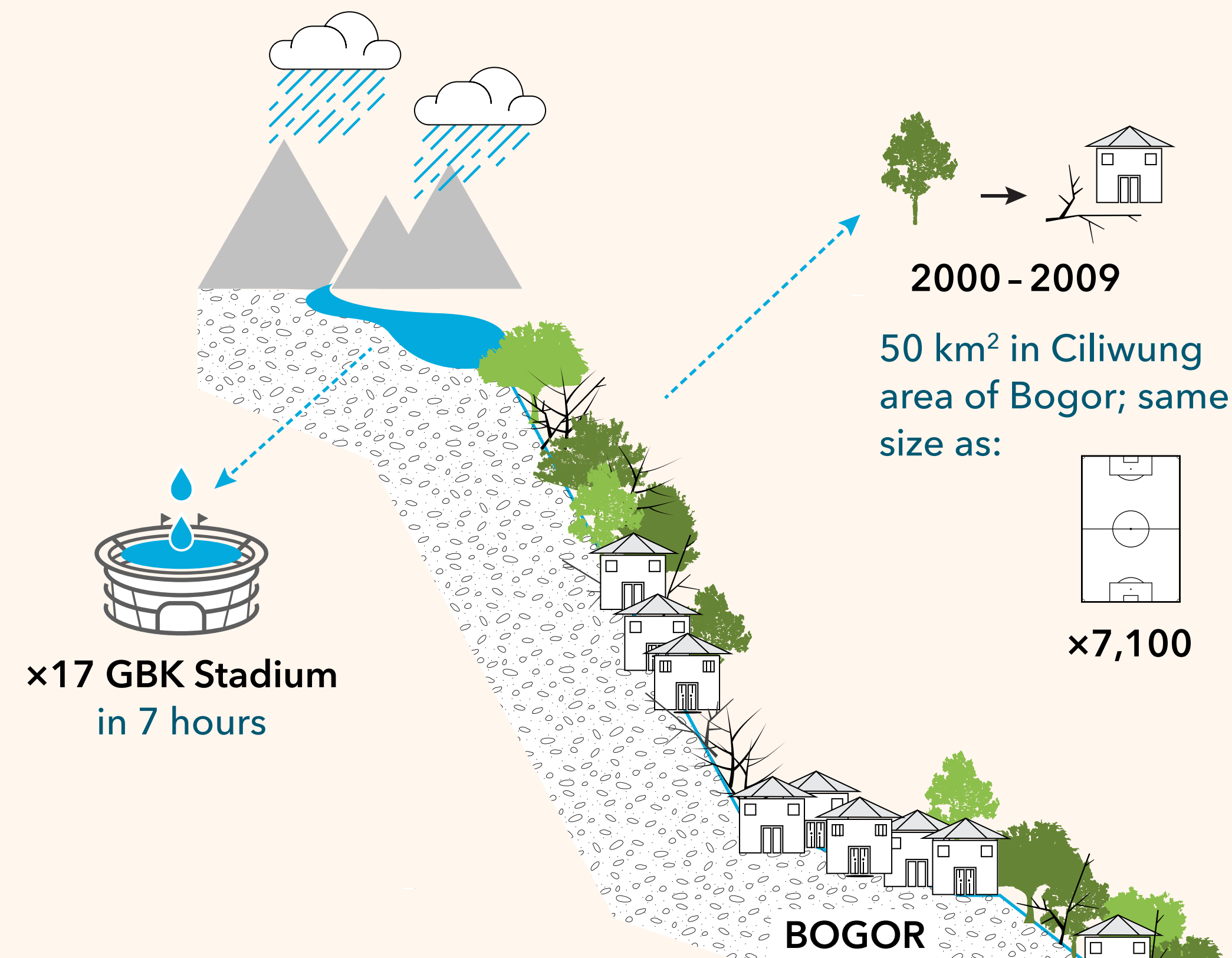


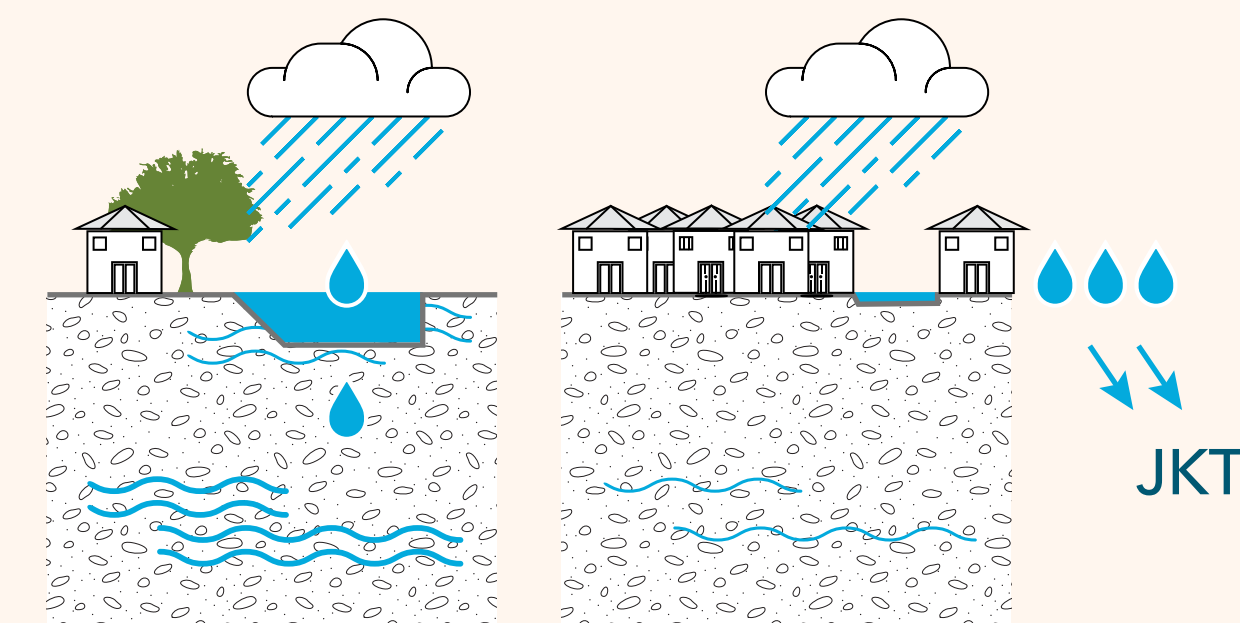
Water runoff from Bogor

Land use change from forest or plantations to private homes—many of which are built illegally—means that rain runoff is not absorbed into the land and flows straight downstream.



Water runoff from Depok

Depok's population is growing rapidly as people in Jakarta look for more affordable housing. 20% of Depok residents are Jakarta workers. More houses mean there is less natural land that can absorb water and rain runoff flows more quickly downstream.



Garbage

Urban waste within rivers and neighborhood gutters can block floodgates and other city infrastructure needed to control flooding.



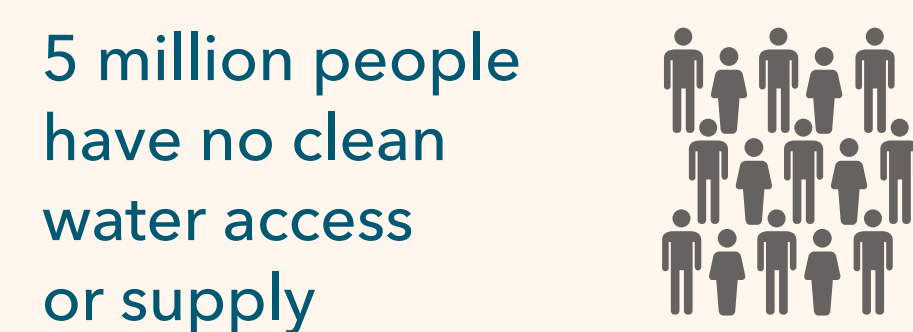
Reservoirs

Reservoirs and lakes are vital for flood prevention during the rainy season and water storage during the dry season. At the time of the Dutch there were 800 reservoirs. Now there are only 200 reservoirs and dams:

Bogor Regency	95 dams
Bogor City	6 reservoirs
Depok City	20 dams
Tangerang Regency	37 dams
Tangerang City	8 reservoirs
Bekasi District	14 dams
Bekasi City	4 reservoirs
DKI Jakarta	16 dams

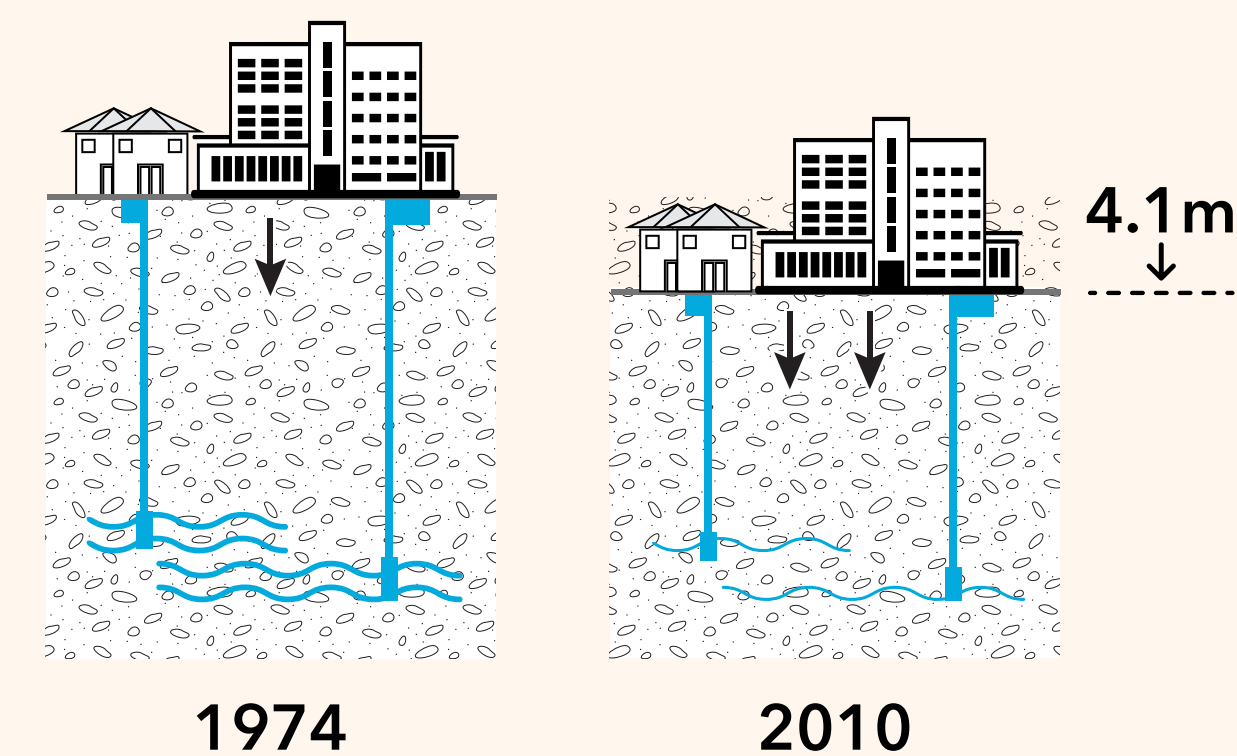
80% of reservoirs are now in disrepair, too shallow, or they have been turned into areas for housing.

5 million people have no clean water access or supply



Land subsidence

Land subsidence may have the largest influence on future flood risk. 40% of Jakarta is sinking 3-10cm/year because of excessive groundwater extraction. Many industries, companies and developers extract groundwater illegally.



Why Jakarta Floods

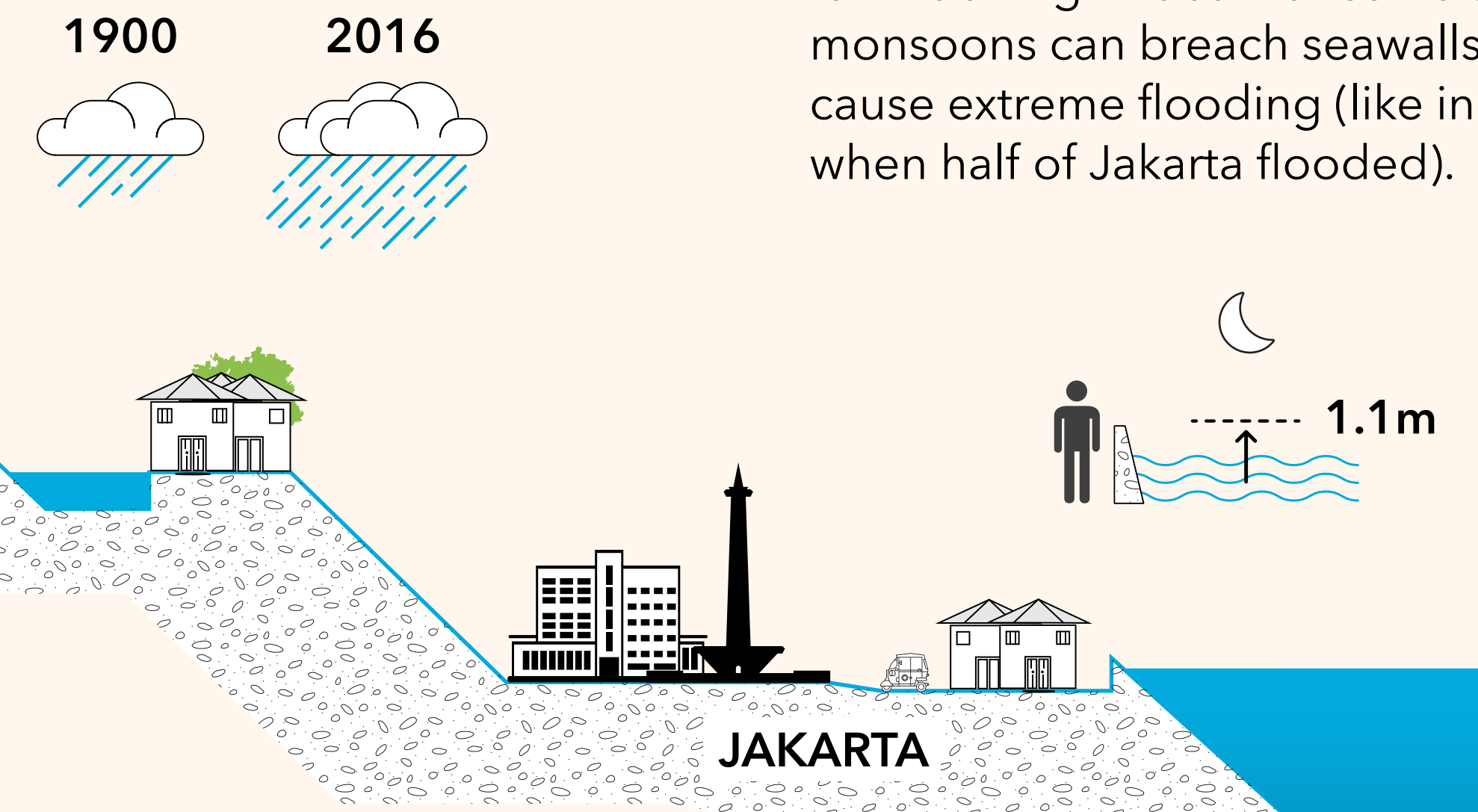
With 13 rivers flowing through the city, it is important to understand how each flooding factor influences flood risk.

Climate change

40% of Jakarta is below sea level and faces rising sea levels (up to 500mm by 2050), tidal waves and rainfall. Extreme daily rainfall (like the 2014 flood) is more frequent.

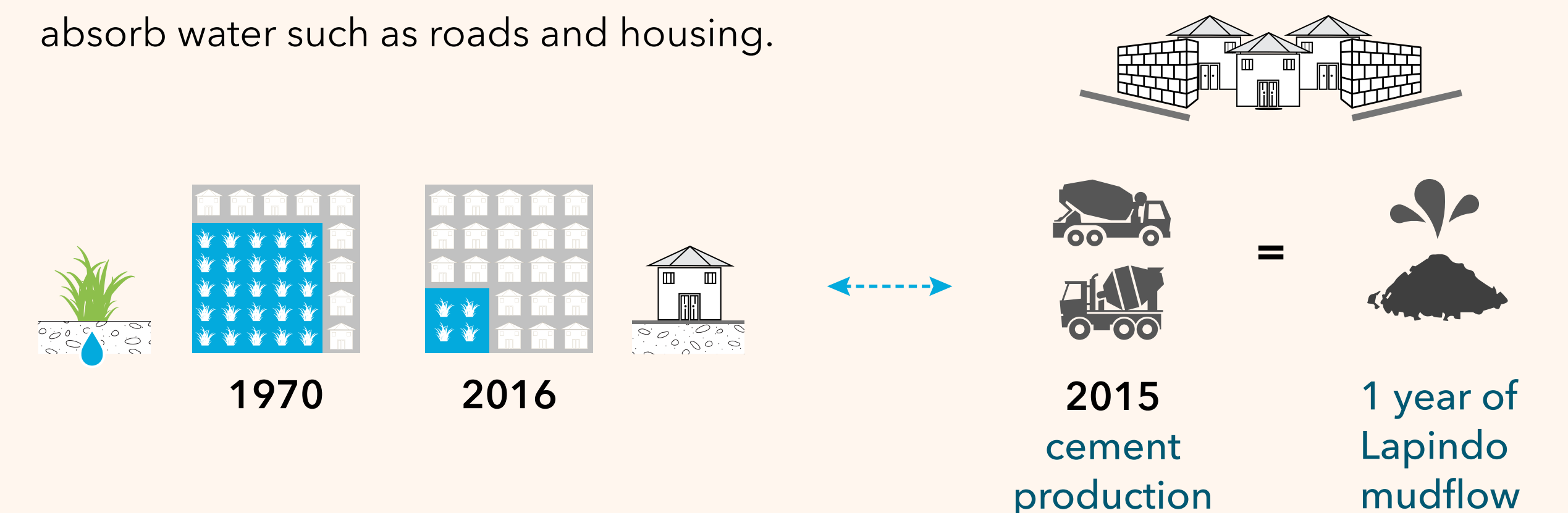
High tides

There is a maximum range of 1+ meters between high tide and low tide. High tides that coincide with monsoons can breach seawalls and cause extreme flooding (like in 2007 when half of Jakarta flooded).



Drained delta

Most of Jakarta was once a vast swampland that has since been drained and covered with surfaces that do not absorb water such as roads and housing.



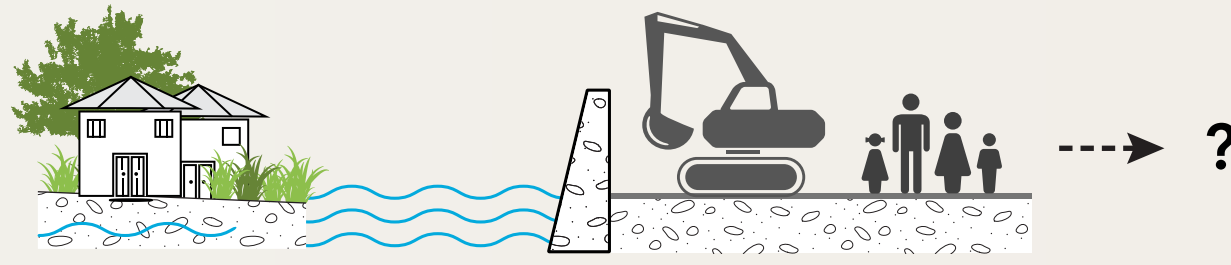
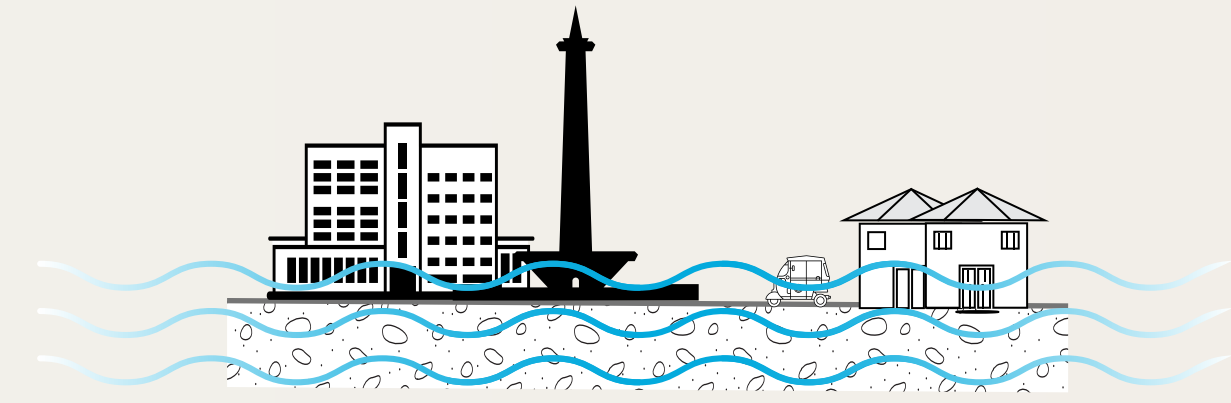
Current Solutions

Normalization

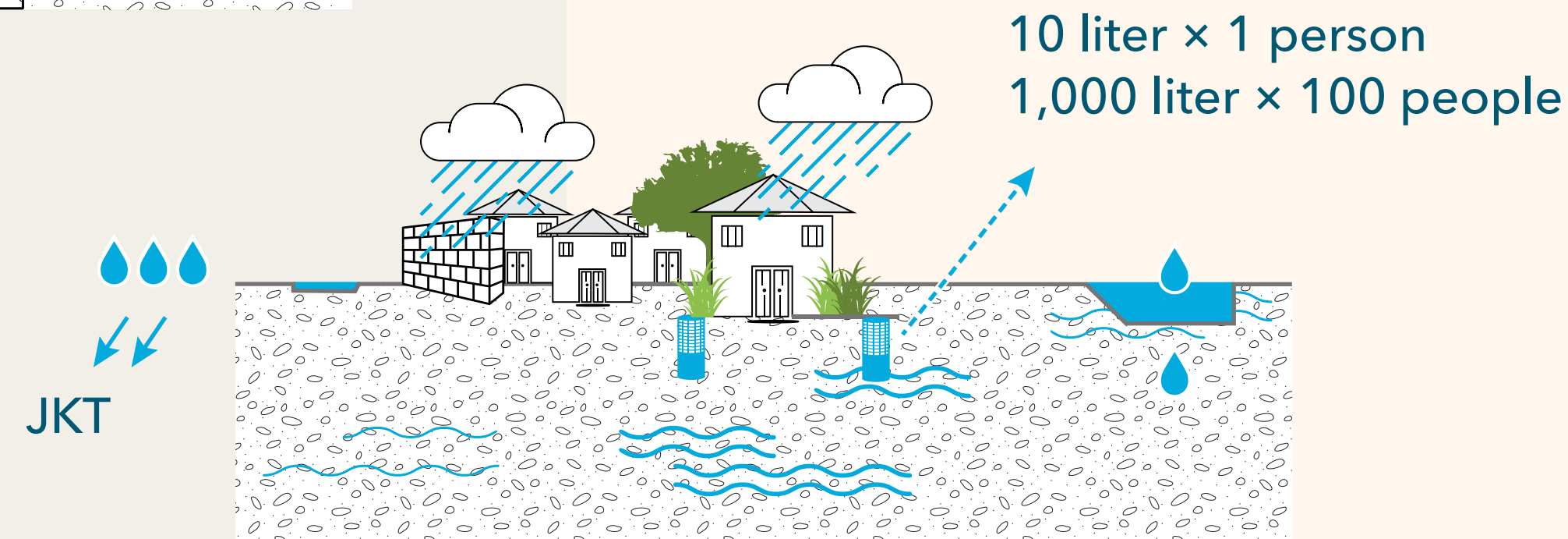
Straightening the river
Replacing the natural riverbank with cement causes increased water runoff that moves more quickly downstream.

Embanking with concrete
Pouring cement along rivers prevents water absorption and threatens groundwater availability for local residents who need it.

47%, or 9km, of the Ciliwung River has already been normalized of the 19km slated for normalization.



33% of 2015 evictions (>2600 families) occurred because of normalization.

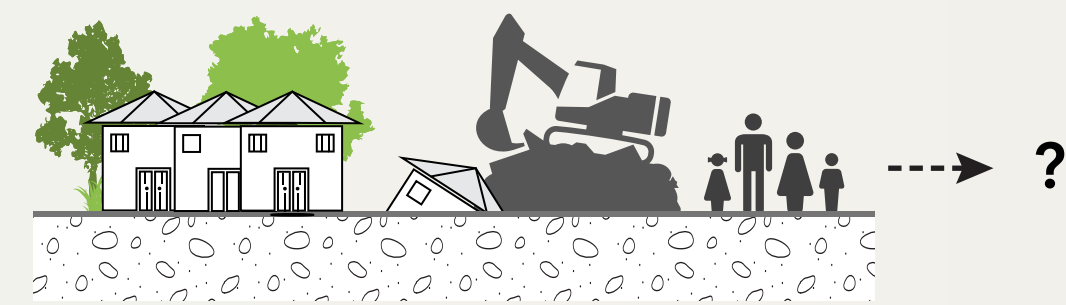


Increase catchment areas

Construction of new homes and any land-use change are monitored to protect permeable surfaces (that allow water to soak into the ground). Natural areas—such as forests, riverbanks, and lakes—along with existing reservoirs are preserved to catch water and recharge groundwater. People collect and reuse rainwater for household tasks. Land-use change is unnecessary and evictions are reduced.

Green zones

The designation of 'green zones' to increase water absorption mostly affects the poor while the wealthy can build over existing reservoirs and green areas.



TOTAL EVICTIONS

2014	2015
4,667 families	8,145 families
25 locations	113 locations

Land reclamation

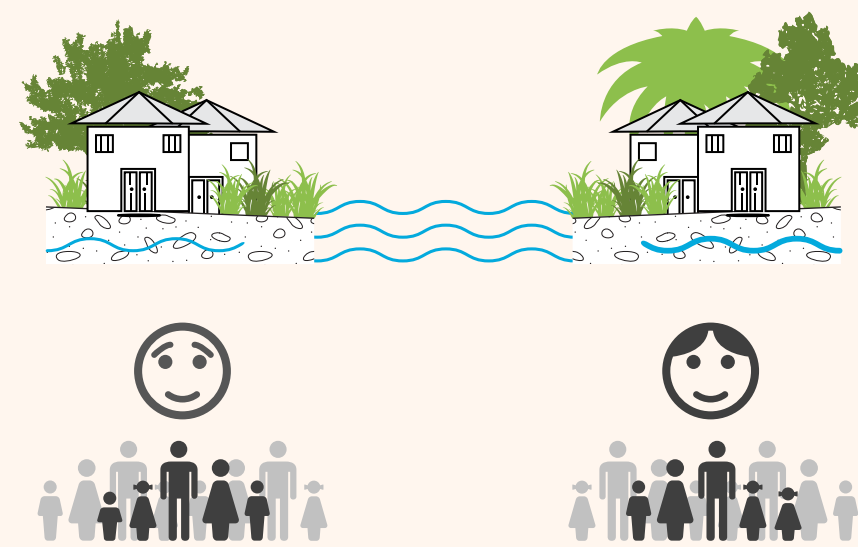
The creation of artificial islands limits water flow from Jakarta's 13 rivers into the sea, causing the pooling of sewage and increasing toxins in coastal waters. Reclamation also restricts fisherman access to the sea and causes higher coastal water levels that increase flood risk.



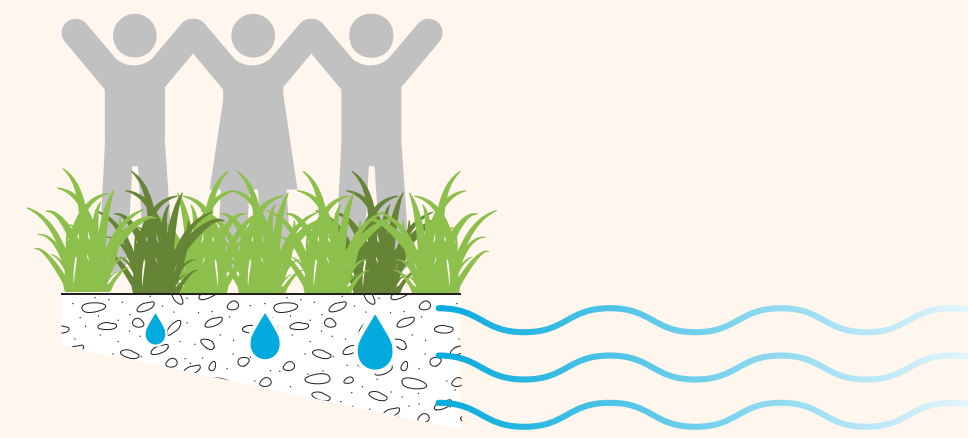
Terrible impacts on fisheries, flood risk, and the environment.

Naturalization

Rivers are no longer straightened and the practice of applying cement along the riverbank is discontinued. Rivers naturally absorb water into the sides of the riverbank, which slows water flow, allows groundwater to recharge, and lowers flood risk.



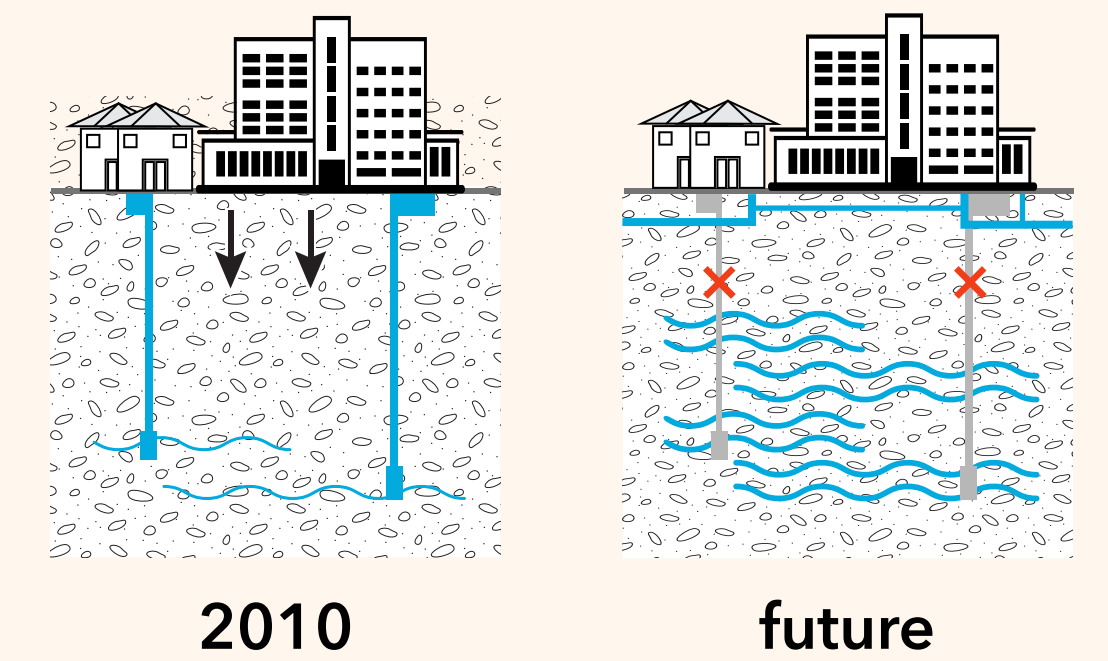
Ideal Solutions



Jakarta can still reduce flood risk while maintaining the quality of forests, rivers, coasts, and communities.

Reduce ground-water pumping

Water pipeline infrastructure now supports residential areas, businesses, and industry needs. Grey water is recycled. Because the ground sediment is naturally saturated with water, Jakarta land subsidence has slowed. With less sinking areas, flood risk is reduced and homes and businesses are safer.



No reclamation

Jakarta Bay reclamation no longer blocks river flow into the sea and fishermen have full access to the bay and marine resources. Jakarta's coastal and river embankments are strengthened and flood risk is much lower. Water quality in the Bay of Jakarta improves because rivers flow with gravity to the sea.



Waste management

Jakarta has a sewage treatment plant that improves water quality in the Bay of Jakarta (only 2% of waste water is managed in 2016). With a better management system, rivers are clean and water quality along the coast is improved. Small communities, such as kampongs, self-manage waste to reduce garbage buildup and clean rivers.

