



Where does the water come  
from and where does it go?

Catchment, Drainage  
and Cascade




This document has been made to be used as a community resource and is meant to evolve with the contributions and experiences of everyone working to protect lakes. Please write to us with your contributions.

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Please write to us at [water@biome-solutions.com](mailto:water@biome-solutions.com) or find us on Facebook [here](#).

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An aerial photograph of a city, likely Bengaluru, showing a dense urban landscape with a grid-like street pattern. Several lakes of varying sizes are scattered throughout the city, appearing as dark, irregular shapes. The text is overlaid on the left side of the image.

This is a cascade of  
lakes: from  
Puttenahalli Lake  
upstream to  
Allalasandra Lake,  
Jakkur Lake,  
Rachenahalli Lake,  
Hebbal and  
Nagawara Lakes



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This is Jakkur Lake's  
rough catchment  
area



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Jakkur Lake has multiple inlets







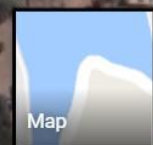
Here is its tank  
bund

Google




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6 Environmental





An aerial photograph showing a large, rectangular, light-colored industrial facility, identified as the Jakkur STP, situated in a green, wooded area. To the right of the facility is a large, dark, irregularly shaped body of water, identified as the lake's wetland. The surrounding landscape includes patches of green vegetation, some residential buildings, and a dirt road.

Here you can see  
the Jakkur STP


It has 10mld  
capacity

And here is the  
lake's wetland.



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This is the overflow  
and drainage



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It has a beautiful  
open well



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And a Kalyani



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An aerial photograph showing a large, calm lake in the center. To the left of the lake is a densely built-up urban area with many small, light-colored buildings and some larger structures. A road or railway line runs diagonally through this urban area. To the right of the lake is a more rural landscape with large, rectangular agricultural plots, some of which are green, suggesting crops. The lake itself has a few small, dark islands or patches of vegetation in the water. The overall scene is a mix of urban development and natural/agricultural land.

You can't see it but  
this lake provides  
200 kg of fish per  
day in peak season



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Many apartments  
that offer lake  
vistas are coming  
up



All these lakes are  
connected, they  
flow into each  
other.

The health of one  
lake affects the  
health of the entire  
system

Puttenahalli Lake

Allalsandra Lake

Jakkur Lake

Rachenahalli Lake

Hebbal Lake

Nagawara  
Lake





# Our Lakes: Components of the Water System

The **Catchment** is a geographic area where rain falls and flows into the lake

**Drainage** is the network of kaluves and raja kaluves (storm water drains) through which rainwater flows

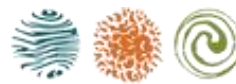
Every lake has **inlets** which bring this water into the lake

A **lake/tank bund** is a stretch or ridge that holds the water back and creates the reservoir

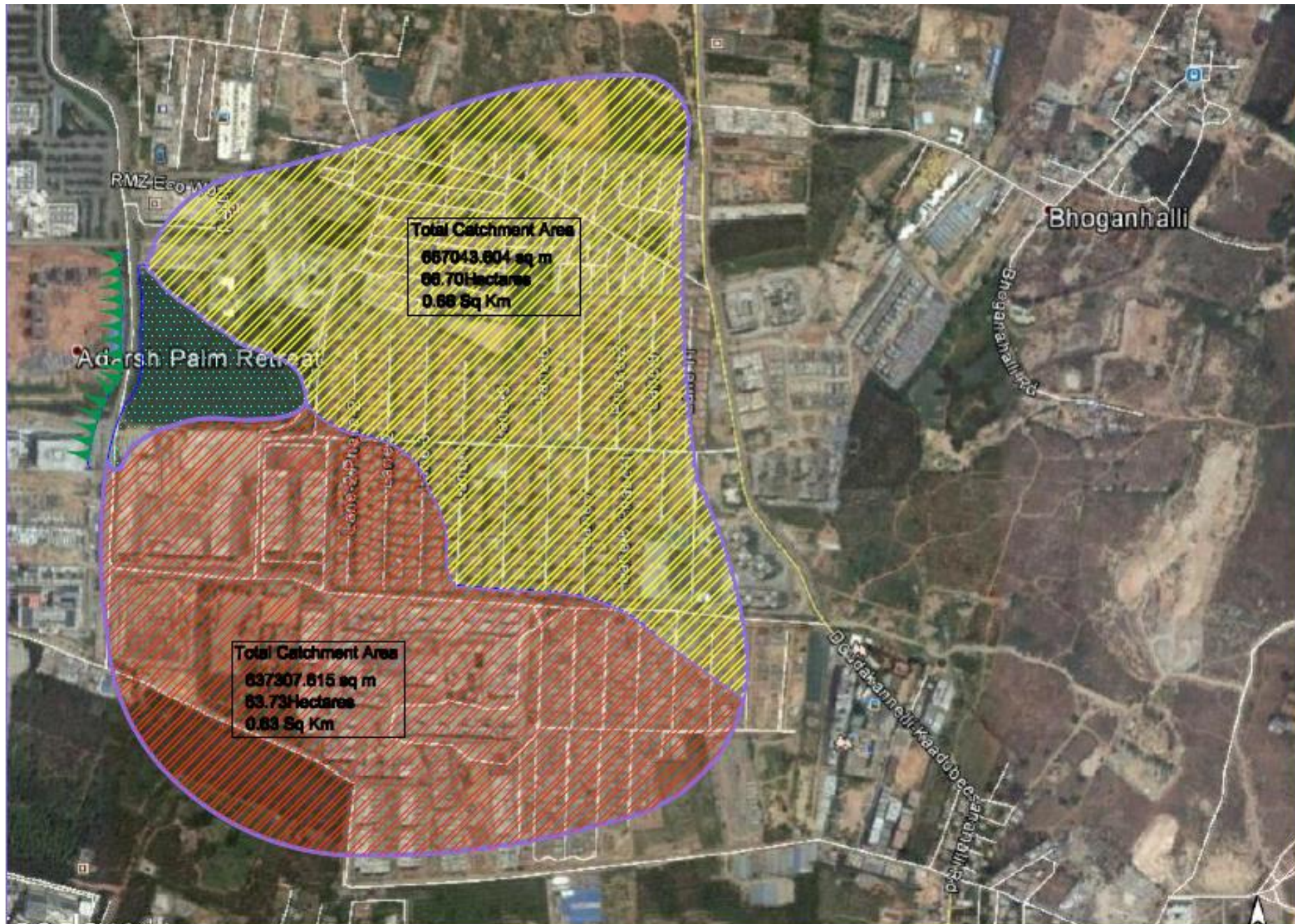
The **overflow** from the lake goes through the overflow weirs or culverts. These are traditionally referred to as **Kodis**.

The **Achcut** or command area is what is downstream of the bund and would have originally received irrigation benefits.

All these elements come together as a **cascade** or **cascade network of lakes** that are the rivers of Bengaluru

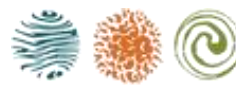






The **Catchment** of the lake is the extent of land where all the rainfall and surface water flow into the lake

Catchment of  
Devarabisanahalli  
Lake

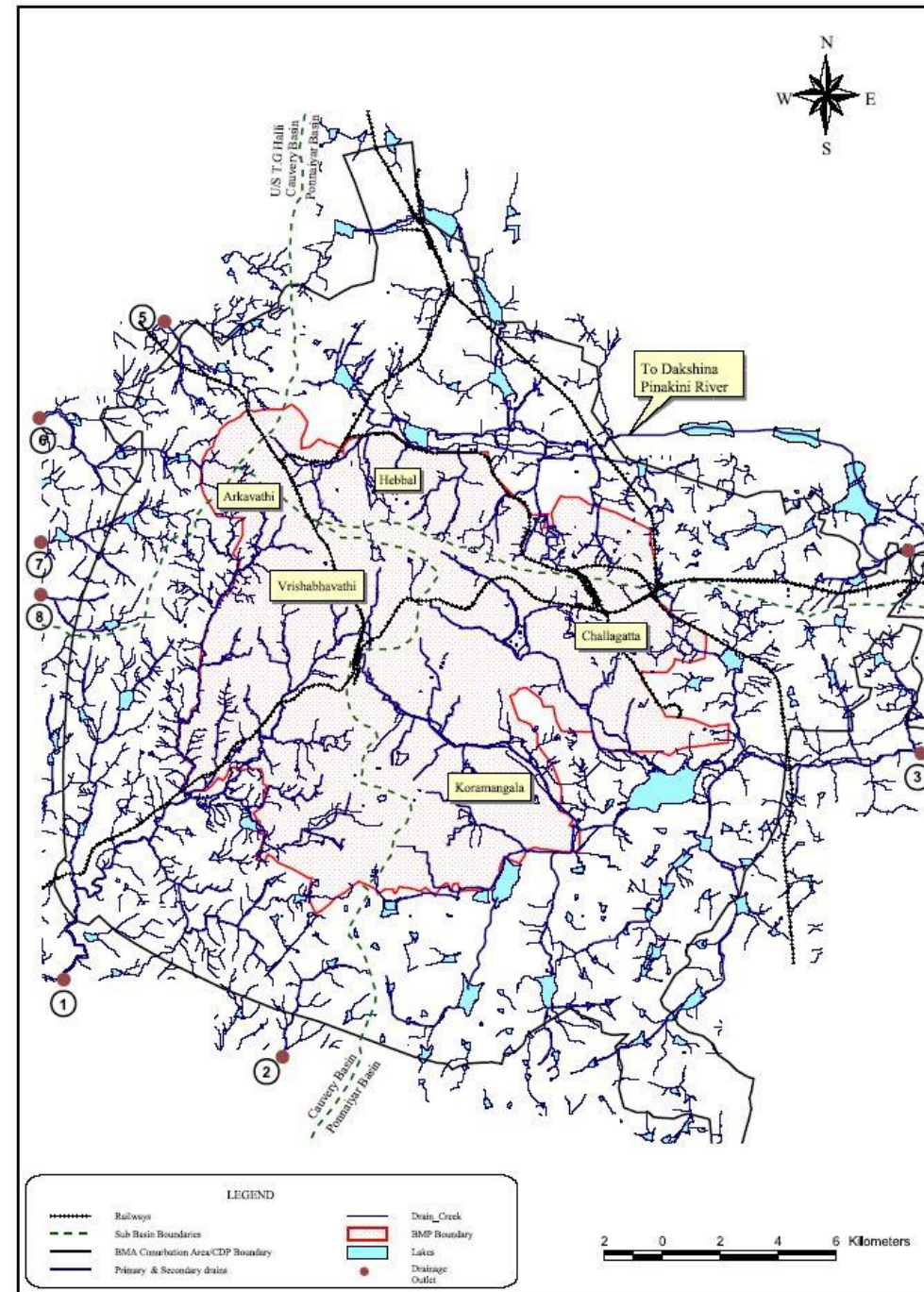


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# Bangalore's Stormwater Drainage

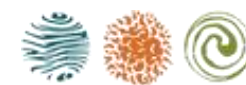
**Drainage** is the network of kaluves and raja kaluves (storm water drains) through which rainwater flows







Stormwater  
Drains or Raja  
Kaluves:  
A clean Raja  
Kaluve near  
Jakkur Lake and  
a Raja Kaluve  
filled with  
sewage in  
Hennur



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Inlets bring water into the lake.

Inlets in Jakkur Lake





# Wetlands: Improving Water Quality Naturally

A wetland in an urban lake is a part of the water body that breeds a high density of aquatic life, and typically uses up the nutrients in the lake and enhances the water quality of the lake.

The sewage entry into many tanks tends to naturally foster wetlands if nutrient levels are high.

Some lakes, such as Jakkur, have wetlands incorporated into their design.





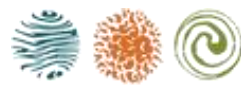


The **overflow** from the lake goes through the overflow weirs or culverts. These are traditionally referred to as **Kodis**.

Overflows:  
Jakkur Lake







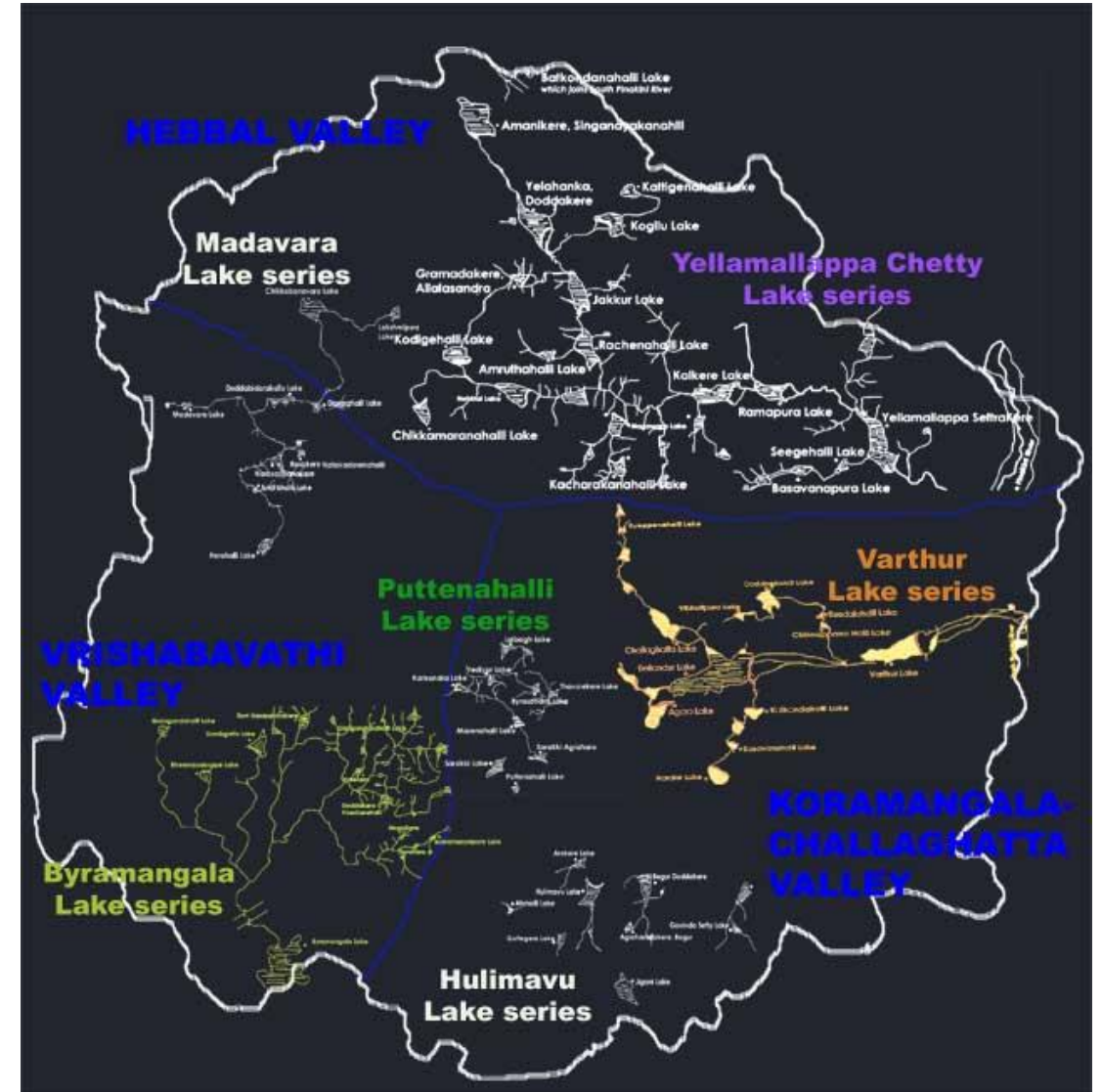


# The Cascade System

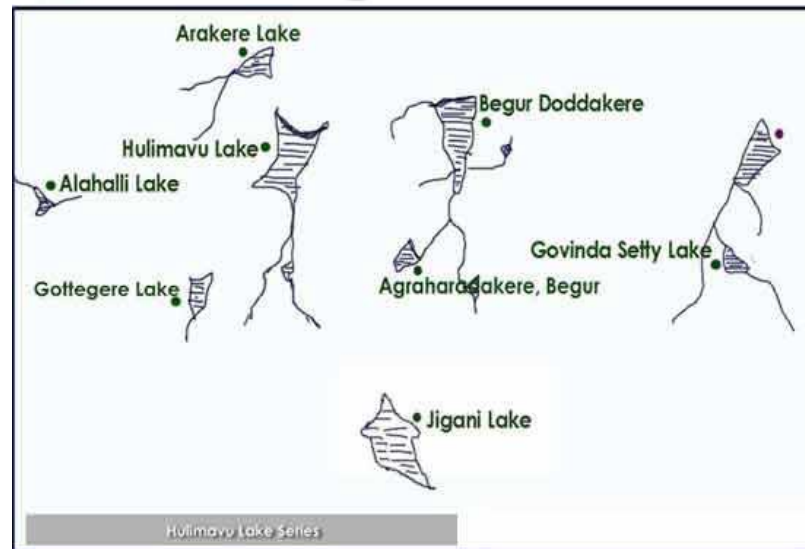
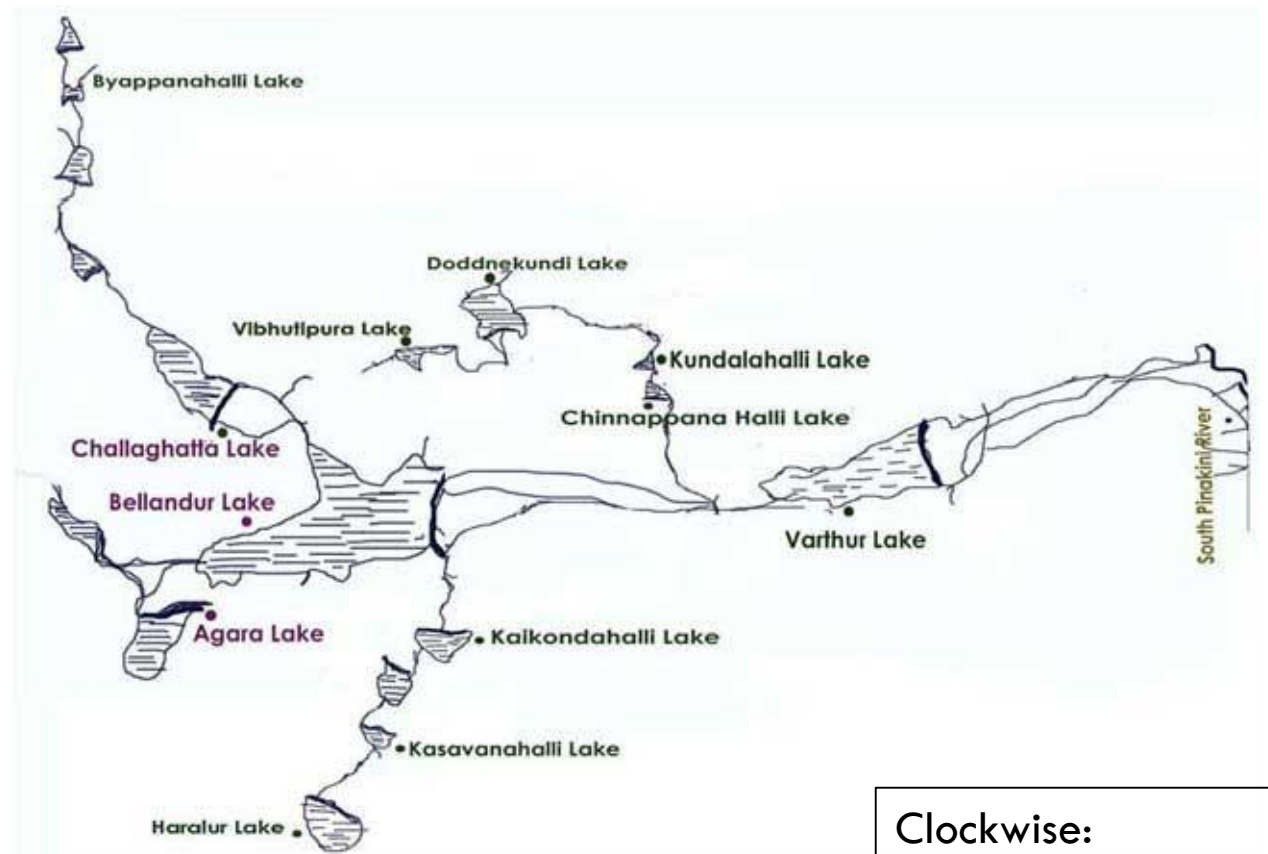
Lakes are linked to each other through drainage networks to a series of lakes or a **cascade**.

These cascades were designed to help water flow from higher to lower elevations.

These are some of Bangalore's lake series.







Clockwise:  
Yellamallappa  
Chetty Lake series,  
Varthur Lake series,  
Hulimavu Lake series,  
Lalbagh Lake series



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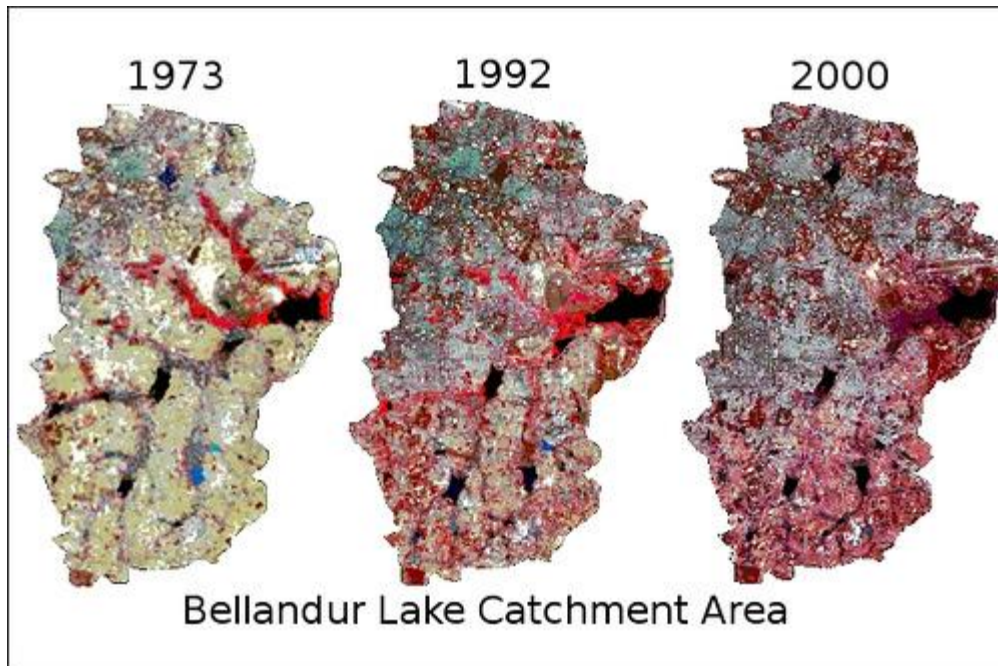


What happens to lakes  
over time

Community disconnect is  
what kills the lake



# This is Bellandur Lake: A Changing Catchment



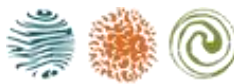
In 1973, you can see that lakes were well connected, with clear areas of vegetation growing along the networks that linked them (highlighted in red)

By 1992, as the city grew, these lake networks began shrinking and became increasingly fragmented

By 2000, the entire catchment has been transformed by the urban spread

*Lakes themselves get encroached and disappear*

Source: <http://praja.in/hi/bangalore/2007/09/21/bellandur-lake-i>





# What Happens to Drainage: Encroachment, Wastewater and Solid Waste



Flood plain encroachment



Solid waste dumping-Reduced culvert capacity, inlet block

Source:

[http://wgbis.ces.iisc.ernet.in/energy/water/paper/urbanfloods\\_bangalore/city\\_infrastructure.htm](http://wgbis.ces.iisc.ernet.in/energy/water/paper/urbanfloods_bangalore/city_infrastructure.htm)



# Resulting in Changes to the Cascade System





# Sowl Kere



Catchment and cascade disrupted – the lake goes dry.



# Untreated Waste Water & Solid Wastes Flow into the Lakes





# Dodda Kudlu Lake in 2012 and 2014 – encroachments into the lake





# Impact

**Lost livelihoods:** people dependent on these lakes forced out

**Lost resource:** Loss of the source of water for drinking, domestic, economic, environmental uses

**Lost space:** the community's access to the lake diminishes

**A Disconnect: the Community disengages from the lake**



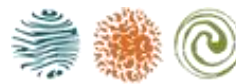
# The Lake Becomes a Liability

The lake is a public resource, it belongs to all of us.

Over time, there has been a lack of accountability and ownership, little or no monitoring, inequitable sharing and uncontrolled growth around our lakes.

The lakes have become a source of public health issues, a hive for safety and security problems, and a sink for all our waste.

The lakes have become a liability.







Source: BBC.com



Source: thehindu.com



The lake as a liability





The lake as a liability





The lake as a liability





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With thanks to  
Shri Ramprasad and Friends of Lakes, PNLIT,  
MAPSAS, Jalaposhan  
And everyone engaged in  
lake rejuvenation in Bangalore

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