

Sinkholes in MASS

Sinkholes in MASS are caused by five factors

- **Population growth**
MASS experienced an unexpected surge in population around their civil war from 1980-1992
- **Tierra blanca joven (TBJ)**
MASS is built on 50cm - 50m of fine, silicate volcanic ash
- **Hydrological systems**
Both human made and natural systems easily erode TBJ
- **Maintenance**
The city is unable to keep up with increasing maintenance as pipes age
- **Earthquakes**
About 20 earthquakes of medium intensity are felt annually in El Salvador. Earthquakes crack water pipes.

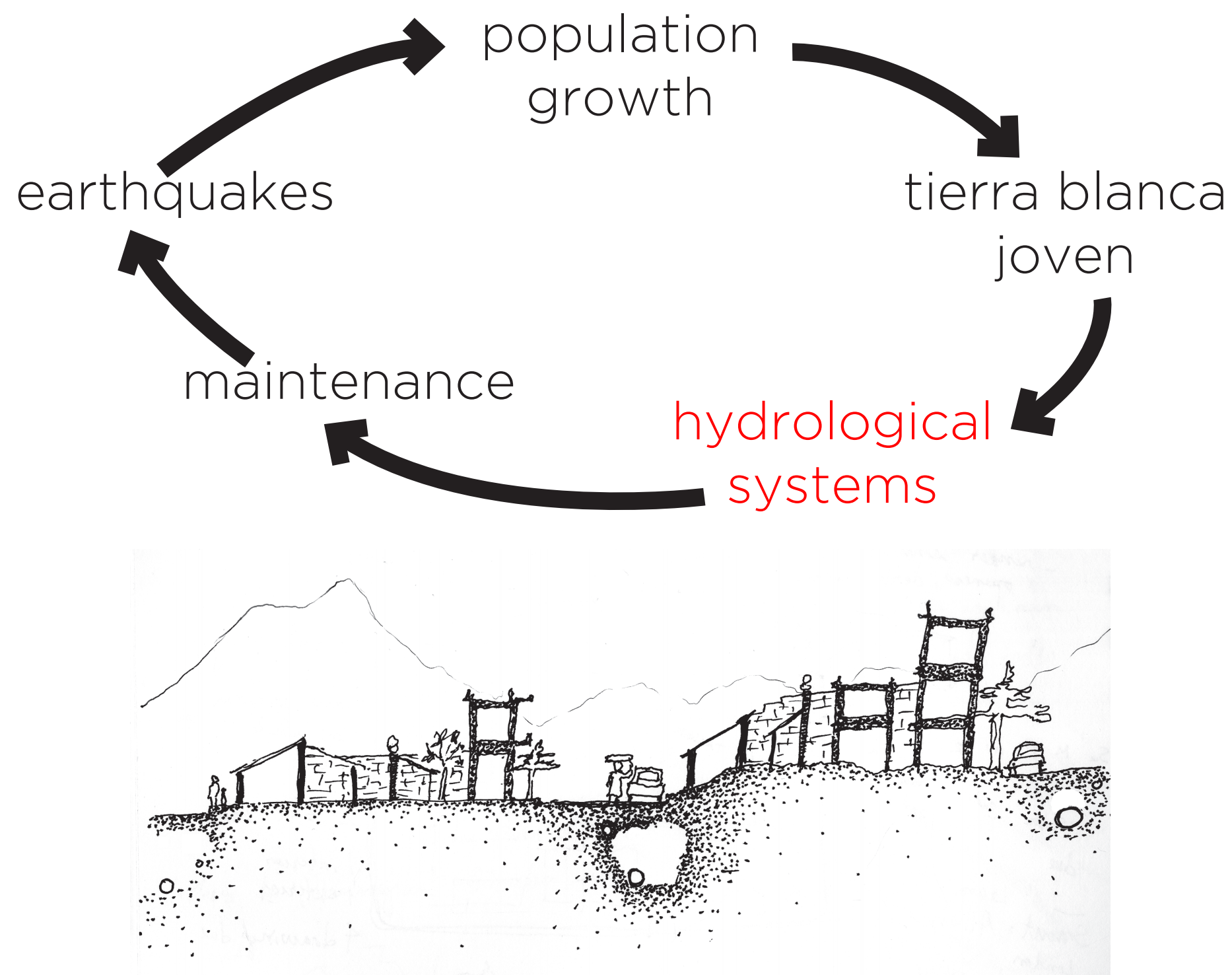
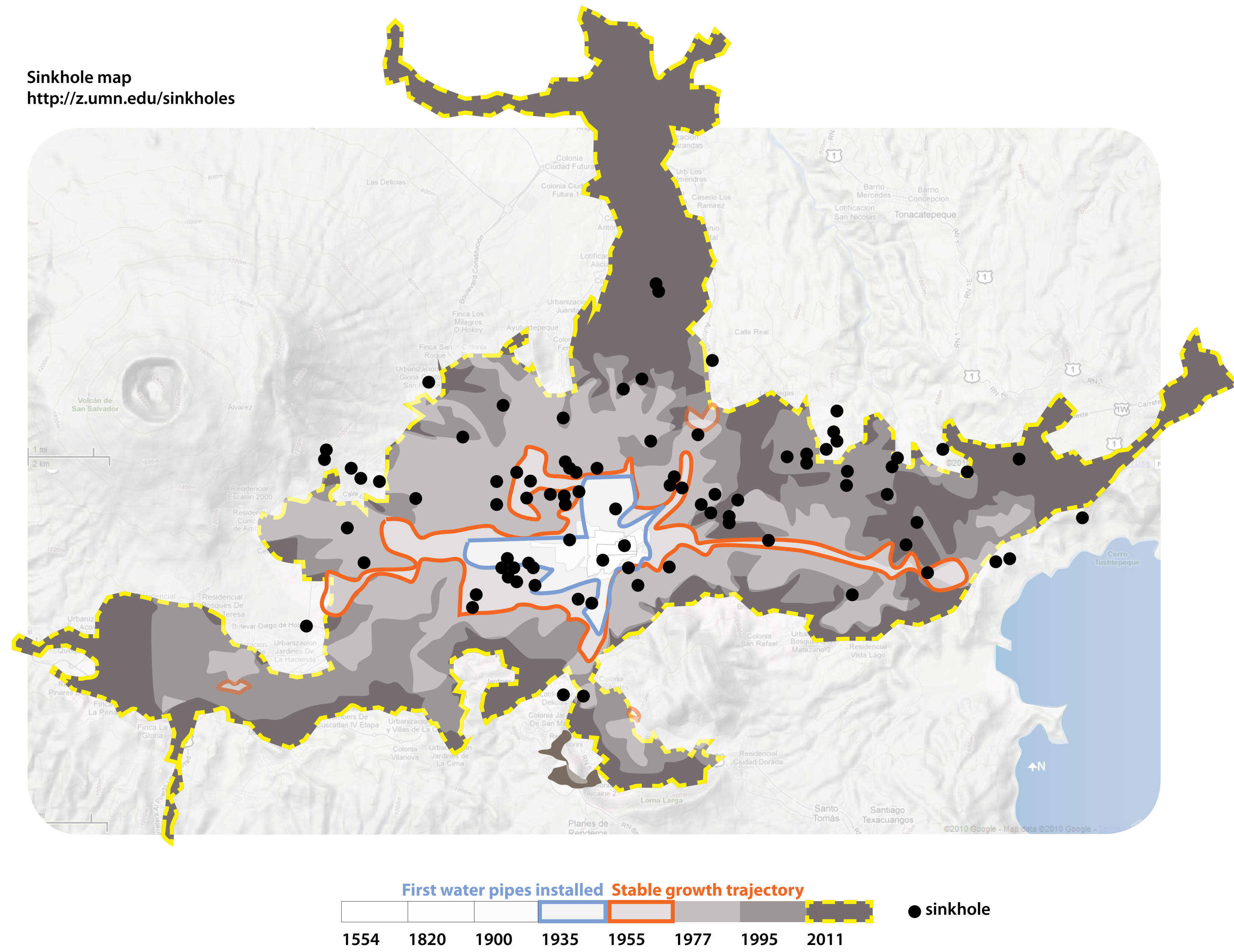


Sinkholes in the Metropolitan Area of San Salvador (MASS) are caused by

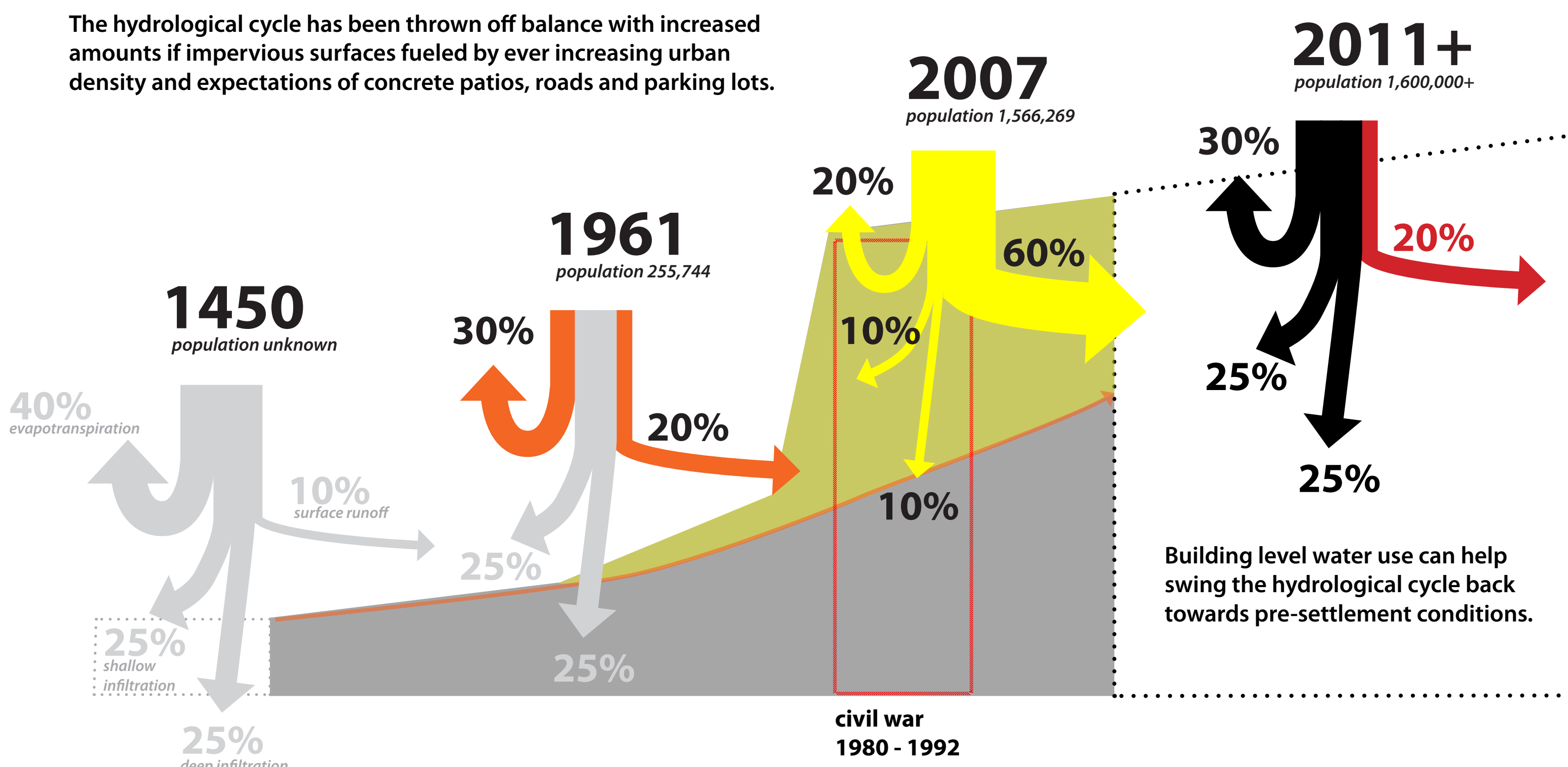
- storm water system failures,
- potable water system failures, and
- sanitary sewer system failures.

Over 400 sinkholes currently exist in MASS.

Sinkhole map
<http://z.umn.edu/sinkholes>



The hydrological cycle has been thrown off balance with increased amounts of impervious surfaces fueled by ever increasing urban density and expectations of concrete patios, roads and parking lots.

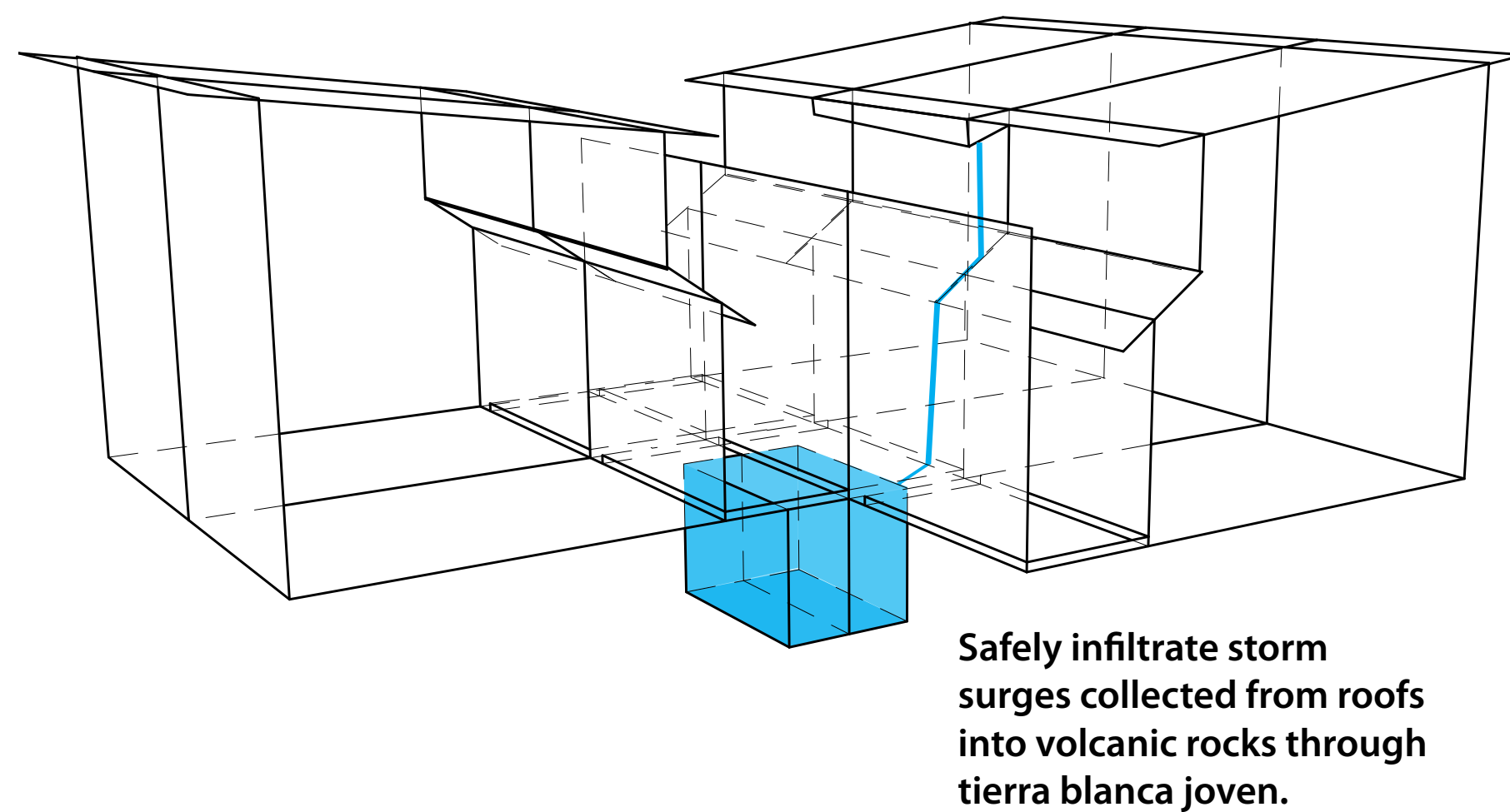


Sinking MASS

Sustainable Water Use Practices for a City Plagued by Sinkholes
Laurie McGinley - School of Architecture - College of Design

Water Design for MASS

storm water infiltration, diversion and detainment

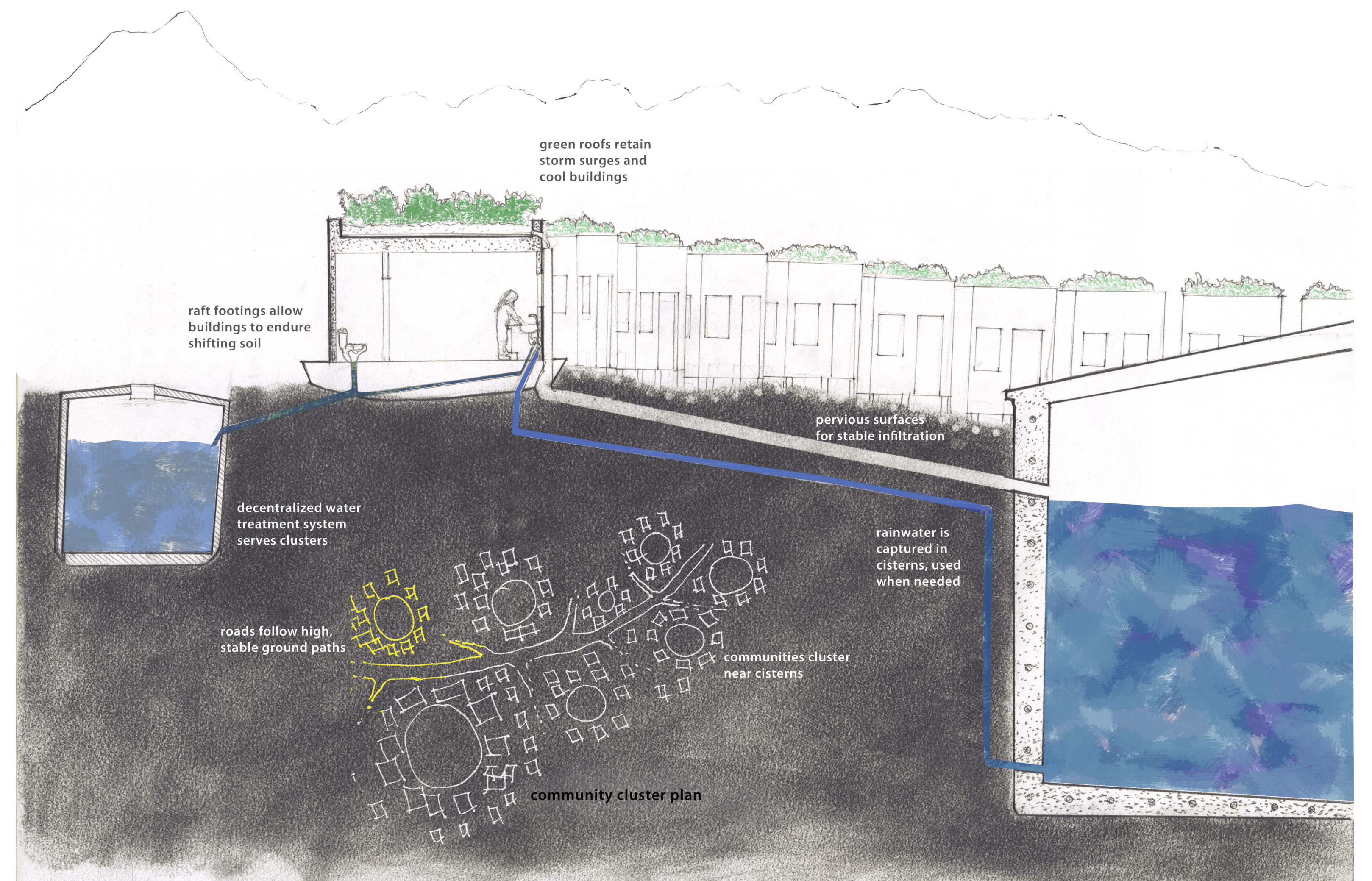
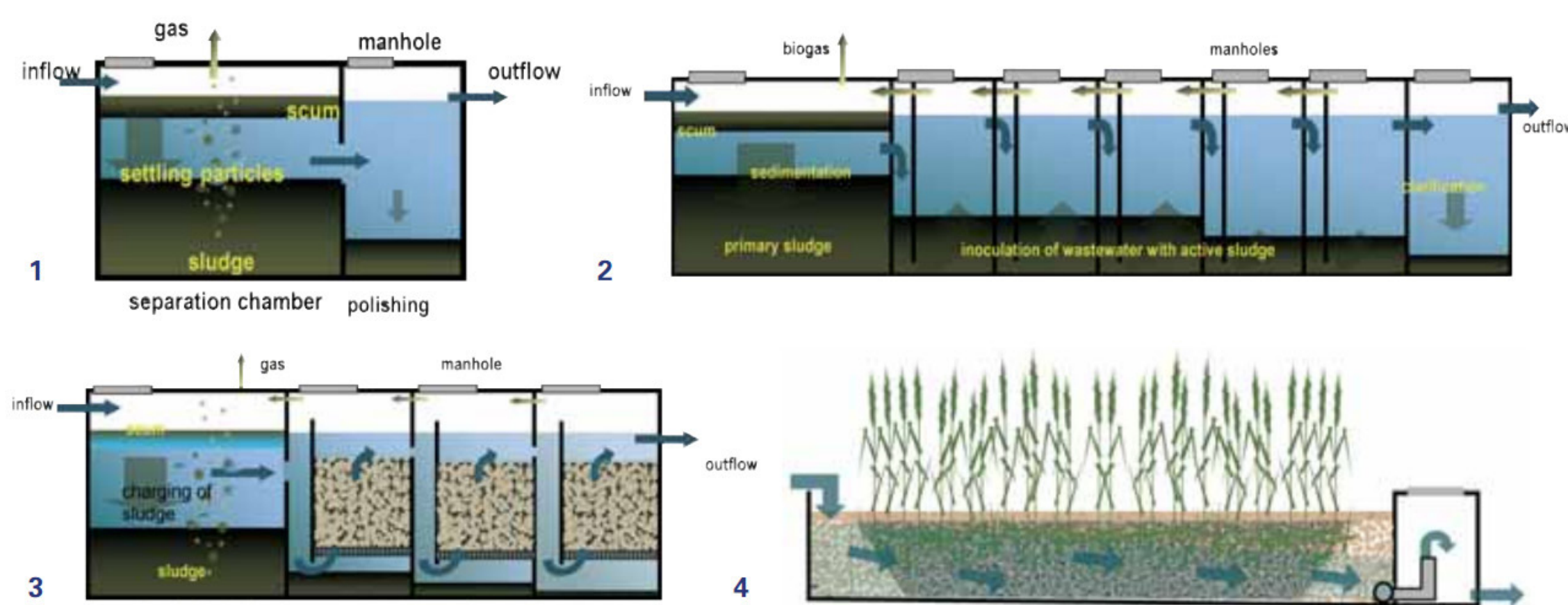


Safely infiltrate storm surges collected from roofs into volcanic rocks through tierra blanca joven.

rainwater catchment to water plants, wash cars and flush toilets



Decentralized Waste Water treatment systems (DEWAT) releases uncontaminated water into local water ways after the storm surge



Community scaled rainwater catchment systems could alleviate the pressure to properly treat water while providing a more consistent source of potable water for use in buildings.

Community scaled sewage treatment systems can safely treat waste to be released into water ways while avoiding the need to pump water through unstable TBJ.