



Watershed Management plan for Talegaon Dabhade, Pune, Maharashtra

Ar. Swati Ramesh Rode

Assistant Professor

PDEA'S College Of Architecture, Pune, India

Abstract: There is an important role of watershed management in contributing sustainable development and environmental conservation in fast developing regions like Talegaon Dabhade, Pune. This research paper is about watershed management planned especially for Talegaon Dabhade, by taking into consideration its unique geographical, topographical and hydrological features. It consists of Need of watershed management as per present situations, case studies, techniques proposed.

Index Terms - Watershed management, stream restoration, Aquifer recharge, geography, Topography.

1. INTRODUCTION

A watershed is an area from which runoff water from precipitation is collected and drained through a common point. Watershed management is the need of hour. Urban Areas are dependent on watersheds, but urban expansion and land use changes have contributed to lowering the use of watershed. A management document that lays the framework for protecting and enhancing the natural environment, also preserving the watershed within is the watershed management plan. Such watershed management plans are also needed in Talegaon Dabhade of district Pune because, there were seven lakes nearby years ago. And because of the development in the construction there are only two lakes left with water at present that too not, potable.

2. GEOGRAPHY OF TALEGAON DABHADE

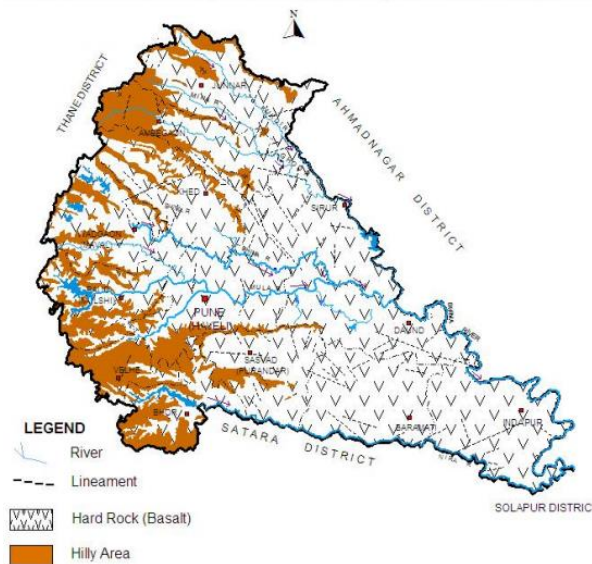
The town Talegaon Dabhade, taluka Maval, District Pune in Maharashtra state is spread over 2668 acres of land. Talegaon is at the highest altitude between Pune and Mumbai. It is located quite high in the mountains, at about 620 M over the sea level. There is hilly and undulating terrain type of topography of the Talegaon Dabhade. Overall slope is towards East and North-East.



Source: By Author

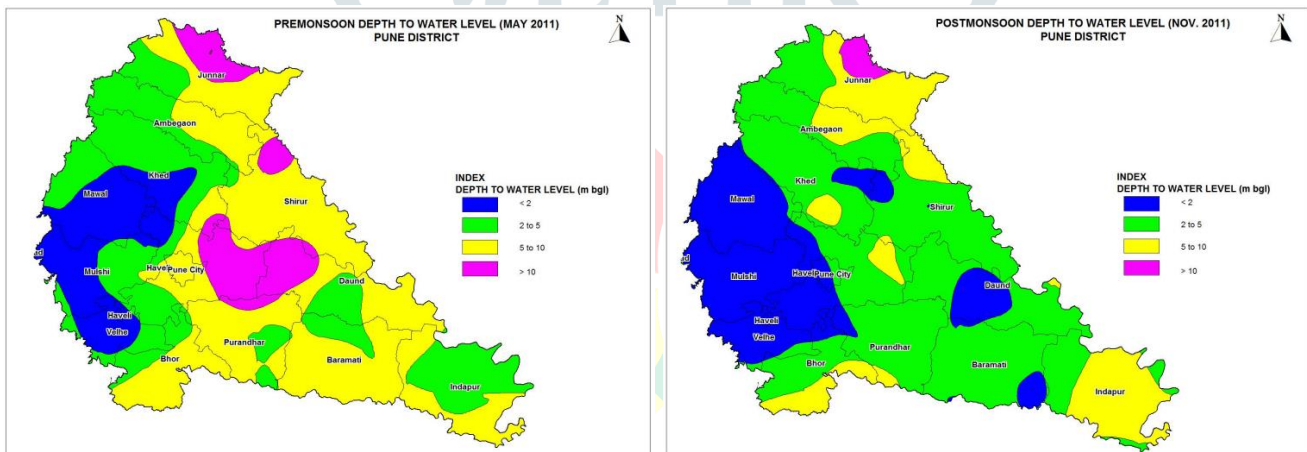
2.1. Geological Structure

The land consists of Hard Rock (Deccan Trap Basalt) which covers 95% of the area and it has low groundwater development potential. And Soft Rock (Alluvium) occurs in small areas along of river Bhima, Ghod, Mula, Mutha and their tributaries or lakes 5%.



Source: Gov. Of India Ministry of Water Resources CGWB

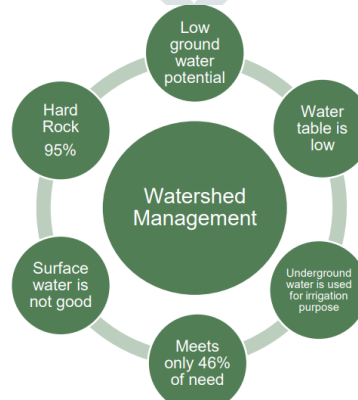
2.2 Hydrogeology Structure



Source: Gov. Of India Ministry of Water Resources CGWB

Ground water table is very low, Pre-monsoon Depth to Water Level & Post-monsoon Depth to Water Level is < 2 (m bgl) Thus only meeting 46% of the requirement.

3. NEED FOR WATERSHED MANAGEMENT IN TALEGAON DABHADE.



Source: By Author

In Talegaon Dabhade ,95% of land consists of hard rock that’s why water holding capacity of land is very low. Hence underground water table is low. Underground water is used for irrigation purpose. It only fulfills 46% of the need of irrigation.

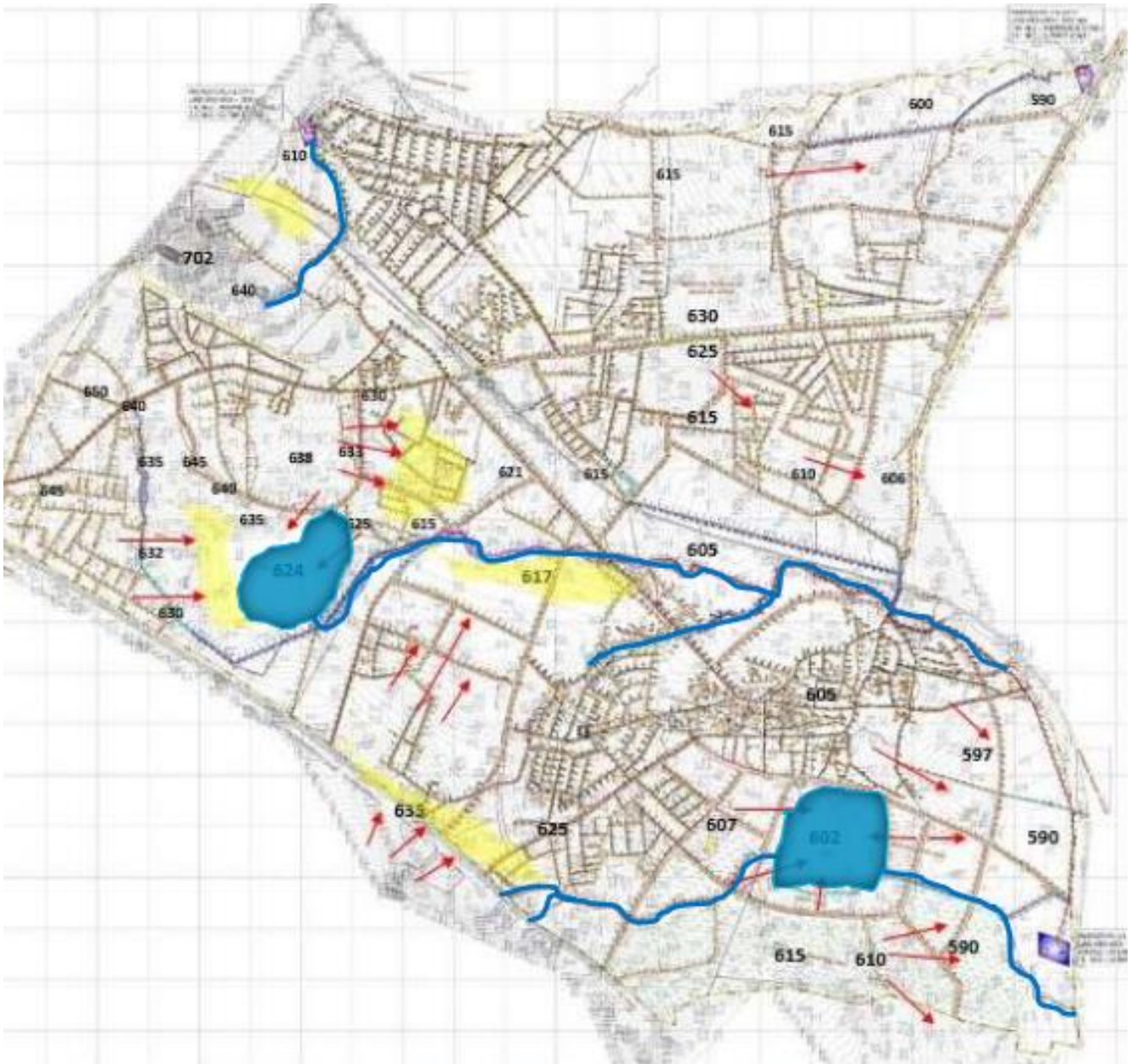
3. GOALS AND STRATEGIES FOR WATERSHED MANAGEMENT.

Improvement of water quality always remains the mainstay of watershed management, so that fisheries restoration and public use will be possible.

To meet the goals following strategies are proposed,

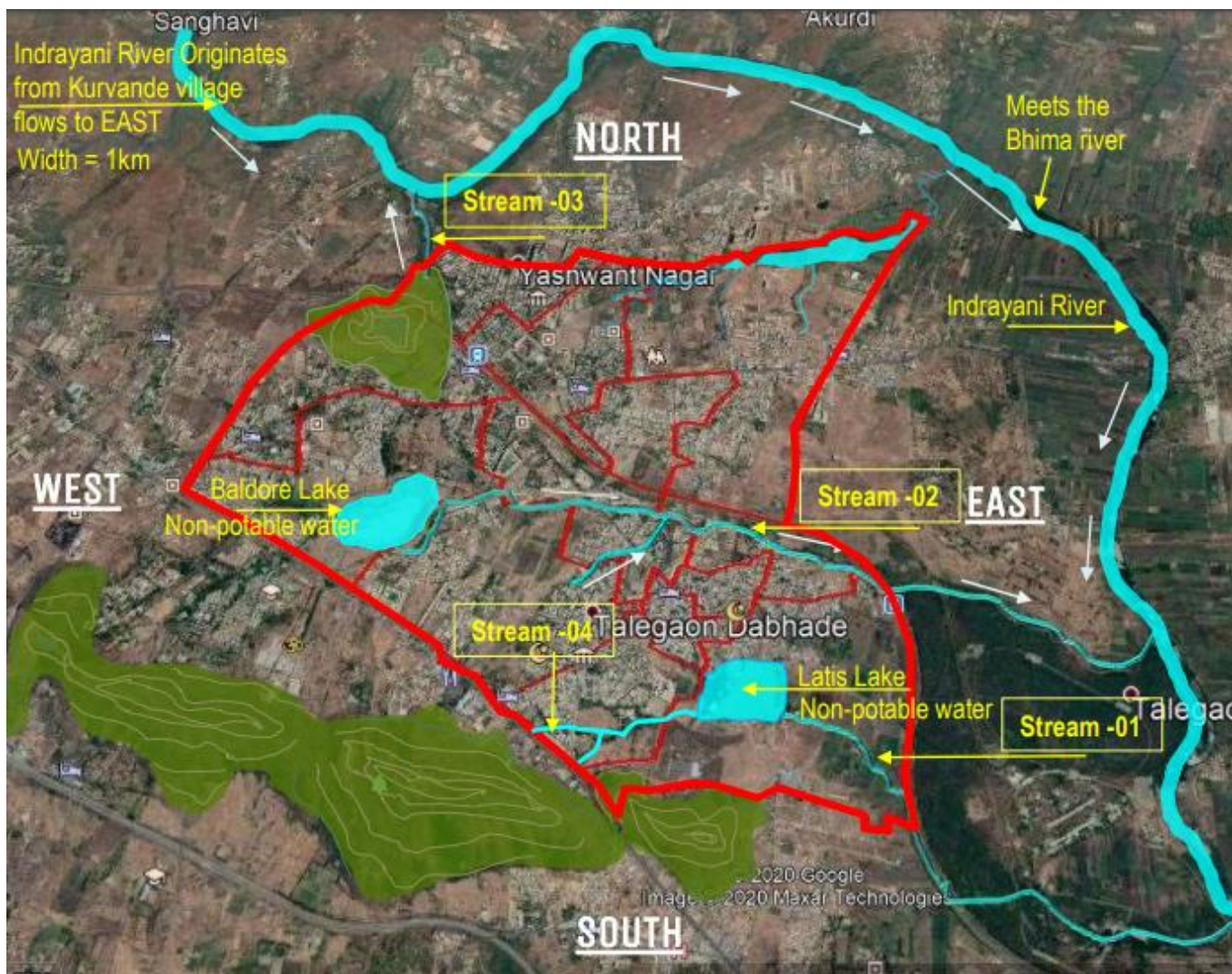
1. Non-point source controls: Septic system upgradation, drainage repair, Litter control measures, Regular monitoring etc.
2. Maintaining minimum flows, Increase in dissolved oxygen, Reduction of toxins, organics, metals, etc. Reducing bank erosion and sedimentation Litter Clean-up Invasive control (such as the zebra mussel) Fish restocking.
3. Public events based on watershed, Reduce health hazards, Improved visibility of stream, Public information (such as signage, websites, and newsletters).

5. TOPOGRAPHY OF TALEGAON DABHADE.



- Slope is towards East and North-east and towards the lakes and streams.
- Level of the lakes are Latis level is 602m and Baldore lake is 624m.

6. WATERSHEDS OF TALEGAON DABHADE.



Baldore and Latis Lake are the only two lakes left with water out of seven at present condition out of seven. Stream 1 is connected to Latis Lake and Indrayani River. Indrayani River which originates from Kurvande village flows to East & Meet the Bhima River through Dehu and Alandi these are the Hindu Pilgrimage center. Stream 2 flows from West to East through Baldore lake and meets the Indrayani River. Stream 3 flows from South to North which meets to the Indrayani River. And Stream 4 flows from West to East meets to the Latis Lake as shown in picture above.



Stream carries waste water from the side locality. Natural streams are converted into waste water drains. Results in loss of Ecosystem.

7. CASE STUDIES

7.1 COOUM RIVER, TAMIL NADU

The Cooum river in the Tamil Nadu is one of the shortest Classified rivers draining into the Bay of Bengal. To stop the surface trash and weeds the floating barrier used diagonally (not in perpendicular position) over the water stream and it also allows the water to pass through the barrier as shown in the picture below. By Using the natural flow of the water, barriers which are diagonally placed brings the surface trash to the river bank. As soon as the trash hits the barrier, it automatically slides downstream. From there, collected trash is extracted by the land based excavators and conveyors.



7.2 NEKNAMPUR LAKE, HYDERABAD



In the Nekkampur lake in Hyderabad they have left the artificial islands with plants in water to stay floating on the lake, to improve the water quality.

The plants keep the lake clean through hydroponics system, resulting in a cleaner water and a beautiful lake in turn. This water is best suited for the flora and fauna depending on the water.

7.2 KOI FISH IN DRAINAGE CANAL IN JAPAN.

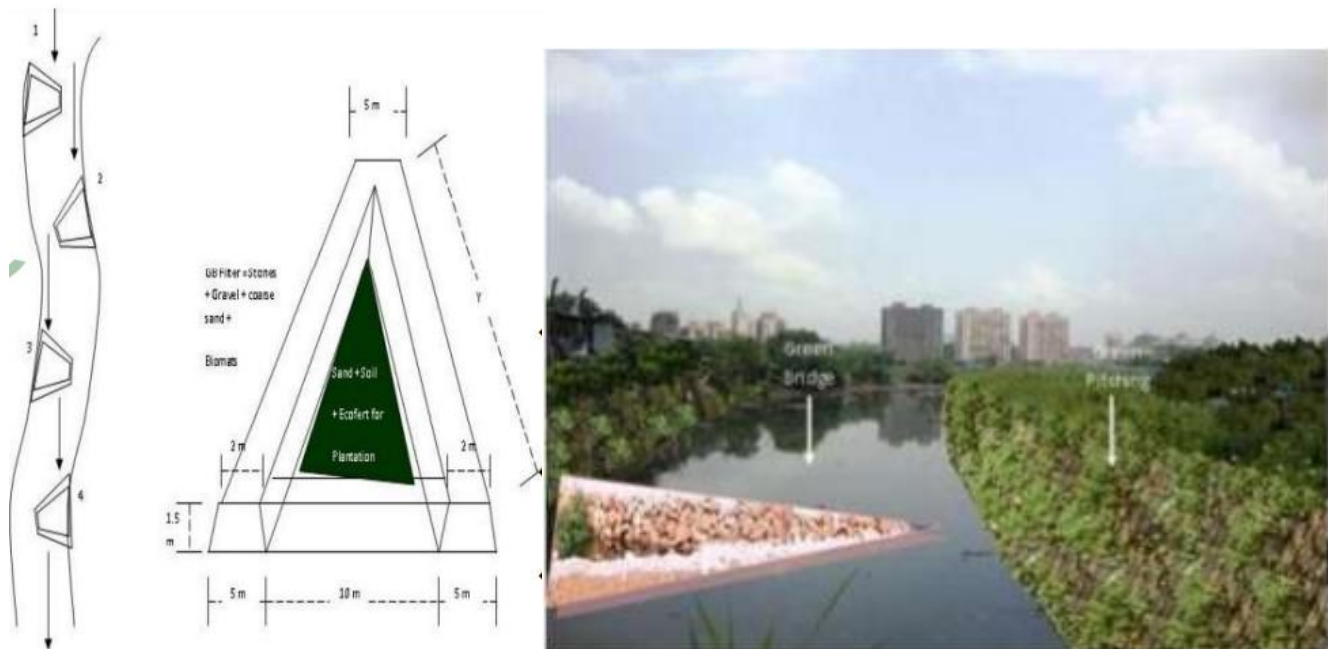


Koi fish which are Carp, are bottom feeders. They feed over all type waste accumulated at the bottom of any type of water Body/drainage, keeping the ditches clean. In Japanese City, Colorful Koi Fish Swim through the Street Drainage Canals. In the city of Shimabara on Japan's Kyushu Island, the street's gutters they are home to hundreds of koi carp as are so clean.

8. STREAM RESTORATION

For the stream restoration first have to identify the problems, analyze the resource data determine the objectives, secondly formulate the alternatives evaluate the alternatives and make decisions accordingly. And finally evaluate and implement the plan.

8.1 GREEN BRIDGE TECHNOLOGY



Green Bridge Technology is the horizontal eco-filtration system – a propagation of ecological system to treat the pollution flowing through the streams and rivers. For the plantation, it consists of Sand, soil and Ecofert. The turbidity of flowing water is reduced because all the floatable and suspended solids are trapped in this biological bridge. Increasing the diffused oxygen level in water because of the Green Plants present on the bridges and which in turn makes easier the growth of aerobic organism, which reduces the organic pollutants.

8.2 USE OF AQUATIC PLANT

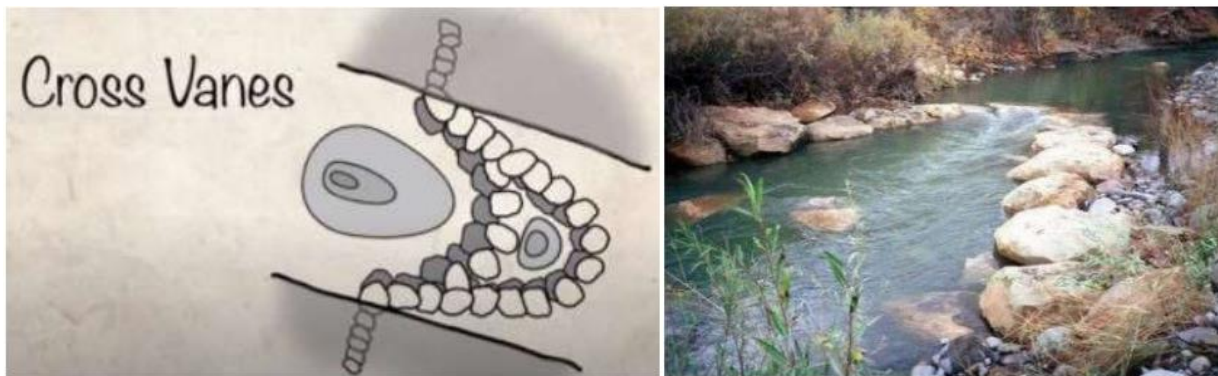
For improving the water quality aquatic plant can be used. Absorption of the high levels of phosphorus and nitrogen in the sewage water entering the water body is done by the plants. The pollutant removal plants are Water Lettuce, Water Hyacinth, Golden pathos, Water chestnut, Water Lillis, Water star grass, Lotus etc.



And also includes wetland plants, mosquito repellents and ornamental plants like Cattails, Bulrush, Citronella, Canna, Hibiscus, Fountain grass, Flowering herbs, Tulsi, Ashwagandha.



8.2 CROSS VANES TECHNOLOGY FOR NATURAL STREAM



To control the direction of flow of the stream, rock structures built below the water level which are carefully placed this type of structure is called Cross. Rock structure present in streams are used for this technology. And also it is less expensive. To direct a stream's energy toward the center of the channel and relieve pressure on an eroding streambank one or more structures can be used. The sizing of the structure and angled must be done to be more effective.

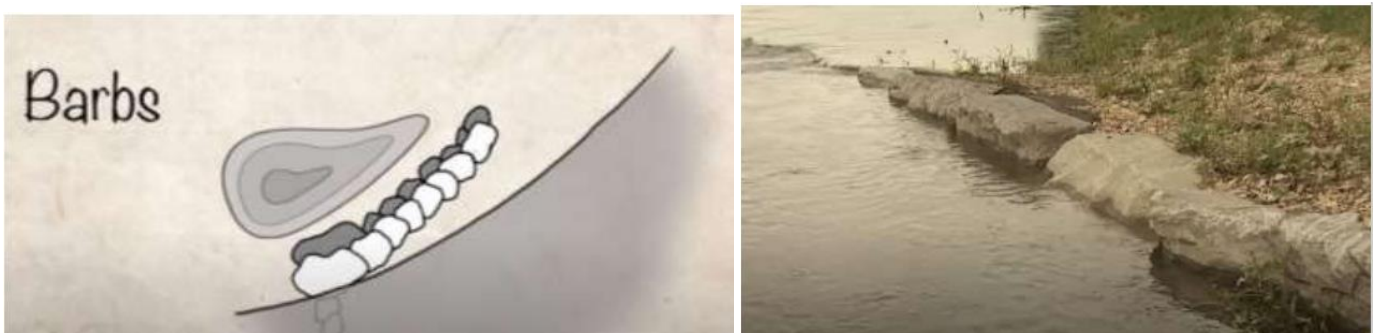
These structures were formed or developed and applied to

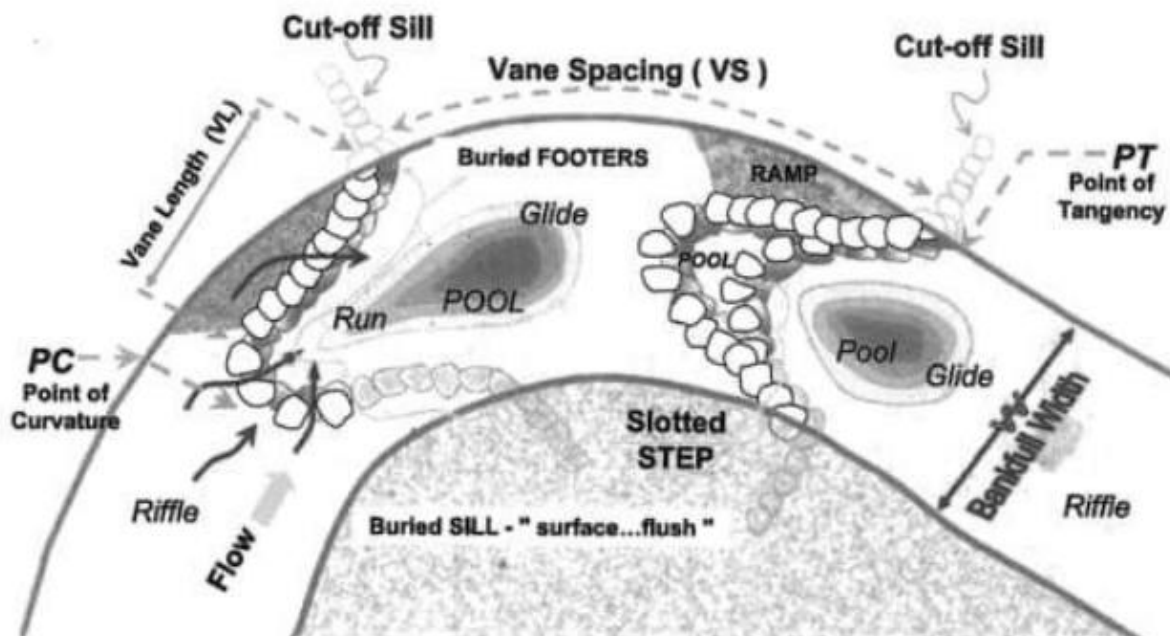
1. To Establish grade control, 2. To Reduce streambank erosion, 3. To Facilitate sediment transport 4. To Enhance fish habitat 5. To Maintain width/depth ratio, 6. To Maintain river stability, 7. To Dissipate excess energy, 8. To Withstand large floods, 9. To Maintain channel capacity, and 10. To be compatible with natural channel design.



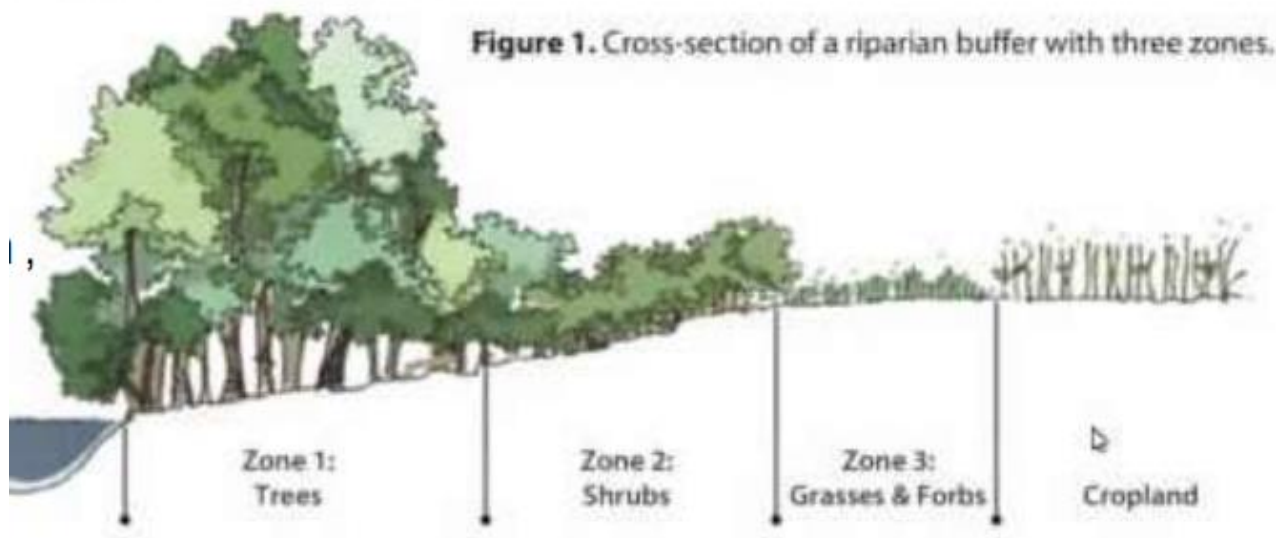
8.3 BARB TECHNOLOGY FOR NATURAL STREAM

Rock structures that extend into the stream flow to modify bed topography and flow patterns of the stream are called Stream Barbs. During channel-forming flow events considered approximately a 1.5-year flow Stream barbs are very low structures that should be completely overtopped. is defined as the flow that transports the greatest amount of sediment over a long period of time and controls the channel geometry is called the Channel-forming flow or bankfull. Barbs are used for streambank stabilization, erosion Risk, and fisheries habitat improvement in meandering, alluvial water body systems. By using variety of materials facing flow of the stream which is located outside of the meander bend that are barbs.



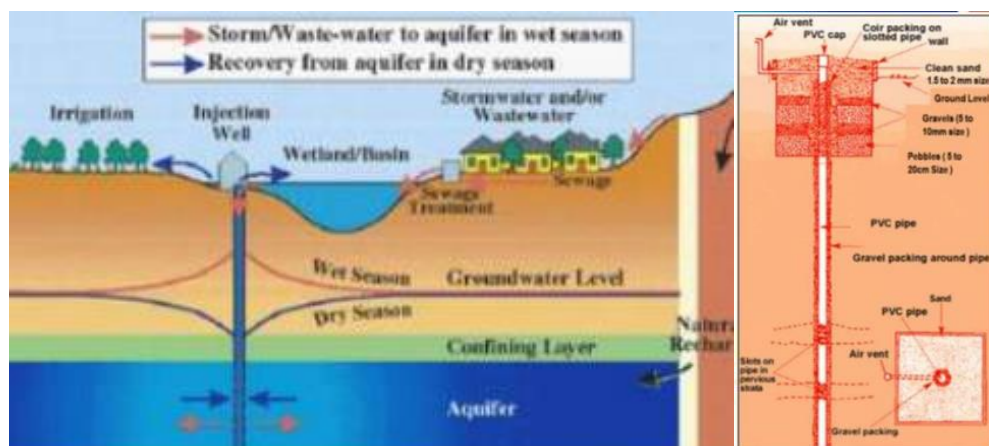


Provision of Cross vanes and green bridge over the certain intervals that can be done to improve the water quality. Plantation of native trees 3-4.5 m , shrub 2 m etc.15 meters of buffer zone is created from the streams.

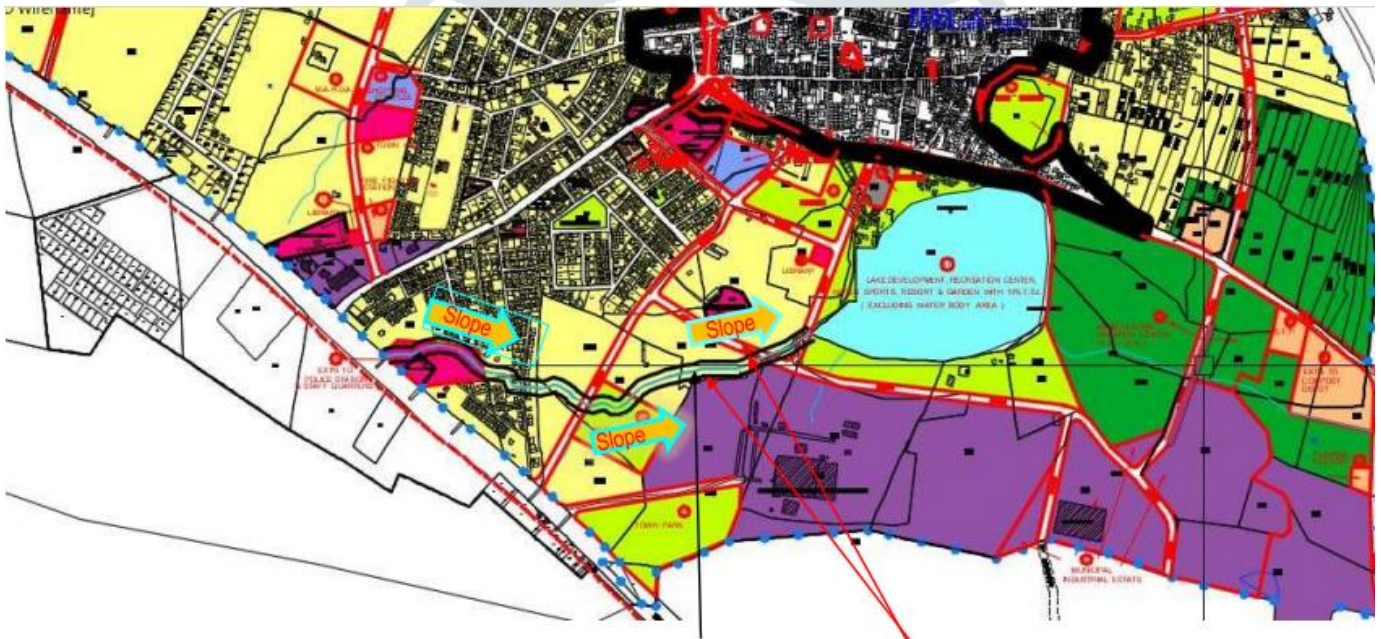
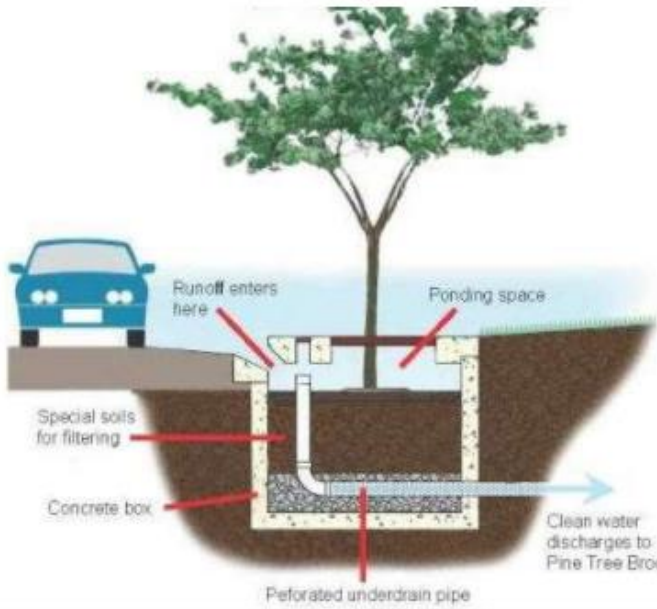


8.4 AQUIFER RECHARGE

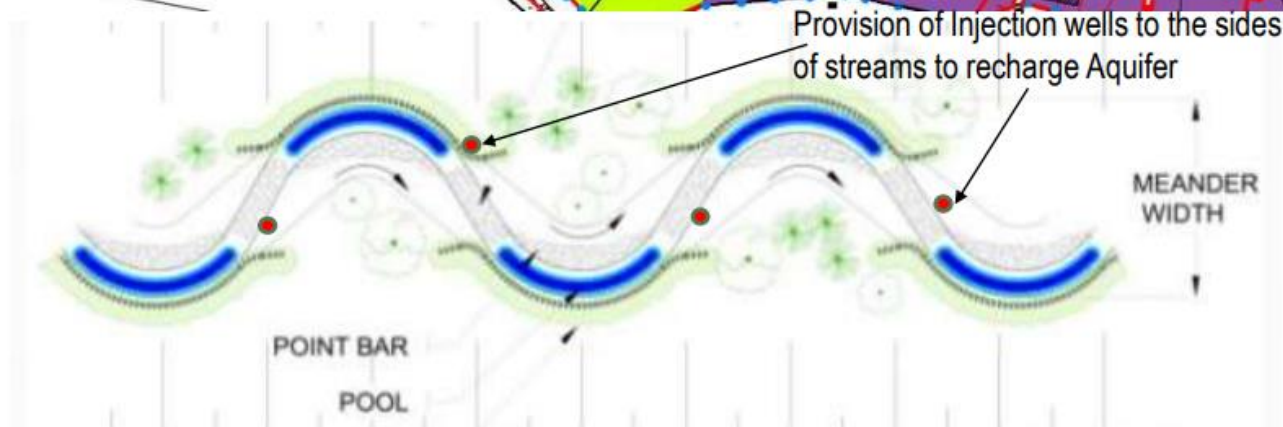
Recharge of the Aquifers are the another techniques for the watershed management. For the Aquifer Recharge collection of baseline information i.e Topo sheet, DPR etc, geological mapping & preparation of geological map. Establishing water level data, well inventory, Rain gauge etc. Preparation of aquifer maps, conduction of the pumping test, water quality analysis, conducting socio-hydrological survey, finding groundwater balance and preparing the Groundwater management plan.



Injection wells can be used to recharge the Aquifers, storm water runoff flows inside the injections wells it consist of concrete encasing around the injection well head and inside that there are gravels to purify the surface water and to that head pipe is connected up to the aquifers. Surface rainwater or water is collected in the concrete box and the water is supplied through the pipes to the recharge the aquifers.



- Existing stream
 - 1.5 to 2m wide
 - Length is 1030m
- Black colour line 15 meter buffer zone or setback from the existing streams



Reshaping of streams with meander pattern.

Conclusion: By using techniques like Green bridge, Cross Vanes, Barbs, and providing injection wells at the regular intervals to recharge the aquifers, and by reshaping the streams with meander pattern, creating artificial islands, planting aquatic plants by using floating barriers we can restore & can improve the present condition of the Aquifers and the watersheds of Talegaon.

REFERENCES

- [1] Pat O'Neill, Ben Higgins, And Christine Rohrer "Applying Integrated Watershed Management Techniques in Stevens Creek", Water Environment Foundation 2006
- [2] Singh RV. 2000. (Ed.) Watershed planning and management. Yash Publishing House, Bikaner, Rajasthan, India.
- [3] Bohn BA, Kershner JL (2002) Establishing aquatic restoration priorities using a watershed approach. J Environ Manag 64(4):355–363
- [4] Allen, P. M., Arnold, J. G., and Byars, B. W.(1994). "Downstream channel geometry for use in planning-level models." Water Resource. Bull., 30(4), 663–670.