BIOHYDRO

50 SHADES OF GREYWATER

UPCYCLER

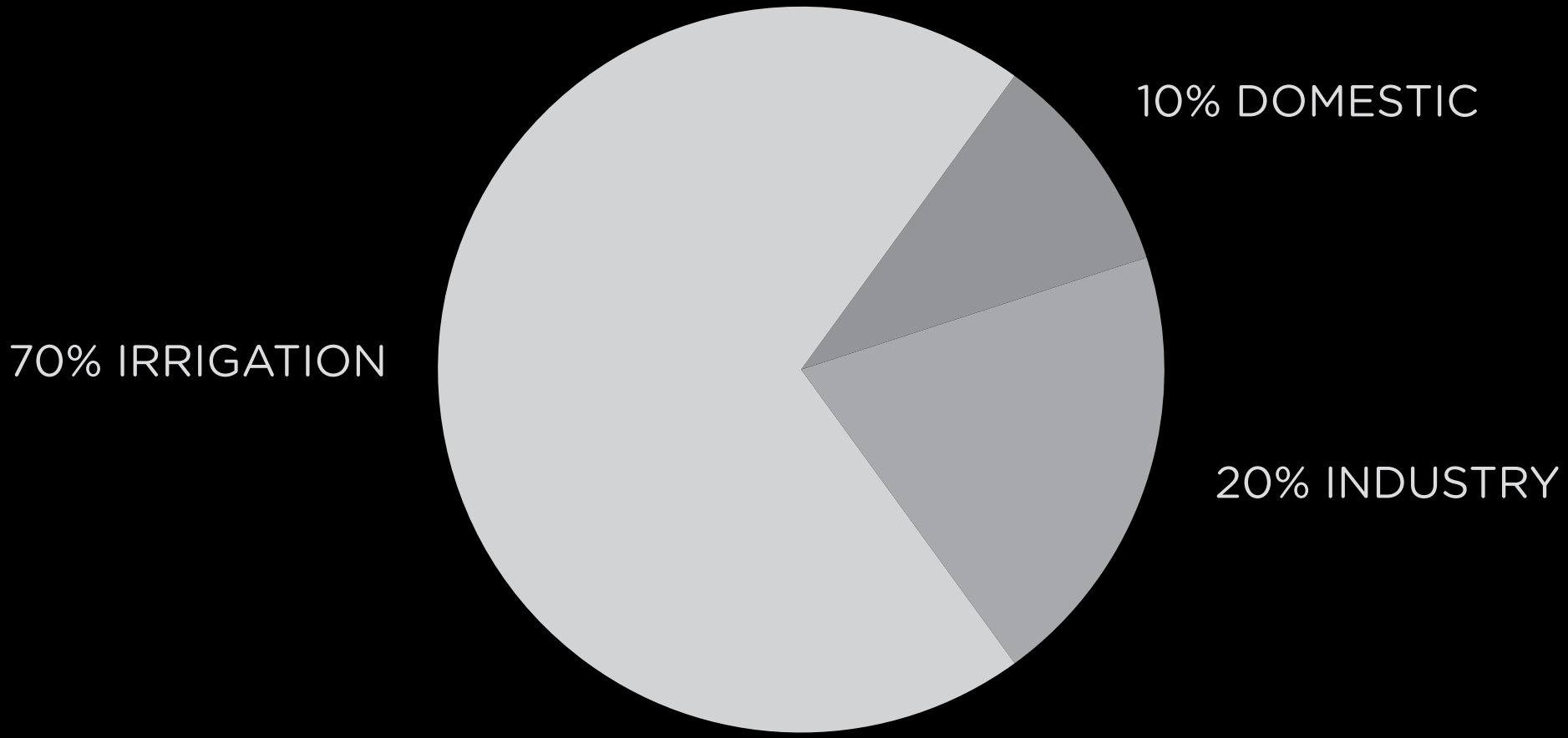
Iaac Institute for advanced architecture of Catalonia

INTRODUCTION

Water - our most valuable resource, and increasingly polluted. Wastewater treatment systems are energy-intensive, require massive and extensive infrastructure, and often use chemicals and other less than ideal methods to process wastewater to potable levels.

And yet, we drink less than 5% of our daily water use.

GLOBAL WATER



Agriculture accounts for about two-thirds of global freshwater use. In most cases, greywater is adequate for the irrigation of crops.

1 + 1 = AN OPPORTUNITY

By combining a readily available greywater supply with existing space, it becomes possible to transform otherwise unproductive landscapes into agriculturally productive ones, addressing the issue of greywater treatment while generating a local food supply.

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In Valldaura, water is a precious commodity. Since it is a location without service, water must be trucked in from the city of Barcelona, and consequently wastewater in sewage form must be trucked out. Meanwhile, the rain collected from the site is used solely for irrigation purposes. However, since rainwater is practically clean and much easier to purify to potable levels, it would make more sense to do so and then use the resulting greywater to irrigate the surrounding landscape.

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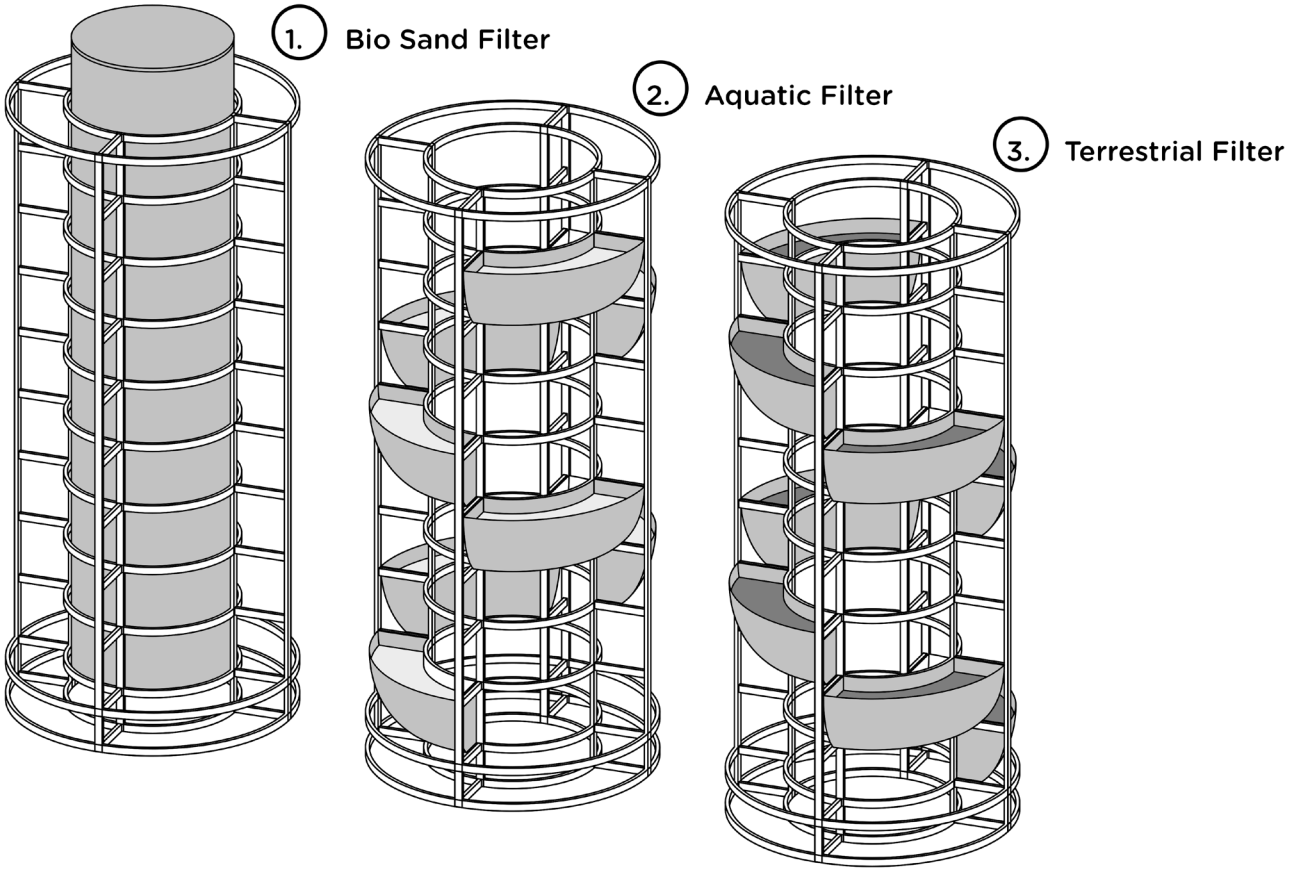
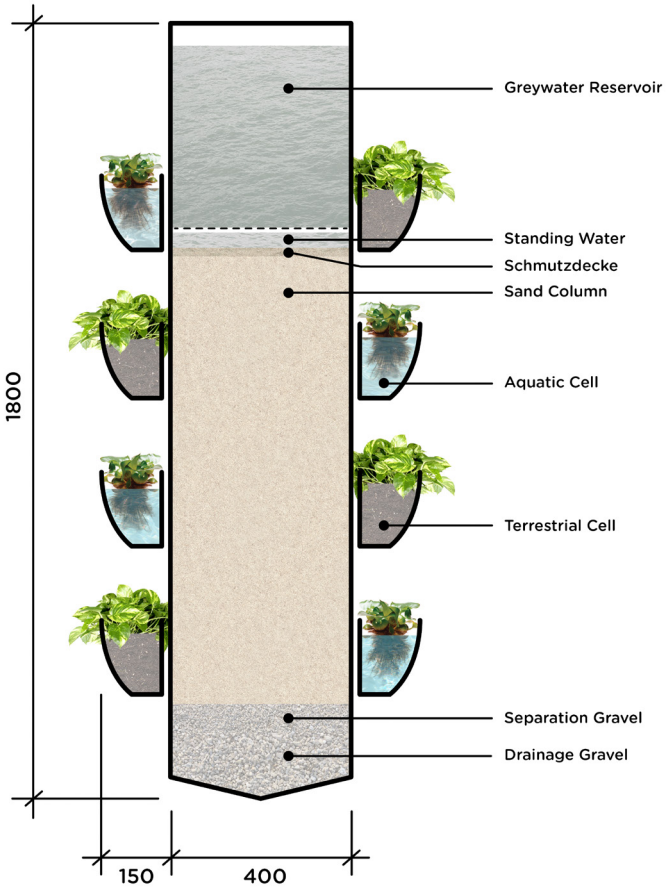
This biophysical water purification machine relies on simple technologies to upcycle greywater for reuse. Compact and adaptable, it is designed to be integrated into a domestic setting, unlike most water purification systems, which operate at larger industrial scales.

BHU MECHANISM

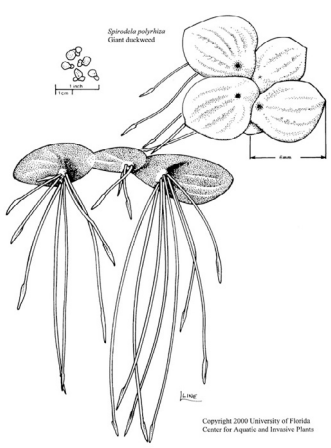




The physical and biological mechanisms within the machine break down and consume the pathogens, nitrates, phosphates, organic compounds, as well as other elements, purifying the greywater to a level suitable for irrigation purposes.

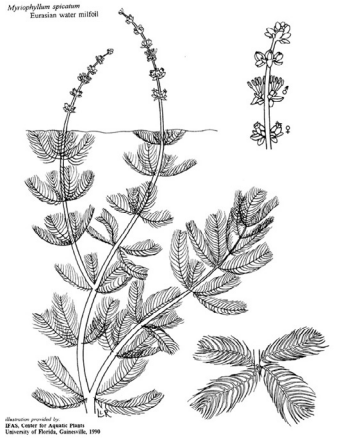
PLANT SELECTION

Sedge grass

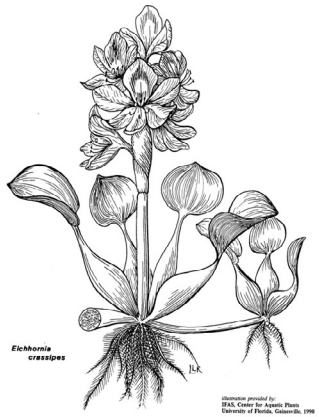


Duckweed

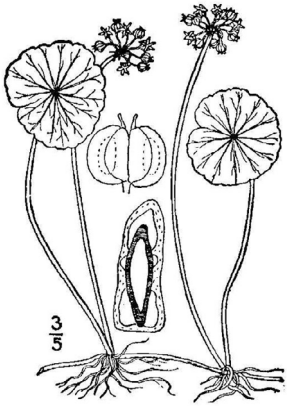
Broadlead arrowhead



Eurasian watermilfoil

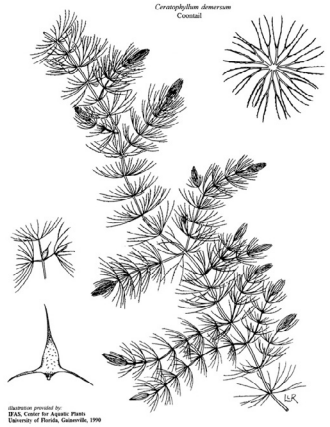


Water hyacinth



Pennywort

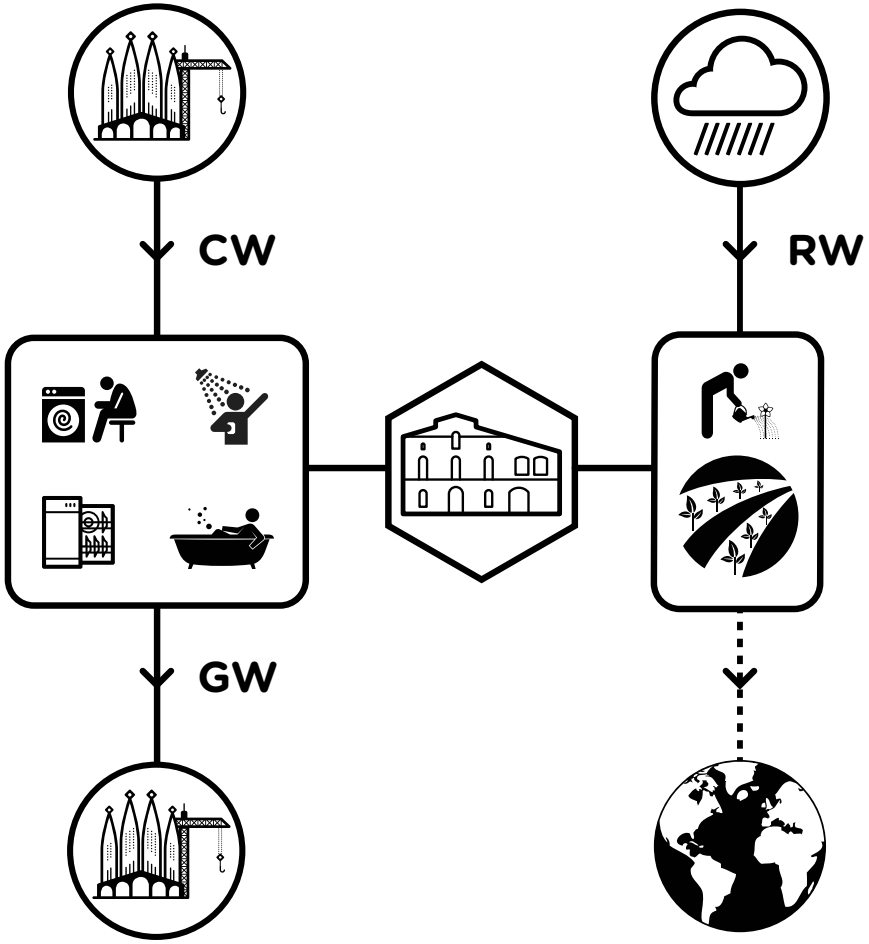
Frogbit

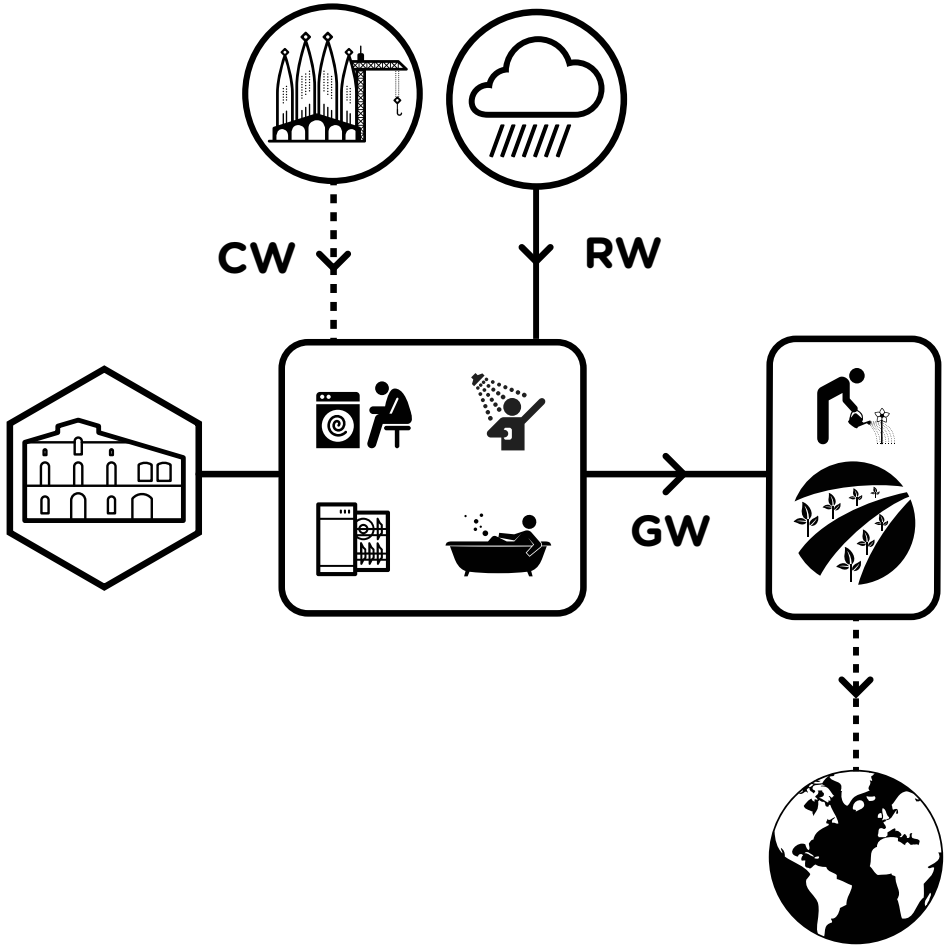


Coontail

Plants for the BioHydro Upcycler are selected on the basis of their size and water purification efficacy. Macrophytes can be either submerged, emergent, or floating on the surface of the aquatic cells.

VALLDAURA REMAPPING





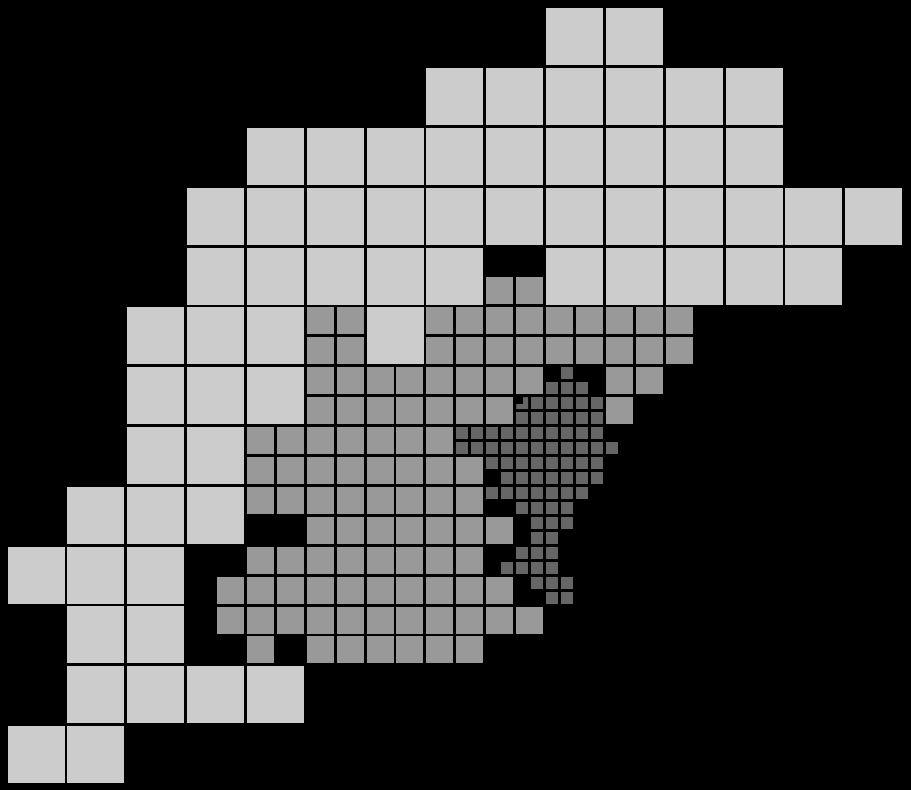
The current water situation in Valldaura is based on a centralized water distribution system. It exhibits little to no self-sufficiency or resilience.

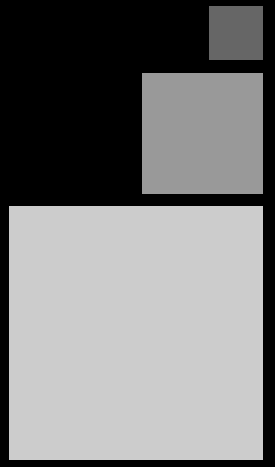
The new scheme would provide a high level of resilience with little to no reliance on an urban water supply, except in the case where not enough rainwater is collected to supply the residents of Valldaura house.

VALLDAURA BHU

This is how the BHU machines might look when implemented in the context of Valldaura. Indoor positioning is also an option, as would be the case for apartments and housing without outdoor space in an urban context.

TERRITORIAL SCALING





16,000 inhabitants per km²

3,000 inhabitants per km²

1,000 inhabitants per km²

One such machine has the capacity to purify, at minimum, the daily greywater output of a single person, or 50 to 70 L. This is enough to irrigate a 10 m² garden plot per day, which is enough area to provide at least half of the annual vegetable needs of one person.

If implemented in an area with more readily available green space and greywater supply - single family homes, for example - the agricultural output would have the capacity to create self-sufficient microcommunities with a reliable local food supply.

A POSSIBLE FUTURE?

Perhaps one day, Barcelona could look like this.

50 SHADES OF FREEDOM