnupad. The toilets on the Riverbank are to be connected to a vacuum sewer line, discharging the wastewater also to the pump wells at Vishnupad. From there the entire wastewater from District I and the Riverbank is lifted up to the site of the existing STP. There a new DTS will be established, in order to treat the wastewater alongside with the existing STP. The DTS will run under full load throughout the whole year, and the existing STP will take the respective rest of the wastewater. This sharing pattern between DTS and existing STP allows to reduce the energy consumption for the aerobic treatment in the existing STP as much as possible and ensures that the bacteria cultures in the DTS (mainly anaerobic bacteria) are kept alive and on fully efficiency. As a by effect of the treatment process, the DTS produces energy (Biogas) which can be stated as a surplus benefit.

The Takli lake beautification plan incorporates a decentralized treatment plant for 700cu.m of wastewater. This treatment plant will be sized up to handle the wastewater generated in the Takli Lake area and railway station.

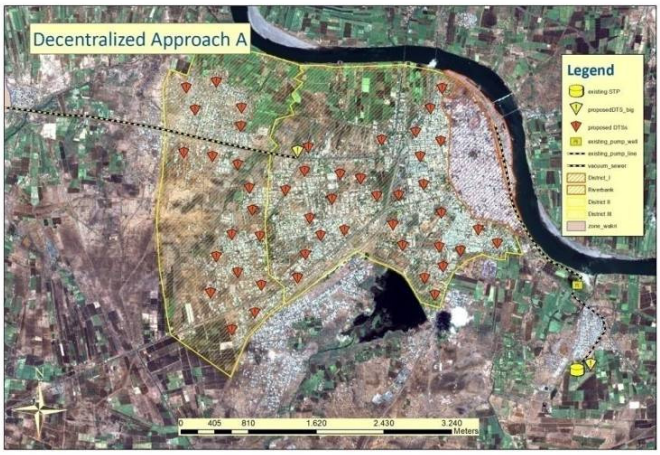


Figure: GIS image showing decentralised approach A

[Note: amount and locations of the DTSs for District II and III are not defined yet; the respective symbols placed on the above picture "Decentralized Approach A" are just rough assumptions.]

5.2.2 Decentralized Approach B

The Decentralized Approach B doesn't differ from A in terms of District II, District III and Wakhri. But instead of placing a big DTS nearby the existing STP, a new Pond System will be established there. The Pond System will run the whole year at full capacity, disburden the existing STP substantially during non peak season. The wastewater produced at Riverbank is transported by vacuum sewer line to the pump wells at Vishnupad, where it flows together with the wastewater from District I; from there it is lifted (pumped) up to the existing STP and the pond system for treatment.

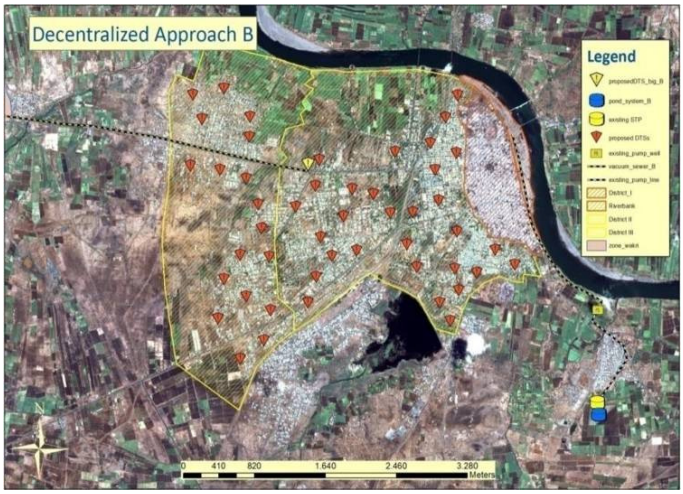


Figure: GIS image showing decentralised approach B

The Decentralized Approach B contains the following:

- **A.** Pond System next to existing STP - Pond System and existing STP share the wastewater from District I and the Riverbank for treatment
- **B.** Riverbank – vacuum sewer line to pump well to Vishnupad
- **C.** New additional pump well at Vishnupad
- **D.** District I – wastewater is discharged by existing gravity sewer network to the pump well at Vishnupad
- **E.** District II and III – new DTSs at adequate locations spread over the Districts treat the wastewater decentralized
- **F.** Wakhri model camps – vacumm sewer line transports wastewater to District II, there it gets treated in DTS(s)
- **G.** Takli Lake area – New treatment facility proposed by Takli Lake Beautification Team

5.2.3 Advantages of Decentralized Approaches

The decentralization has the advantage that the sanitary infrastructure (wastewater discharge and treatment) of District II and III can be developed stepwise. No huge investments into a sewer network are necessary; instead the installations of the new DTSs are covered by the savings for the sewer network. The treated water as well as the produced biogas out of the DTSs can be used locally.

Further advantage of decentralisation is the fact that the whole system itself is supported by many small systems; in case of failure of one of them, the system as such is not much affected. In contrast to that, if a centralized system with one STP for a huge amount of wastewater suffers from failure the entire wastewater treatment system is affected and stops. Since the DTS doesn't require any process energy, the wastewater from the decentralized zones (District II and II) will also be treated in case of power cuts.

In both approaches the new treatment facilities for the wastewater from District I and the Riverbank are situated next to the existing STP. It would be also possible to place the DTS (Decentralized Approach A) at Vishnupad, having the advantage that the wastewater treated in this DTS doesn't need to be lifted up; instead it could flow by gravity from the pump well into the DTS. The DTS would be under the flood level and in case of floods the system could get damaged and/or washed out. Besides this aspect the location of the DTS (Decentralized Approach A) and the Pond (Decentralized Approach B) next to the STP has the advantage that the treated water can be released by gravity into the Gopalpur nala from which the surrounding farmers could tap the treated water for irrigation purposes - just as they are currently doing.

5.2.4 Centralized Approach

In the Centralized Approach the entire wastewater from all zones (except Takli lake area) is discharged to a central point for treatment and further reuse. District II and III will be covered with a gravity sewer network; connected with the already existing sewer network from District I, discharging the wastewater to Vishnupad where a new pump well has to be established. The wastewater produced in the new camp sites at Wakhri is discharged via a new vacuum sewer line to District II, where it will be pumped into the gravity sewer network for further discharge to the pump wells at Vishnupad. Wastewater generated at the Riverbank is discharged via new vacuum sewer as well to the pump wells at Vishnupad, where all the wastewater flows together and gets further lifted up to the site of the existing STP for treatment. Next to the existing STP a new Pond System is provided, handling the entire wastewater treatment together with the existing STP.

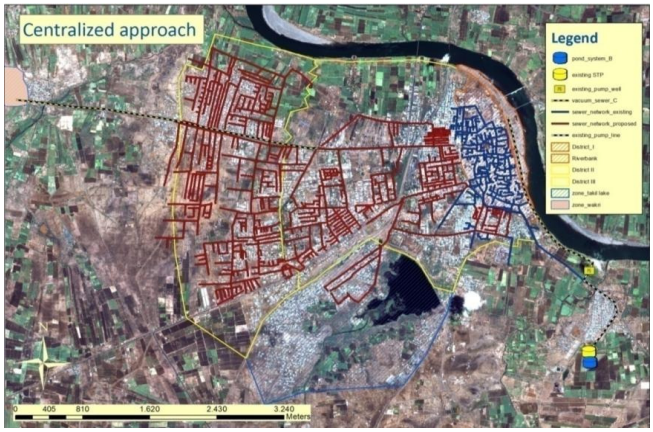


Figure: GIS image showing centralized approach

[Note: The Takli lake beautification plant incorporates a decentralized treatment plant for 700cu.m of wastewater. This treatment plant will be sized up to handle the wastewater generated in the Takli Lake area and railway station.]

The Centralized Approach contains the following:

A. New gravity sewer network for District II and III, connected with sewer network from District I, as per MJP proposal

B. Wakhri model camps – vacuum sewer line to District II, there release of wastewater into gravity sewer line

C. New additional pump well at Vishnupad

D. Riverbank – vacuum sewer line to pump wells at Vishnupad

E. District I – wastewater is discharged by existing gravity sewer network to the pump well at Vishnupad

→ Entire wastewater flows to pump wells at Vishnupad

F. entire wastewater gets lifted up from the pump wells at Vishnupad to site of existing STP

G. New pond system next to existing STP

→ Pond system and existing STP share the wastewater for treatment

H. Takli Lake area – New treatment facility proposed by Takli Lake Beautification Team.

For the nala water management, the following measures are suggested:

A. Industries which discharge currently their wastewater untreated into the nalas i.e. Milk dairy unit at Isbavi and Vithal Sahakari Sakhar Karkhana Ltd (sugar factory) need to have on-site wastewater treatment and discharge only the treated effluent into the nalas.

B. In case it is possible to localize discharge point sources with heavy organic load along the nalas, small on-site treatment plants (e.g. small wetlands) can treat the wastewater before discharge into the nala. This will reduce the organic load of the nalas substantially. But it is to point out that these measures make only sense if there are only a small number of such point sources having big impact of the total organic load in the respective nala. In case of bigger amount of point sources carrying low BOD wastewater, this measurement may not be suitable because it becomes uneconomical.

C. A DTS can be placed at the end part of the nalas (before entering the river), treating the nala water before entering the river. Considering that the construction costs for this technology is in the range of 20 to 23 Lakh Rs. per KLD, the unit for:

- Malpe nala (0.4-1.0 MLD) would cost: up to Rs. 220 lakhs
- Lendki nala (0.4-0.5 MLD) up to Rs. 120 lakhs
- Gopalpur nala (1.2-1.6 MLD) up to Rs. 350 lakhs

If this investment finally pays out does not depend only on technical considerations; it has to be pointed out that in case of fully treatment of the nala water, the pressure on the residential population of Pandharpur to change their habit of simply discharging everything into the nalas as well as for the decision makers to implement a proper sanitation system will get reduced. From this point of view it is more advisable to force the implementation of proper wastewater collection, discharge and treatment instead to invest into nala recreation because this will also solve the problem with the polluted nalas.

5.3 *Sludge management*

Out of the anaerobic as well as from the aerobic wastewater treatment, mineralized sludge is formed, which settles at the bottom of the treatment vessels or ponds. This mineralized sludge consists of inorganic and organic material which chemically cannot be further decomposed such as sand, cellulose and lignin. Mineralized sludge is rich in nutrients and earth forming material and can therefore be reused in agriculture as nutrient rich soil conditioner; which closes the nutrient cycle and helps to sustain the soil fertility. However, the sludge needs to be treated before it can be reused, as it can be cross contaminated with pathogens from fresh faecal material and worm eggs which settled in the sludge.

5.3.1 Sludge management concept

Since mineralized sludge also forms in septic tanks, which are widely spread over District II and III of Pandharpur, and, in case that the proposed Decentralized Approach A or B get implemented, resulting in the construction of many DTSs – it is indicated to build up a comprehensive sludge management concept for entire Pandharpur, driven either by the municipality or a by a private agency. This sludge management concept covers the whole sludge cycle from sludge collection over sludge treatment to the contribution of the end product.

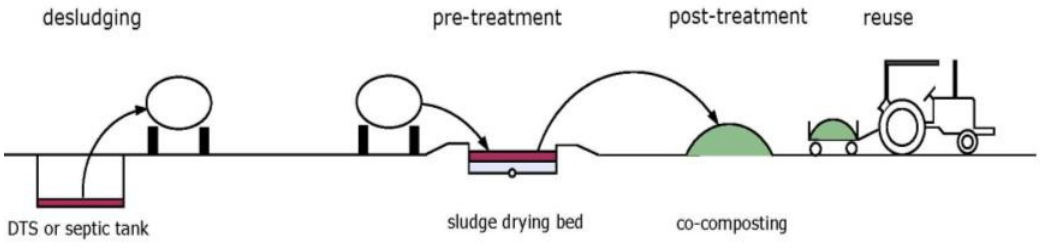


Figure: Sludge management concept

A. Sludge collection:

Desludging of the anaerobic tanks by vacuum sucking tankers: the municipality already owns some tankers for desludging of septic tanks – nevertheless, as per requirement, new desludging tankers have to be purchased. After the process of desludging, the tanker transports the sludge to the site for further treatment.

B. Sludge treatment:

Pre-treatment: The first stage of a sludge treatment is the dewatering of the sludge in so called sludge drying beds. Drying beds consists of a gravel-sand filter, equipped with a drainage system. The sludge is loaded on the bed and the water is evacuated mainly by percolation through the filter and by evaporation. The dewatered sludge is suitable for further treatment, which is necessary for pathogen removal. Dried sludge can be removed after 7 to 14 days, depending on the climatic conditions.

Post-treatment: Further treatment of the sludge may happen trough co-composting with organic waste e.g. kitchen waste or garden waste. The pre-treated sludge is composted together with the organic material. If the composting is well done, temperatures in the heaps reach 55-60°C and all pathogens are destroyed. The produced compost constituted a very good soil conditioner which can be given or sold to farmers.

5.4 *Theoretical reuse potential of the wastewater*

If we assess the wastewater production and flow in Pandharpur throughout the year we see a constant wastewater production from the resident population and daily floating population topped by peaks caused by the floating population correlating with the dimension of the respective festivals and gatherings. The organic load in the wastewater has even higher peaks, because the wastewater produced by the floating population has lower dilution, hence its BOD is higher.

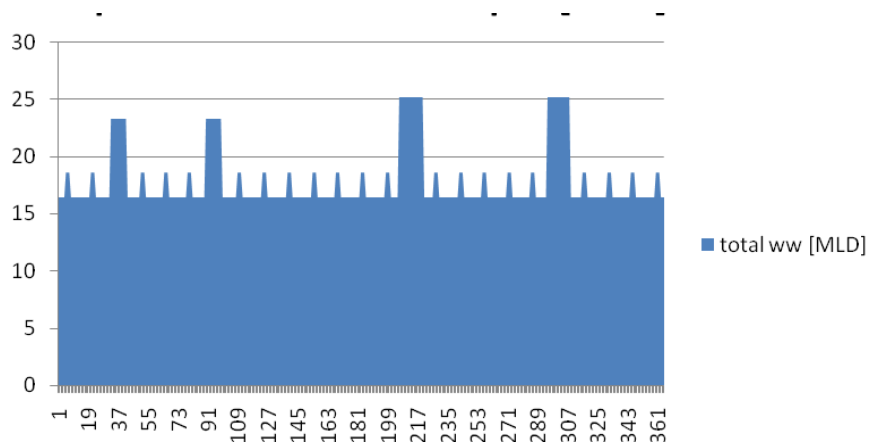


Figure: wastewater production over the year

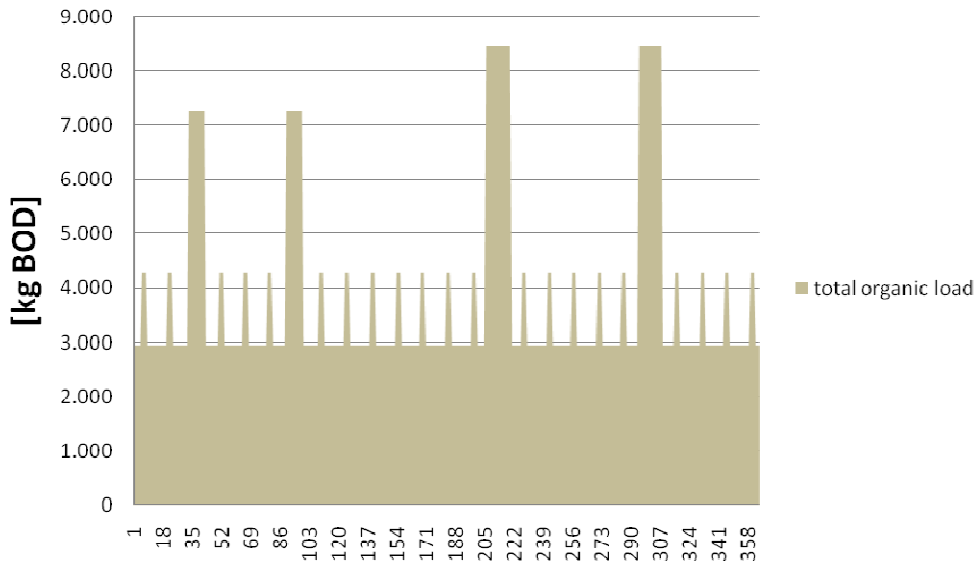


Figure: Total organic load

The total amount of produced wastewater and its organic content is represented by the area under the curves:

→ 6,820 ML water per year

→ Organic material with a BOD equivalent of 3,674 t

The water will be available after the treatment to almost the full extend, desists from evaporation and infiltration losses on the way from the collection to the treatment system and in the treatment systems itself. After treatment it can be reused for irrigation purpose in agriculture or, in case of decentralized treatment with downstream polishing, be reused for toilet flushing. In all approaches the wastewater gets treated to a BOD below 30mg/l, fulfilling standards for discharge into water bodies.

In the anaerobic treatment process the organic material undergoes a chemical degradation with the help of bacteria; in other words it becomes chemically stabilized. This anaerobic process which is happening in the DTS as well as in the anaerobic part of the Pond System, produces methane as a by product. Actually about 95% of the energy stored in the chemical chains of the raw organic material passes into chemical bond of methane molecules. The methane can be used for burning processes either directly in a gas stove or lamp or else in a generator for electricity production. After the stabilization/degradation process a mineralized sludge settles at the bottom of the tanks. This sludge contains a big part of the nutrients which where primary in the organic material. After taking this sludge out of the tanks it can be simply dried or co-composted with other organic material and reused as valuable, nutrient-rich soil amendment in agriculture.

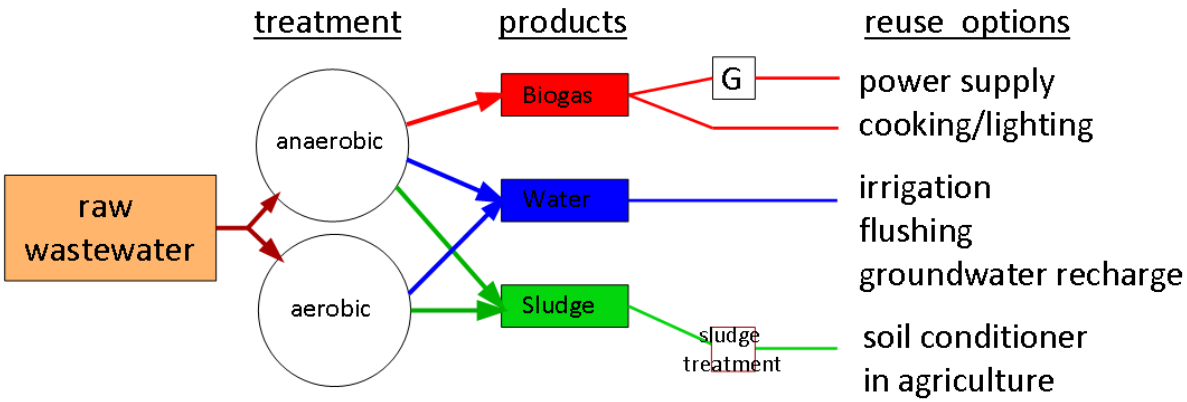


Figure: Treatment and reuse scheme

6 Block Estimates

The costing for the different approaches is provided in the following tables.

6.1 *For collection system*

Table: Details of type and No. of toilets at different locations and their costs

Zone /Location	Type of toilet	No. of units	Unit cost in Rs. (in lakhs)	Total Cost in Rs. (in lakhs)
1. Riverbank	PTCs (1)	2	14.5	29
	PTCs (2)	2	30	60
	SwTs	35	3.5	122.7
2. District I,II,III				
Maths	ITs	1,024	0.11	110.0
Public buildings	ITs	192	0.11	21.0
Open spaces	PTCs (1)	11	14.5	159.5
	PTCs (2)	10	30	300
Parking lots	PTCs (1)	16	14.5	232
	PTCs (2)	16	30	480
	SwTs	50	3.5	175.3
3. Takli Lake	PTCs (1)	2	14.5	29.0
	PTCs (2)	2	30	60
	SwTs	23	3.5	80.6
4. Gopalpur, District I / Queue line	PTCs (1)	8	14.5	116.0
	PTCs (2)	7	30	210
5. Wakhri	SwTs	80	3.5	280
			Total	**2466**

6.2 *For transportation system*

The transportation of the wastewater from different districts of Pandharpur is mainly through:

A. Gravity sewer network

B. Vacuum sewer network

District I is already networked with a gravity sewer system collecting the wastewater from the temple and surrounding areas to the existing treatment plant. This sewer network, at present, does not have the capacity to handle the additional wastewater generated by the pilgrims staying in the hotels, private accommodations and Maths in this district. Often it was observed that the toilets in District I have to be locked up due to the non-flow of wastewater.

Table: Details of the gravity and vacuum sewer system for Centralized Approach

Wastewater Transport		
Transport System Cost	**Establishing** [Rs. in Million]	**O&M** [Rs in Million/yr]
Gravity sewer D I		4
Gravity sewer D II, III	257	7
Pump at Malpe nala	16	0.5
Vacuum sewer for Wakri	21	0.5
Vacuum sewer for Riverbank	16	0.3
Pump at Vishnupad	33	7.7
	344	**20**

The operation and maintenance of the sewer network and the pumping machinery can be taken as about 3% (including salaries) of the estimated cost for the sewerage network. The wastewater from the campsites in Wakhri and from the Riverbank toilets is transported by the vacuum sewer system. The reason for considering vacuum sewer lines is straight-forwarded – the advantages of vacuum sewer lines are as follows:

A. Even if not in use for a longer duration, Vacuum Sewer Systems still work well when required again and do not get choked.

B. Vacuum Sewer System are an advantage in flat terrain where it is difficult to set-up underground gravity sewer lines since the vacuum pipes doe not require deep excavation.

C. Central Vacuum Station (pump with collection vessel) and collection chambers can be set up with ease at locations as per requirement.

The costing for gravity and vacuum sewer system, as required for Decentralized Approaches is provided in the table below:

Table: Details of the gravity and vacuum sewer system for Decentralized Approaches

Wastewater Transport		
Transport System Cost	**Establishing** Rs. Lakhs	**O&M** Rs. Lakhs/Yr
Gravity sewer D I		43
Vacuum sewer for Wakri	214	05
Vacuum sewer for Riverbank	168	03
Pump at Vishnupad	125	37
	508	**88**

6.3 *Treatment strategies*

6.3.1 Decentralized Approach A

Table: Details of the Decentralized Approach A

Treatment System and transport	Establishing Rs. Lakhs	O & M Rs. Lakhs/Yr
Transport	508	88
DTS	4096	24
STP (existing)	-	90
Sludge drying beds	15	-
Total	4619	202

6.3.2 Decentralized approach B

Table: Details of the Decentralized Approach B

Treatment system and transport	Cost (with WSP)		Cost (with MAL)	
	Establishing Rs. Lakhs	O & M Rs. Lakhs/Yr	Establishing Rs. Lakhs	O & M Rs. Lakhs/Yr
Transport	508	88	508	88
DTS	3300	16	3300	16
STP (existing)		90		90
Waste Stabilisation Ponds	527	7.5	305	20
Sludge drying beds	15		15	
	4350	**202**	**4128**	**214**

6.3.3 Centralized system

Table: Details of the Centralized Approach

Treatment system and transport	Cost (with WSP)		Cost (with MAL)	
	Establishing	O & M	Establishing	O & M
	Rs. Lakhs	Rs. Lakhs/Yr	Rs. Lakhs	Rs. Lakhs/Yr
Transport	3442	200	3442	200
DTS	-	-	-	-
STP (existing)		90		90
Waste Stabilisation Ponds	2151	11	1830	57
Sludge drying beds	15		15	
	5608	**301**	**5287**	**347**

6.4 *Comparative analysis*

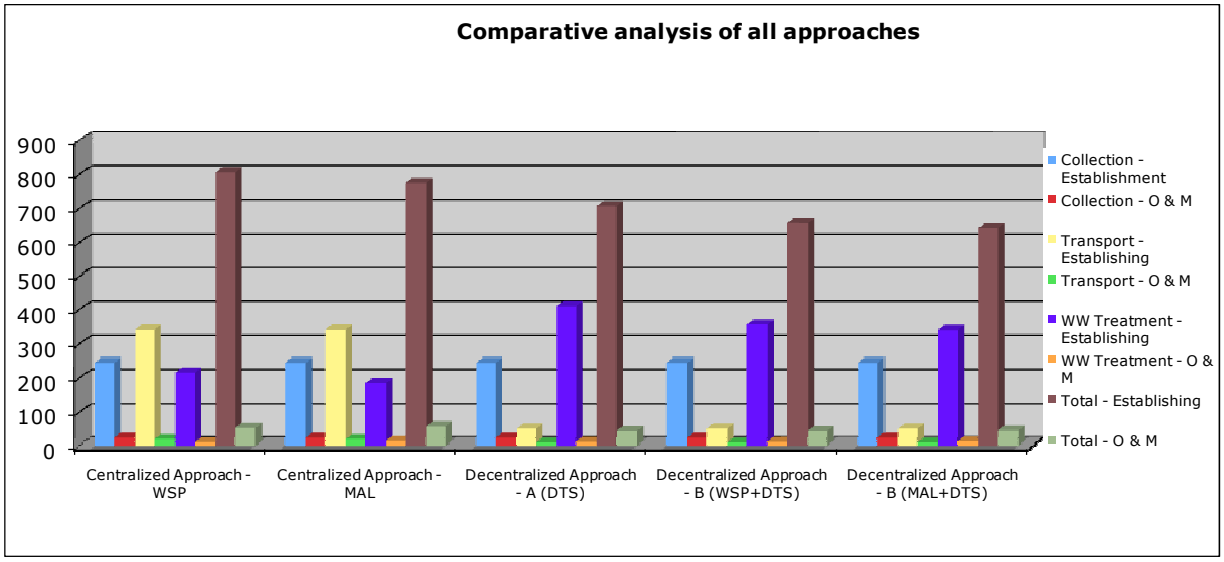


Figure: Cost comparative analysis of the different sanitation approaches described above

7 IEC Strategy

The IEC strategy is more process oriented rather than product-oriented and requires:

a) An **immediate term** approach for the first six months of period for the training to the respective representatives from decision makers to grassroot level.

b) A **short term** approach with emphasis on process, aiming primarily in developing a list of steps for implementing a IEC strategy for all the other religious places too.

c) **Overall IEC planning**, is based on an analysis of the needs and include a package of 3 components: i) formative research ii) strategy to address the needs and iii) monitoring in order to avoid over-reliance on media and materials

The specific objectives of the IEC Strategy are:

1. To improve the resident population's attitude to and perception towards sanitation as well as their capacity to participate in keeping Pandharpur open-defecation free.
2. To improve and enlighten the pilgrim (floating) population on sanitation and hygiene practices.
3. To provide knowledge and information to all the pilgrims, along the Phalki Yatra Marg, thus extending the IEC strategy to the towns and villages along the Phalki Yatra Marg for optimal dissemination of information.
4. To find methods for community participation in order to establish the proposed environmentally and economically sustainable sanitation and sewage management systems with the help of local government bodies, CCDU, TSC Cell, Religious leaders, NGOs and CBO Federation, Mumbai.
5. To ensure that lessons learned provide useful inputs in designing the overall environmental improvement strategy for the city
6. Providing information on the benefits accruing from investing in right practices keeping in mind the barrier-variables related to infrastructure, socio-cultural traditions and beliefs.
7. To promote the recycling and reuse for selected streams of waste.

The essential elements necessary for the successful implementation and fulfilment of the stated objectives of the IEC Strategy document are described as below, without which it would be highly difficult to implement the IEC strategy:

- Leaders of all levels continue and step up their support and political **commitment** to the population and the sanitation program.

- The Government, local authorities and community reserve necessary **investments** for the population and the program.

- MPCB continues its **assistance**, and at the same time assistance from other state departments are mobilized in line with a unified orientation.

Moral and material based incentives are to be ensured to maintain and further promote activities undertaken by the contingent of IEC workers and motivators at grass-root levels.

8 Institutional strengthening and capacity building

In order to improve the current situation in Pandharpur, it is proposed to build up a well structured O&M-body providing its services throughout the year. The structure shall show enough stability and professionalism to cope with the challenges of the wari periods during which this body will be enlarged and strengthened up but maintain its basic structure.

A. **Pandharpur Municipal Council**: The organisational framework of the O&M-body will have its basis with PMC who will have the overall responsibility.
B. **Sanitation Engineer:** The Sanitation Engineer will be in charge of the Stand-by Technical Aid Staff.
C. **The Stand-by Technical Aid**: Their task is to take the appropriate actions wherever technical support for the infrastructure and building is asked for.
D. **Sanitation Inspector**: The Sanitation Inspector will run the O&M-unit through the supervisors heading each unit. Main task of the Inspector is to organise any provision needed at the toilet block and by the caretakers.
E. **Supervisor**: The person assigned with this task shall ideally be local and well experienced in order to train and supervise the staff in his unit.
F. **Caretakers:** The staff assigned for the actual O&M of the toilets will attend beforehand a specific training to learn about the standard that is expected by Pandharpur Municipal Council.
G. **Floating-Units (in wari period)**: Additionally to the above described O&M-Units

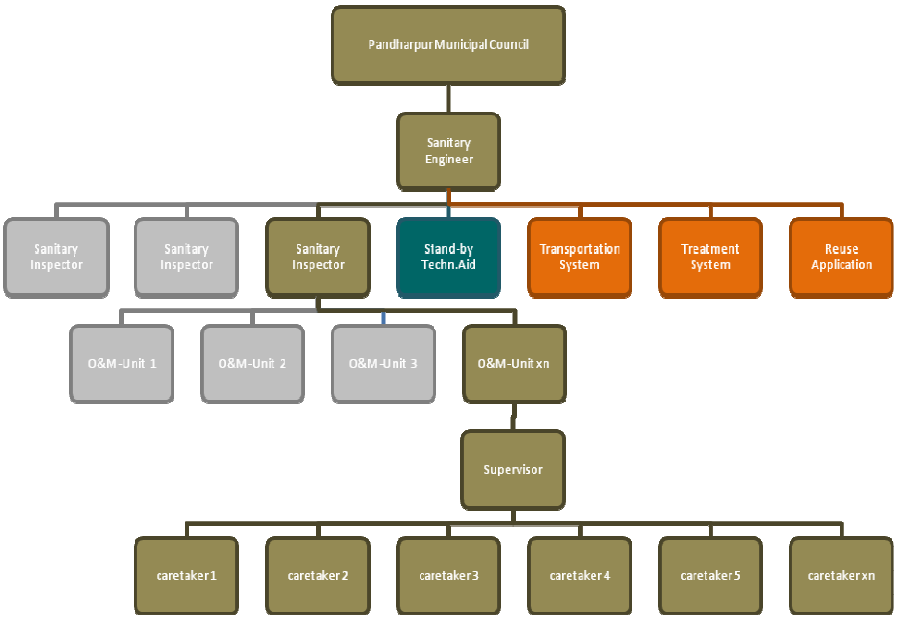


Figure: Organisational structure of the proposed institutional framework

8.1 *Community Based Organizations for O & M*

Pandharpur Municipal Council (PMC) has been taking various measures to deal with the hygienic challenge during and after the waris: contentious increase in the amount of temporary toilets, awareness raising by speaker announcements and printed material, provision of free of charge influenza vaccinations, disinfection of drinking wells by sodium hypochloride and TCL (chlorinated lime) powder and disinfection of river water. Despite these efforts, the sanitary conditions in Pandharpur remain grave – the necessary measurements to improve the situation overwhelming.

It is necessary to provide adequate facilities that are being supported by an institutional framework in the form of CBO Structure as an O&M body – in the position to administrate and guide O&M staff to accomplish these tasks during wari and non wari periods. Proper and continuous O&M of the various sanitation systems is crucial for the long-term success of the entire scheme. Even the most advanced or simple technology will fail without an organisational framework that takes care of the logistics, financial and technical aspect. The potential success of the technological options as discussed main report is directly linked to the development of the O&M-body.

Objectives for CBO development

The CBO structure as basis of the O&M-body offers the potential to meet the challenge in Pandharpur. It is expected that the development of CBO structures will create a stable sanitation system amongst the residential population of Pandharpur, OD practise of the local residents will be reduced and the city can take advantage of the expertise and working force of the CBO in the wari periods.

The three phases of implementation are as follows:

Pre Formation IEC	Establishing of link between PMC and Mumbai CBO Federation
	Identification of PTC's and possible CBO formation with the help of CBO Federation
	Municipal system provision for registration of CBO's
	Creation of PMC committee for the formation of the CBO structure: Hierarchy map of the Municipal authorities and the NGOs.
	Identification of NGOs/social agencies in Pandharpur to take over the capacity building

Formation Stage	Formation of Communities
	Registration of CBO
	Identification of caretaker and core committee, as well as general structure by the CBO
	Streamline of the process of users of PTC's and its O&M
	Initial loan or fund support from Municipal council to CBO
IEC Post formation	Training for operation and maintenance of PTC.
	Wari support system and fund mobilization system by CBO

9 Implementation Strategy

Immediate action (2 months to 6 months)

i. Decongestion of temple area through Decongestion of Queue and model campsite development.
ii. Strengthening the existing toilet infrastructure in Maths and other public locations.
iii. Assurance of clean facilities, with adequate caretakers for operation and maintenance.
iv. Strengthening of the existing collection system through maintenance and support systems wherever required periodically till full phased implementation is completed (e.g. temporary vacuum collection systems).

Short term action (6 months to 2 years)

i. Construction of the calculated requirement of toilet infrastructure at pre-designated locations as detailed in this report.
ii. Construction of appropriate collection, treatment and reuse systems, as per the selected alternatives.
iii. Completion of Riverbank beautification and Takli lake beautification plans.
iv. Development of parking lots with basic infrastructure facilities.

Long term action (2 years to 5 years)

i. Development of District III as Math Area, with state of the art infrastructure facilities, thus aiming to decongest District I.
ii. Development of campsites on the other side of the Riverbank, on a need analysis approach.
iii. Development of pedestrian bridge across the river to cater to the logistic needs of the pilgrims.

A. Monitoring, evaluation and impact assessment

i. Format, with key performance indicators on different management initiatives.
ii. Environmental monitoring with special focus on water and air sampling throughout the year for the first 3 years and random sampling from 3rd year onwards.

10 Recommendations

The recommendations provided in this chapter are collectively taken from the Project Team, Advisory Board of ESF, the client (MPCB) as well as the stakeholders – PMC, Math owners, Temple Trust and other project partners. The recommendations were collected during the two stakeholder engagement meetings, in Pune and in Pandharpur during the course of the study period.

The recommendations listed below are categorized into two sections: institutional and infrastructure, with more emphasis on the building and strengthening of institutional capacity.

10.1 *Institutional recommendations*

The main objective here is to strengthen the Municipal Capacity in order to facilitate the efficient and effective sanitation and sewage management during the wari period. More specifically, it is required to establish a Pandharpur Sanitation Committee - with representatives from Temple Trust and Maths, spearheaded by PMC.

The Committee should aim to move from the current approach of small, uncoordinated, low impact programs to a strategy of comprehensive prevention, intervention and community investment that is linked to strategic community mobilization and to a design aimed to achieve a total Environmental Management of Pandharpur. The comprehensive strategy requires the Committee to jointly conduct planning, to have a high level of coordination; it should be expertise driven and inter-disciplinary in nature. It is important to have an extremely careful implementation sequence so as to permit innovative solutions to take up on the ground conditions.

This Committee must be a new entrepreneurial governmental structure since traditional bureaucracies do not have the agility, capacity or freedom to carry out a comprehensive strategy, which requires expert design, careful implementation and a cross-silo execution if any chance of avoiding chaos and making a measurable impact towards achieving open-defecation free Pandharpur wants to be given.

This Committee will:

A. Develop a water supply and sanitation management team – following the CBO structure.

B. Develop volunteer teams for pilgrim education on the behavioural change as required for a proper management of the town during the wari period.

C. Develop public awareness campaigns and programs to develop a sense of ownership and cleanliness among the residential population of Pandharpur.

D. Develop an effective and efficient contact point to address the issues with sanitation and sewage management, both during wari and non-wari periods.

E. Develop a system of incentives and disincentives for the maths for actively participating in better sanitation and sewage management.

F. Training on the technical management of the treatment processes proposed in this report must be understood completely, so that the technical team is involved right from the implementation phase.

G. Implementation and progress monitoring on the implementation of the developed sanitation strategy as well as the maths incentives/disincentives package.

H. Co-ordinate between the different stakeholders for review and development.

I. Management of websites and information sharing sections on overall Environmental Management in Pandharpur.

J. Identify opportunities for better co-operation in O&M with private entrepreneurs.

The above points are not exhaustive and a detailed plan can be developed based on the influencing factors and other local considerations.

10.2 *Infrastructure recommendations*

The strengthening of the institutional framework is the driving force and support of the development and building up of the actual physical infrastructure – both elements are equally necessary to improve the today situation in Pandharpur and to achieve the goals of the Environment Improvement Program.

The setting up of the infrastructure has two main targets:

A. Firstly, the protection of the environment and thus prevent from further pollution through disposal of solid and liquid waste into the natural water bodies;

B. Secondly, the protection of the residential as well as floating population from being affected by the consequences of the actual practise of open defecation, insufficient water supply and bad living condition especially during wari season.

The improvement of the described situation and the achievement of the set targets will strongly and positively affect the general development of the town in future.

10.2.1 **Sanitary facilities**

A. Sanitation for the residential population with proper/appropriate collection and treatment system, thus focusing on the requirements of the residential population and therefore fulfilling the primary objective of PMC.

B. Appropriately designed sanitation strategy for the floating population, along with improvement of existing infrastructure, should be implemented in a phased manner as deemed fitting by the local stakeholders.

C. Adopting of new approaches – integrating cloak rooms within the toilet blocks, mobile phone locker facilities or mobile charging stations in the toilet blocks, etc. thus creating newer means of revenue generation for the operation and maintenance and thereby its sustainability.

D. Treatment facilities and reuse options for the nalas must be implemented with complete participation from the farming community, so that clear ownership (for operation and maintenance) is defined at the implementation phase itself.

E. Reuse of the recovered resources must be strategically implemented to encourage revenue generation, thereby providing value to the resources and achieving sustainability.

F. Model campsites should be identified at locations on Riverbank and in Wakhri which have the least environmental impact due to the congregation of the pilgrims, and due to the provision of the basic physical infrastructure and water and sanitation systems.

G. Logistical arrangement to facilitate the flow of pilgrims from different places to the main temple must be designed to streamline within the town area to achieve minimum disturbance to the residential population.

H. The bus stand receives the maximum pilgrims and thus needs to be well equipped with infrastructure and manpower to handle the pressure. Separate temporary bus stands can be developed near Wakhri campsites during the wari season to optimize the use of transport and accommodation.

10.3 *Others*

There are other potential recommendations which would augment and strengthen the proposed initiatives, and fare well in the overall development of Pandharpur as a religious tourism destination hence in the town's economy.

A. Development of Isbavi area as Math Area

The development of part of District III is foreseen as a designated Math Area for the existing maths as well as for new up-coming maths with better water and sanitation facilities. This initiative would help to de-congest the existing District I where most of the Maths are located at present, and thus would contribute to reduce the un-manageable high load of wastewater for the underground drainage system. The Math Area can be well designed with all the components of urban design incorporated in its development.

B. New campsites on the other-side of the river

New campsites can be developed on the other side of the river Bhima, with a pedestrian over-hanging bridge for pilgrims to move across. This development is earmarked for phase II of the program, for a pilgrim number that is greater than 500,000.