ARCH 901 DESIGN 1: INTRO TO MEDIUMS & METHODS - FALL 2020

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CONCEPT

- How can architecture frame physical encounters with the complex massive problem (or Hyperobject in Timothy Morton's terms) of climate change?

- This abstraction can become tangible in a natural resource: fresh water.

- Most of the water on Governors Island is not potable. There is a reliance on plastic bottles.

- What if Governors Island could harvest its stormwater for drinking and eliminated plastic bottles on the island?

Governors Island gets 1 million annual visitors.

1 million annual visitors x approximately 1.5 L bottles

CIRCULATION MAP OF GOVERNORS ISLAND

MANHATTAN

HOUSE 14

0.19 KM

0.40 KM

HOUSES

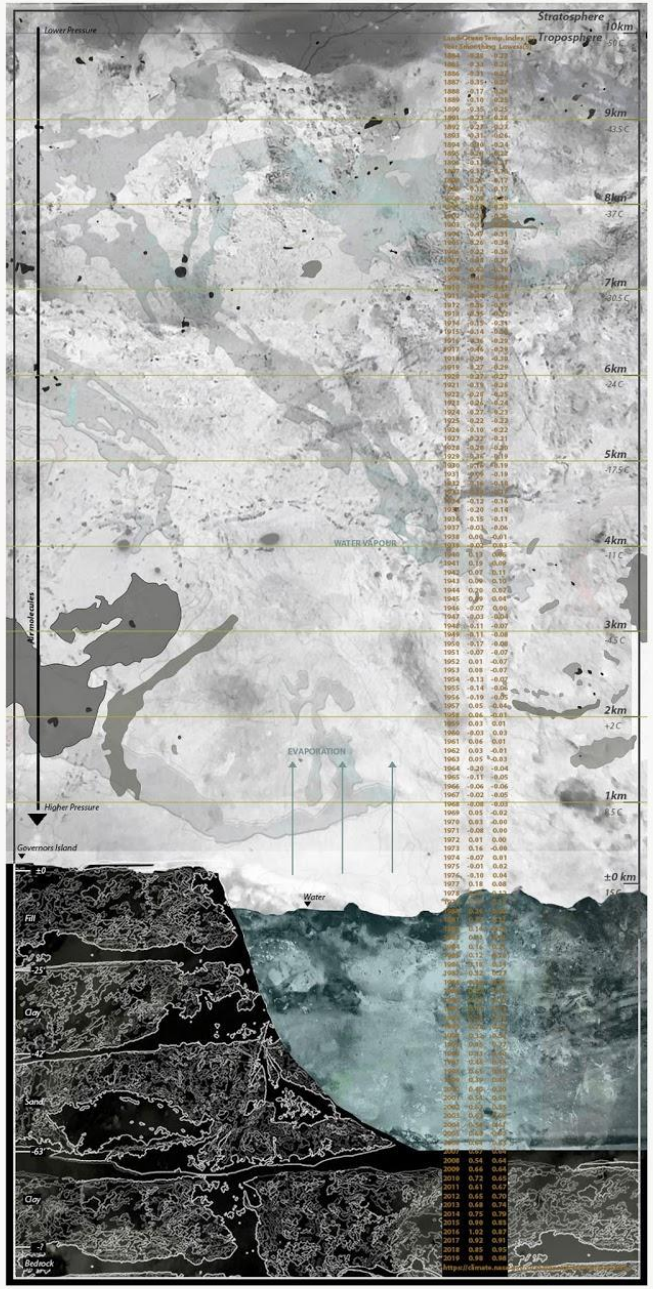
HOUSE 14

BROOKLYN

The site for intervention on House 14 is the prototype for distributed water.

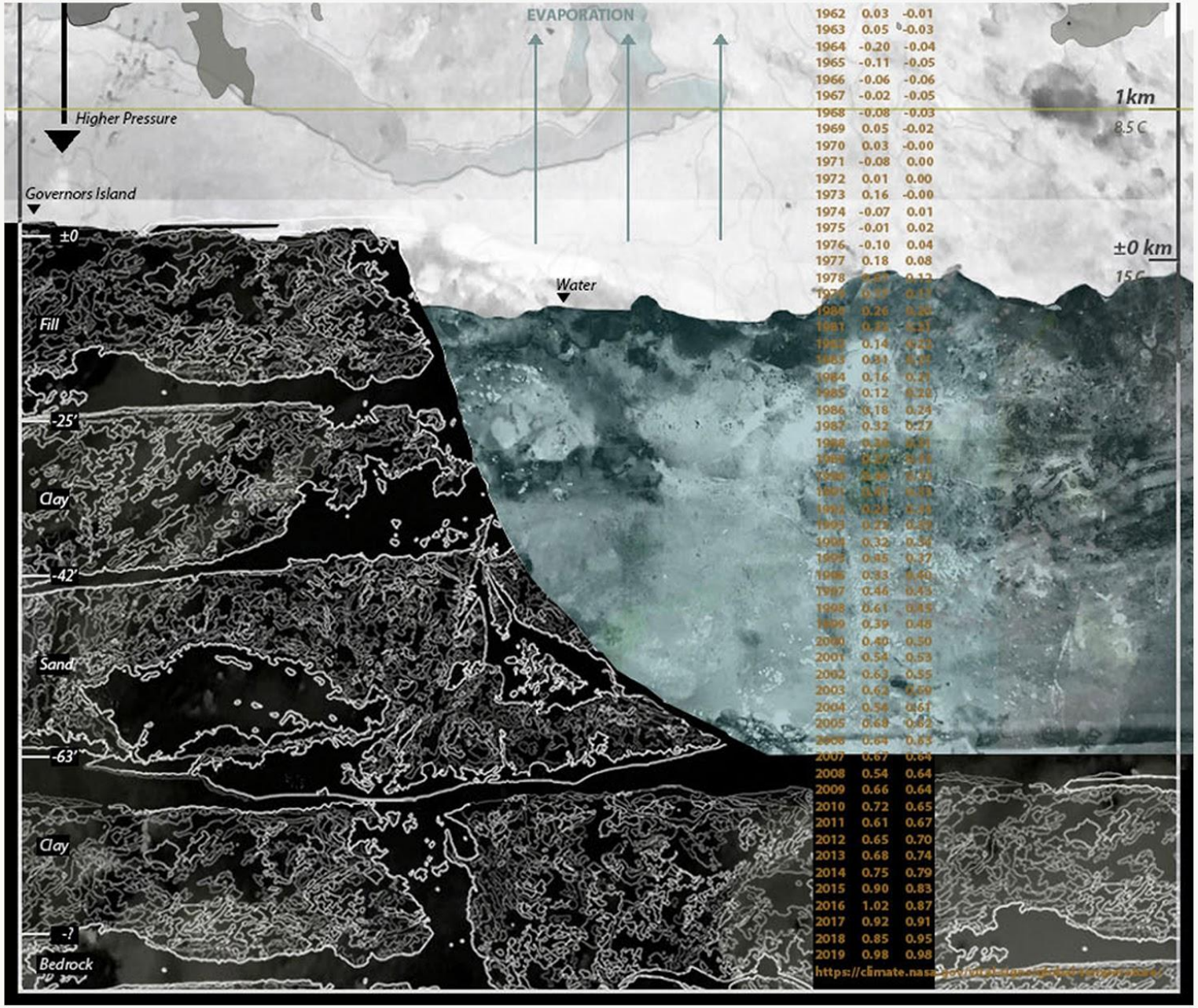

‘‘Nearly 97% of the world’s water is salty or otherwise undrinkable. Another 2% is locked in ice caps and glaciers. That leaves just 1% for all of humanity’s needs — all its agricultural, residential, manufacturing, community, and personal needs. ‘’
https://www3.epa.gov/safewater/kids/waterfactsoflife.html


CONTEXT

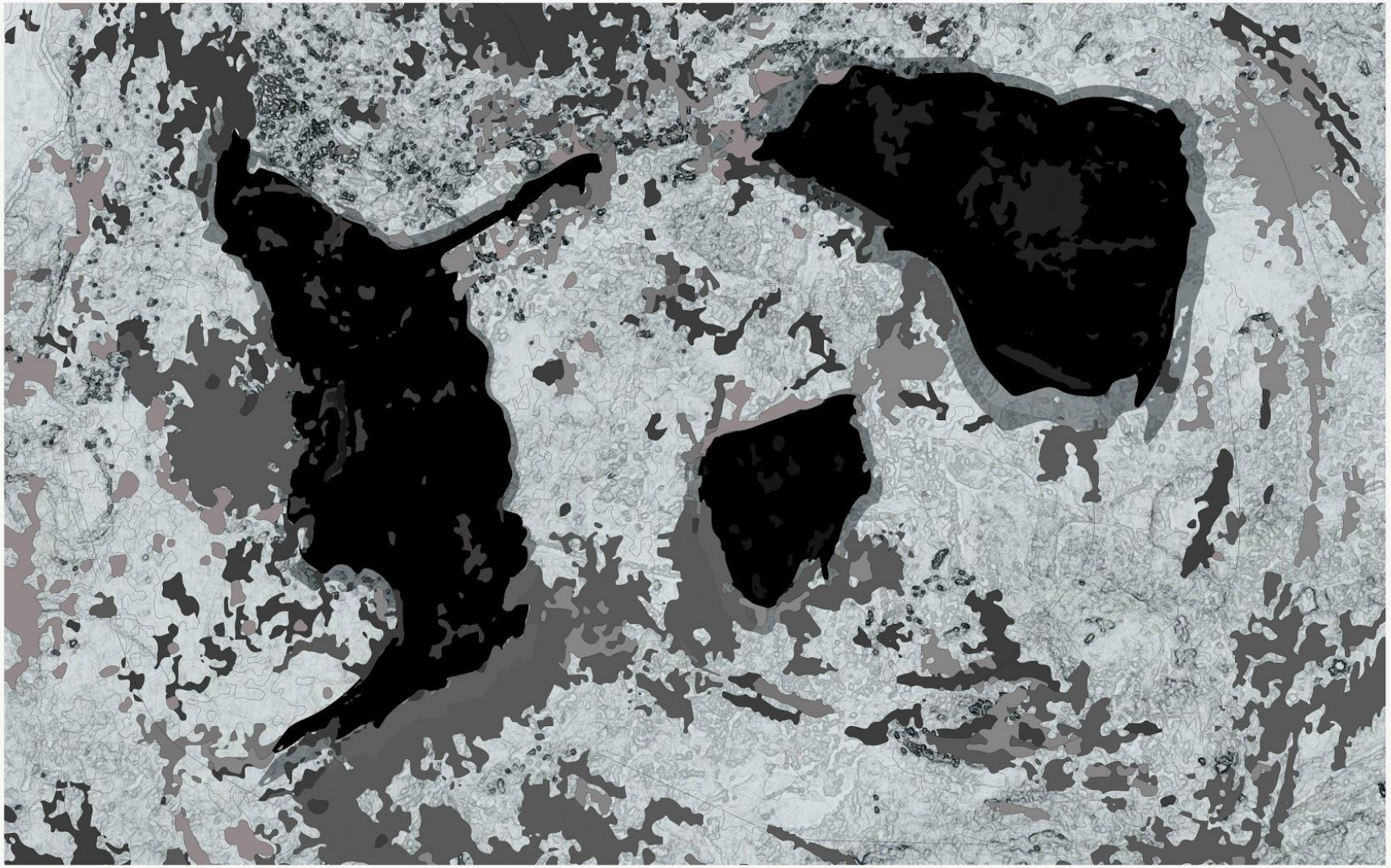


The deep-section is a speculative cut through the atmosphere through the earth and sea bottom layers.

The data shows climate change effects of heat differences kilometers of the atmosphere through time and the levels of the ground that are characteristic of Governors Island.



Governors Island has a shallow water table (2-3 feet deep). Salty water makes inroads into the water table, limiting its use for drinking. Stormwater and rain are the best sources to harvest for drinking water.



The speculative plan explores the correlation between land, salty water, sea- level rises caused by climate change and the storm. The work emphasizes the salty composition and materiality of water.


RESEARCH

RESEARCH STATEMENT SUMMARY

My research topic centers on climate change. Climate change has had effects on the environment and settlements throughout history. The existence of human beings and their activities have altered the environment's ecological equilibrium. Today, it is a noticeable and undeniable fact with the increasing populations of human beings.

The question is, How can architecture frame physical encounters with such a complex, massive problem (or Hyper-object in Timoty Morton's term) of climate change?

The human population is continuing to accelerate in time, that the resources are going to decrease by climate change.
Since the resources continue to decrease, the answer to the question leads to thinking one of the resources is freshwater. For this aim, stormwater and rain are the best sources to harvest for drinking water.

To use the activated carbon filtering system is the renewable system to filter stormwater.
''Biochar- plant and animal material turned into charcoal to store carbon- has been proposed as a climate mitigation strategy. But the data so far inconclusive.''

''The idea of biochar is really attractive, and in my opinion, it is the only viable way of removing carbon dioxide from the atmosphere,'' Matovic says.''

CLIMATE CHANGE

https://www.amnesty.org/en/what-we-do/climate-change/

https://climate.nasa.gov/news/2680/new-study-finds-sea-level-rise-accelerating/#:~:

text=The%20rate%20of%20sea%20level,3.4%20millimeters)%20per%20year%20today.

https://www.edf.org/climate/climate-change-and-extreme-weather

https://scied.ucar.edu/hurricanes-and-climate-change

https://www.usgs.gov/faqs/how-can-climate-change-affect-natural-disasters-1?qt-

news_science_products=0#qt-news_science_products

PRECIPITATION

https://www.ncdc.noaa.gov/cdo-web/datasets/GHCND/stations/GHCND:USW00094728
/detail

EVAPORATIVE COOLING SYSTEM

https://www.sciencedirect.com/topics/engineering/evaporative-cooling

BIO-CHAR FILTERS

https://e360.yale.edu/features/refilling_the_carbon_sink_biochars_potential_and_pitfalls

https://e360.yale.edu/features/refilling_the_carbon_sink_biochars_potential_and_pitfalls

https://www.ucsusa.org/resources/biochar-climate-change-mitigation-strategy#ucs-report
-downloads

https://www.acarbons.com/carbon-filtering/

https://www.sappohill.com/pilot.asp?pg=Activated_Charcoal

https://www.rhs.org.uk/advice/profile?PID=1014

https://www.lenntech.com/systems/deep/activated-carbon/gacfilter.htm#ixzz6f7WExpG2

https://sites.google.com/a/cherrycreekschools.org/water-treatment-systems/home-water-
treatment-systems/activated-carbon-filters

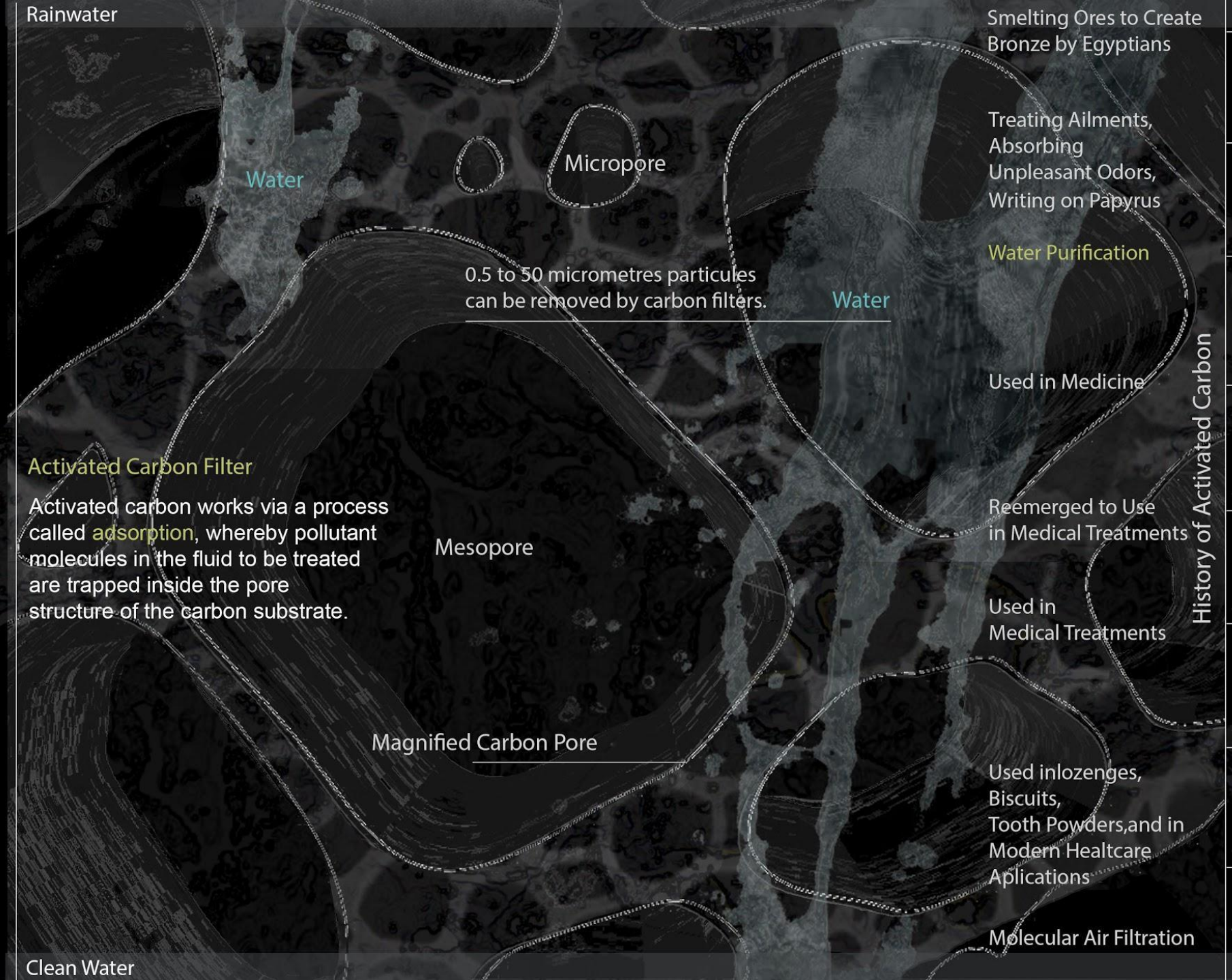
STORMWATER HARVESTING

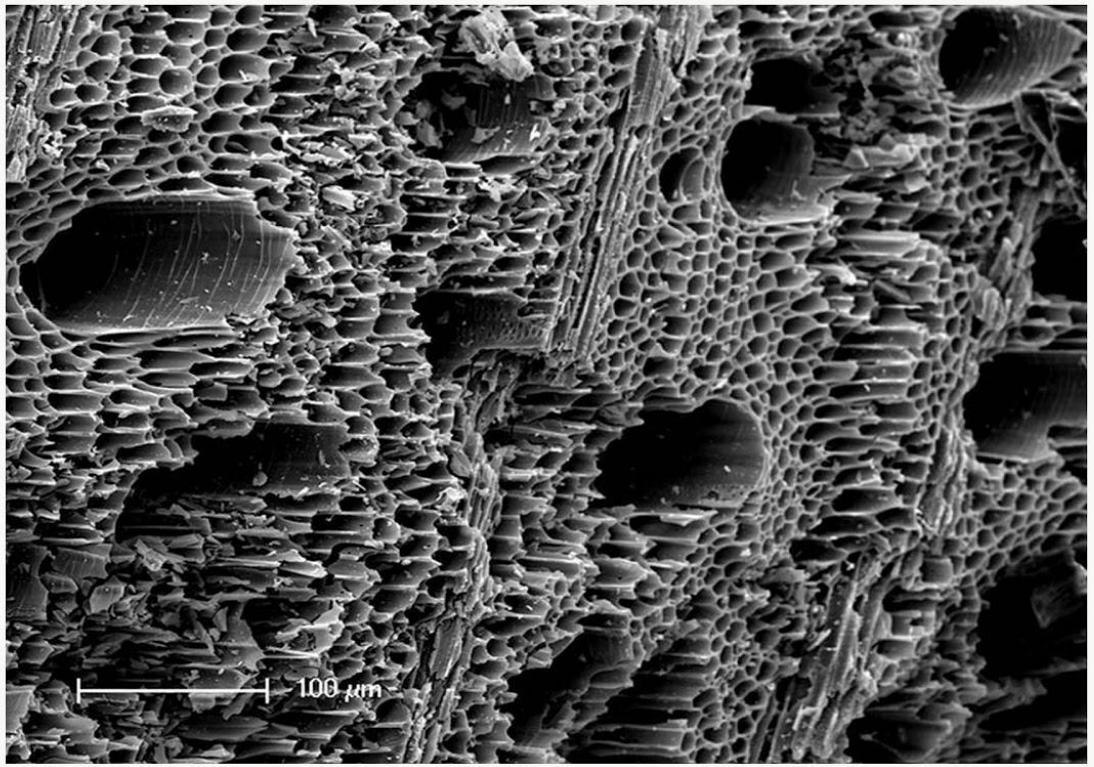
https://www.sciencedirect.com/science/article/abs/pii/S0043135419311698

https://www.sciencedirect.com/science/article/abs/pii/S095965261934096X

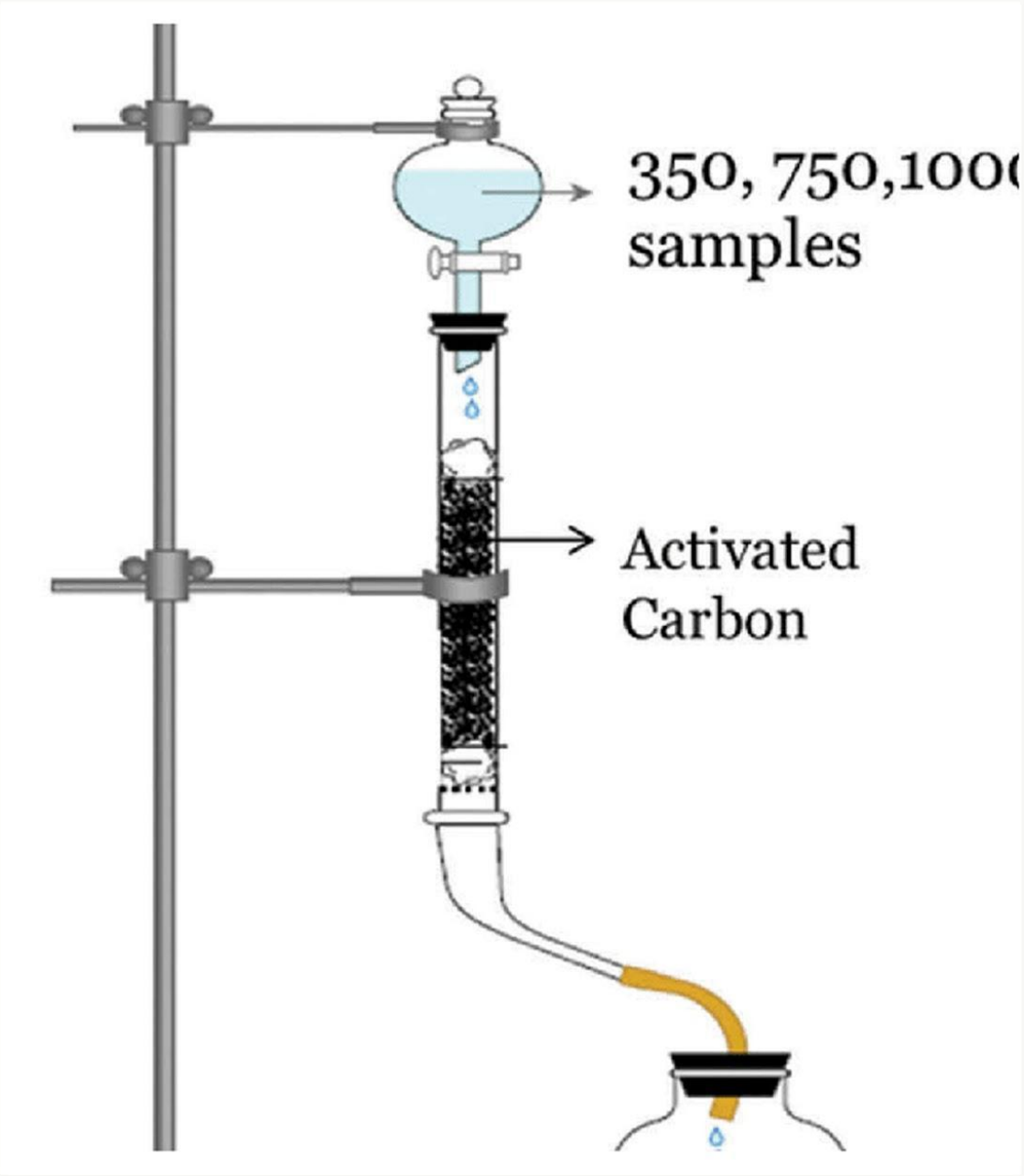
https://stormwater.pca.state.mn.us/index.php?title=Stormwater_and_rainwater_harvest_
and_use/reuse_combined#:~:text=Commonly%20in%20stormwater%20harvest%20and,
than%20other%20forms%20of%20stormwater.

“Biochar—plant and animal material turned into charcoal to store carbon—has been proposed as a climate mitigation strategy. But the data so far are inconclusive. To avoid the worst consequences of climate change, we need to significantly reduce global warming emissions and if possible remove existing carbon dioxide from the atmosphere.”



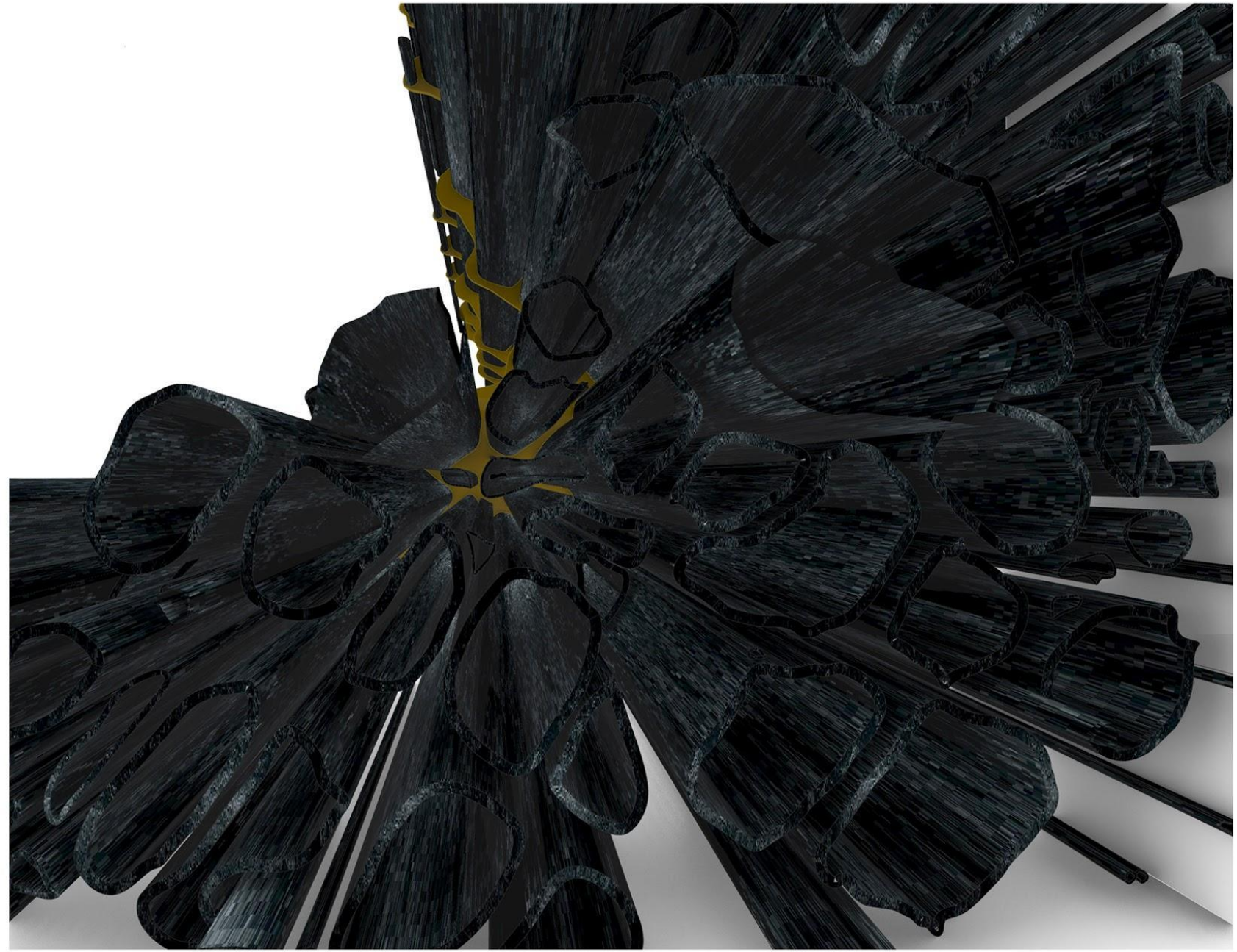


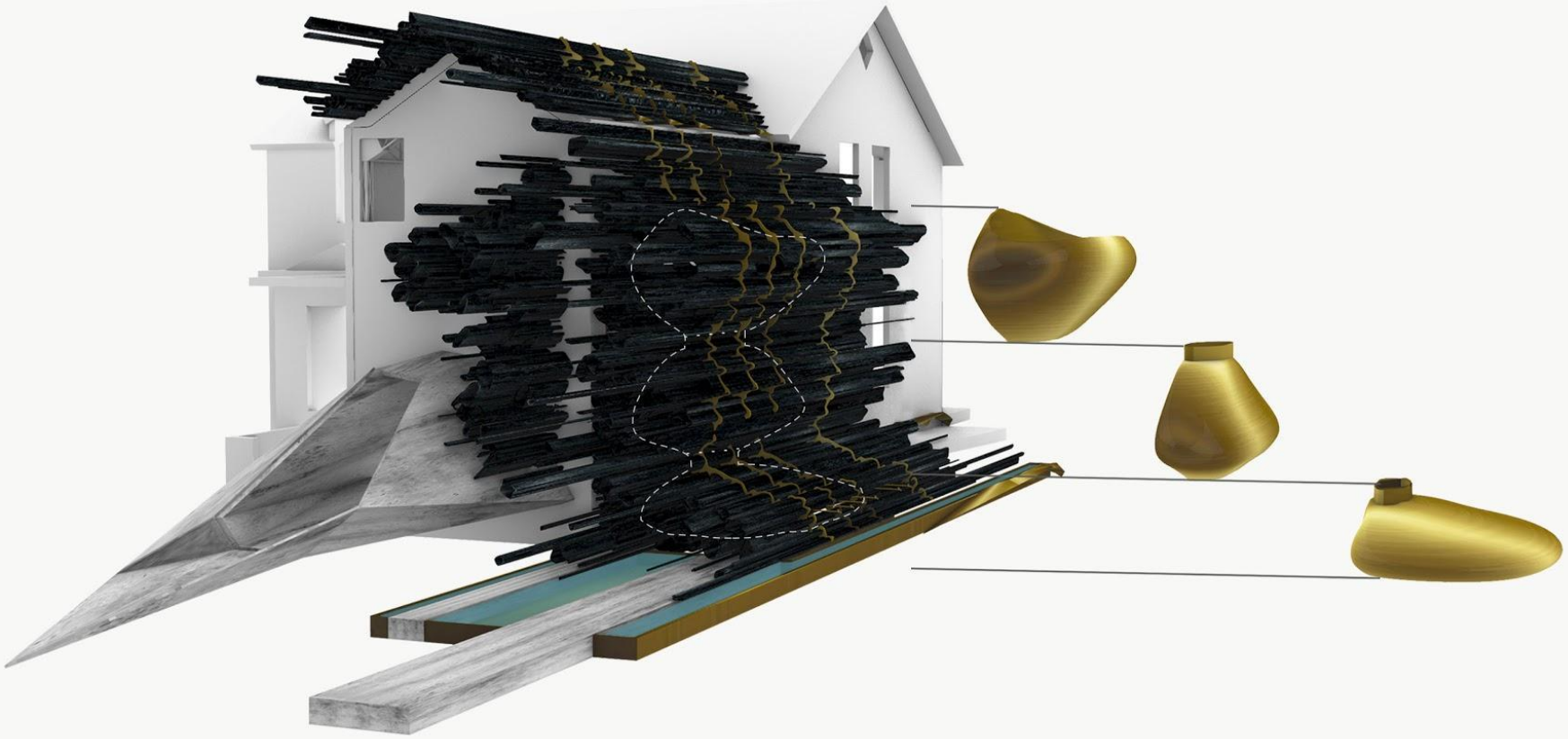
Magnified Biochar



Activated carbon bed water filtering system using gravity, not energy.


PROJECT



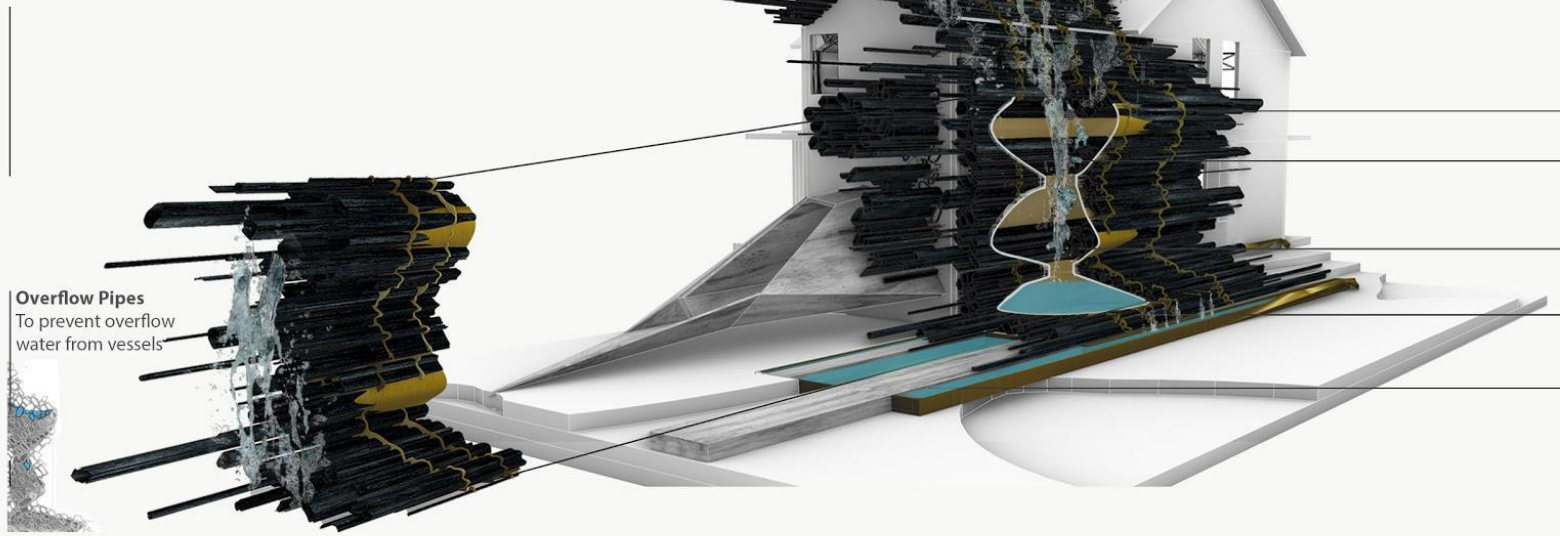


CAPACITY

VESSEL1 - 13.21 m^3

VESSEL2 - 9.28 m^3

VESSEL3 - 9.93 m^3



Overflow Pipes
To prevent overflow water from vessels

Overflow provides evaporative cooling

Gravity System (Low Energy), Harvested Rainwater

Roof surface is 96.5 m2
Average 4.4 in = 111.76 mm / month x 96.5 m^2 = 10,784 liters per month from Building 14 roof
Vessel 1 - 13.21 m^3 - 13,000 liters
filters to activated carbon beds*
Vessel 2 - 9.28 m^3 - 9,280 liters
filters to activated carbon beds*
Vessel 3 - 9.93 m^3 - 9,930 liters
9,930 liters*12 months = 119,160 liters filtered drinking water annual (12 months)
1.5 16 oz / 0.5 liter bottles = 0.75 liters est. average per visitor
1000000 annual visitors (12 months) * 0.75 liters = 750,000 liters (total: 6.29 = 7 house roof needed (equivalent to House 14 roof surface) to supply the whole island .

Evaporative Cooling
Uses no energy, no pump

Activated Carbon Bed

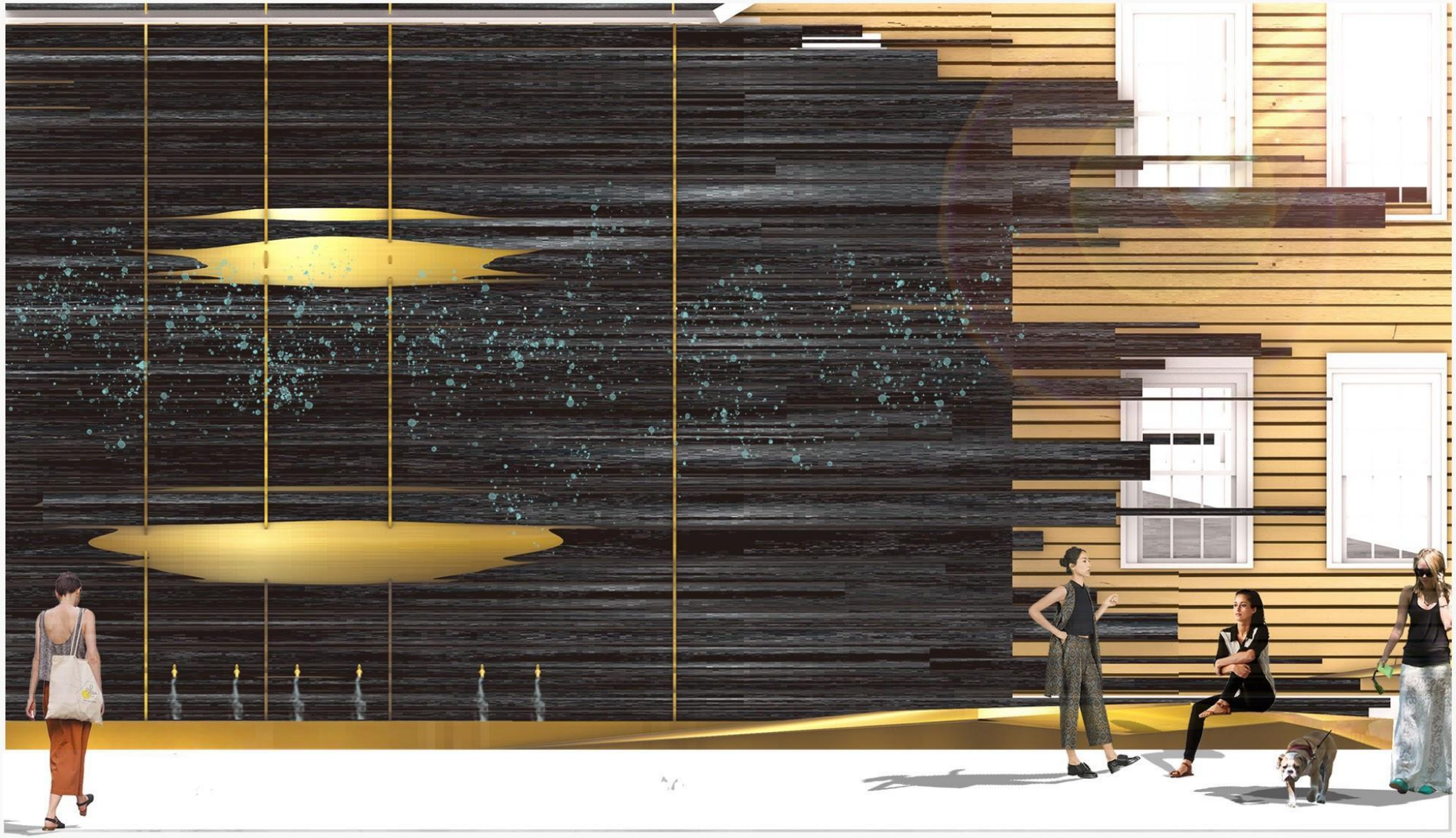
Activated Carbon Bed

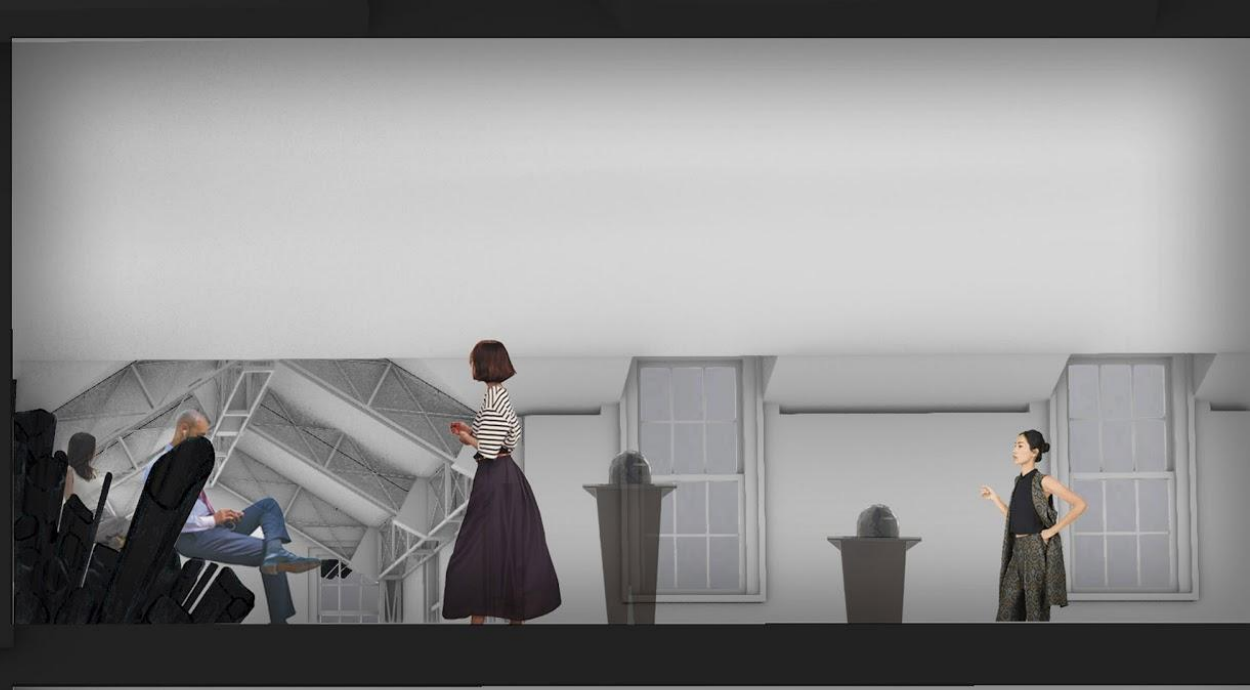
Faucets (Drinking Water)
No need to buy plastic bottles

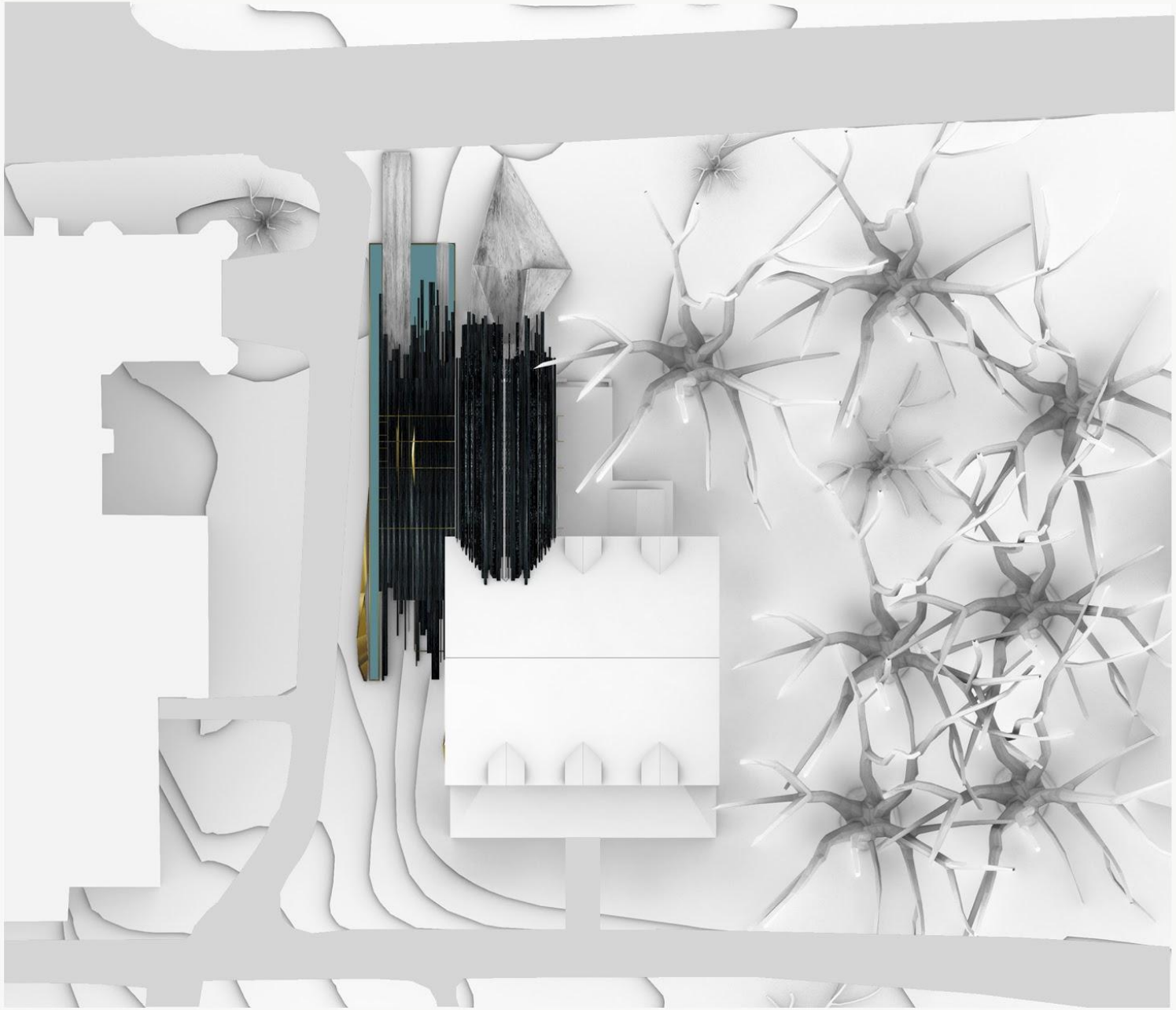
Basin

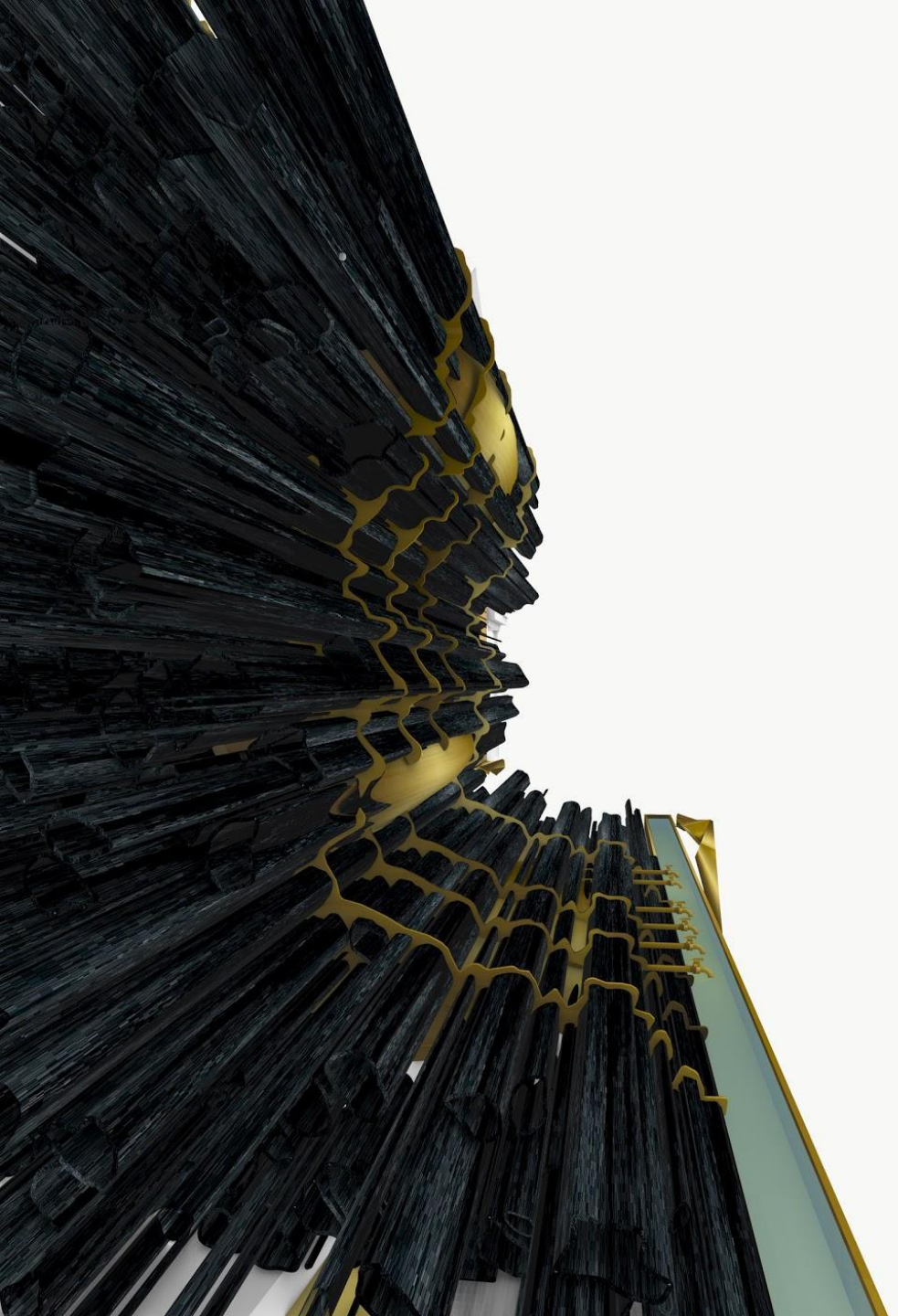
***NOTE:**
Filtration velocity2-8 m3/h.m2
Contact time10 -30 minutes
Diameter50 cm to 3m
Filtration area0,2 to 7 m2
Flowrates10L/h 100 m3/h
Pressure ratings4 to10 bar
Bed depth1 meter min.

https://www.lenntech.com/systems/deep/activated-carbon/gacfilter.htm#ixzz6f7WExpG2









RESEARCH FOCUS IN NEXT SEMESTER

- Water in Architecture.
- Biochar Architecture.
- Biochar Based Materials.
- Architecture Modules made from atmospheric CO_2.
- Biochar Filtering System to use CO_2 from the atmosphere.
- Water Purification.
- Materiality.