Iceland Liechtenstein Norway grants

EVIDENCE

COMPARATIVE ANALYSIS OF URBAN RAINWATER HARVESTING POTENTIALS:

CASE STUDIES OF LISBON (PT), TIJUANA (MX) AND TRONDHEIM (NO)

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IAHR AIRH International Association for Hydro-Environment Engineering and Research
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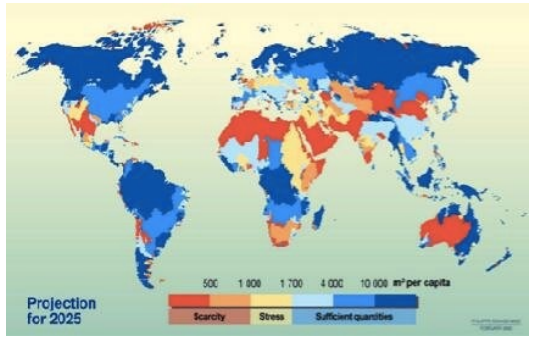


World water scarcity projections for 2025
Source: Wessman, 2012

GLOBAL WATER SCARCITY

need for alternate water sources

Flooding Lisbon in 2022
Source: Portugal News, 2022

INCREASED VULERABILITY

cities are increasingly vulnerable to effects of climate change

Flooding in Tijuana in 2023
Source: LA Times, 2023

URBAN RESILIENCE

need for improved water resource management

OBJECTIVES

This **urban-scale simulation** assesses the **rainwater harvesting potential** of **residential buildings** in Lisbon (Portugal), Tijuana (Mexico) and Trondheim (Norway), considering factors such as climate, building typology and consumption patterns. It includes calculations for **non-potable water savings** and **efficiency of rainwater harvesting systems** across entire urban areas.

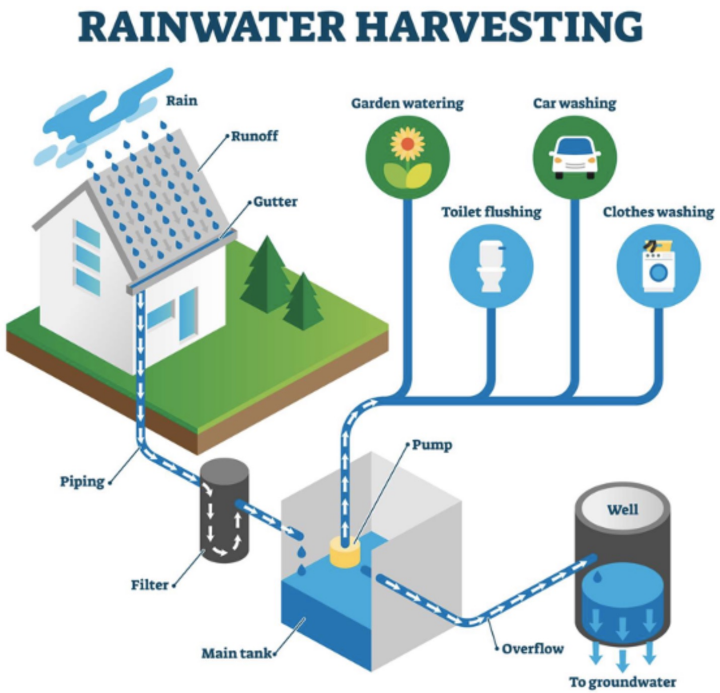
O1.

Determine rainwater harvesting system efficiency

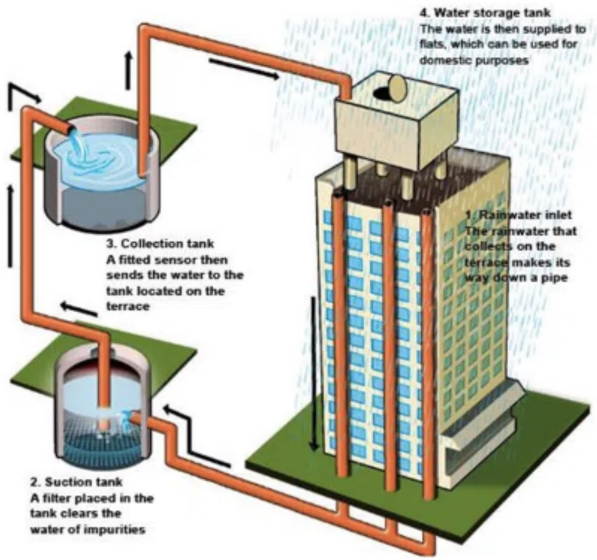
O2.

Determine urban water saving potentials

STATE OF THE ART



Single- Family Home Harvesting System
Source: TreeHugger, 2022



Apartment Complex Harvesting System
Source: N. & S. Associates, n.d.

HARVESTING SYSTEM

rainwater | greywater | green roof | hybrid

BUILDING USE

residential | commercial | university

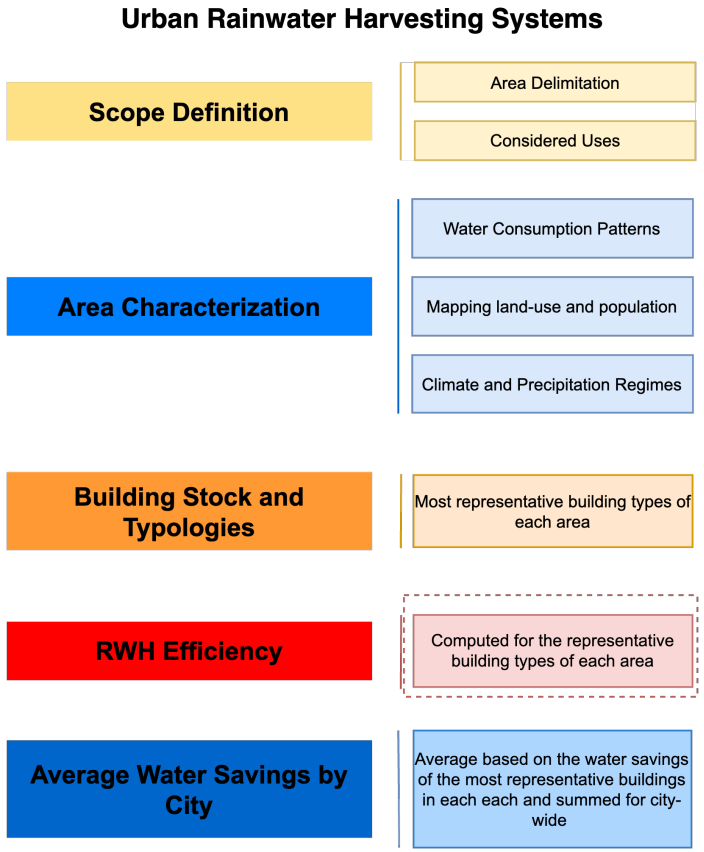
WATER USE

potable | non-potable

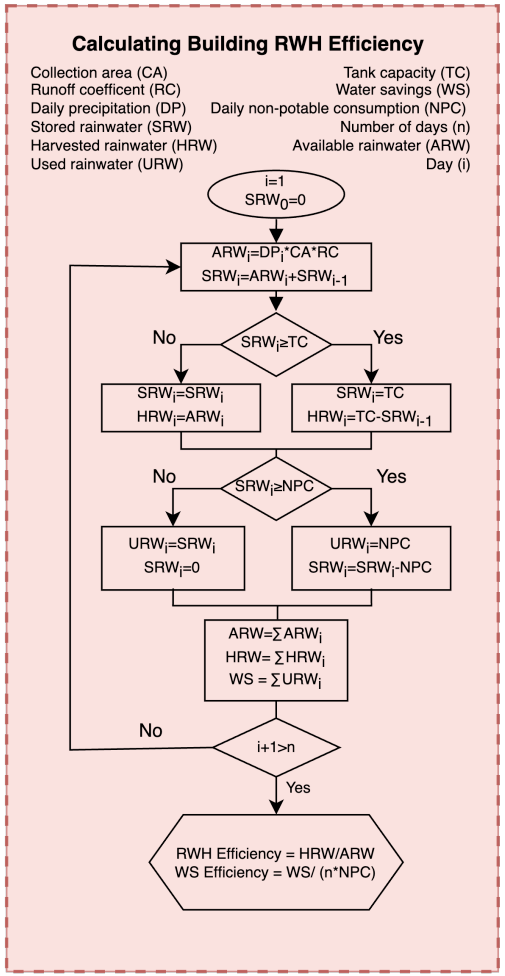
SCALE

building | urban | regional | national

METHODOLOGY

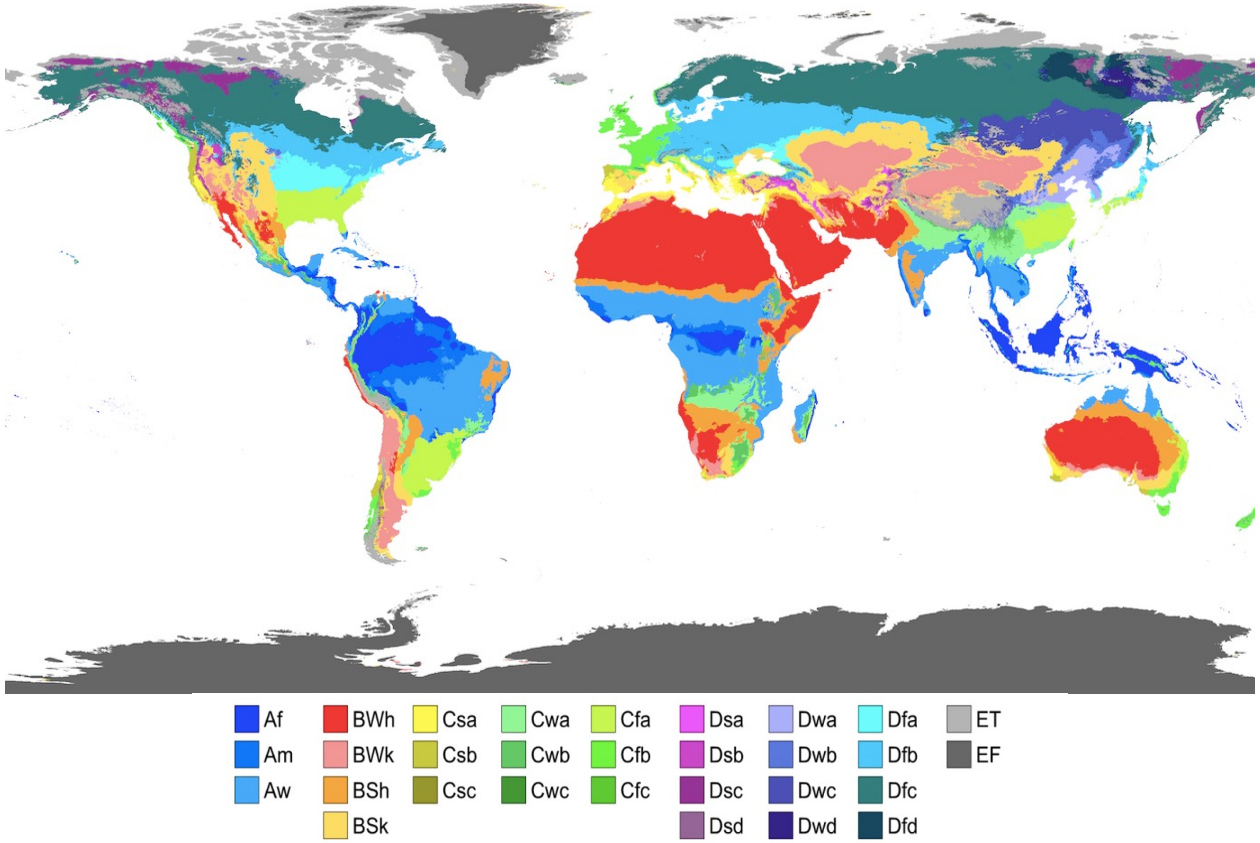


Urban RWH simulation methodology adapted from *Lúcio et al. (2019)*



RWH and non-potable water savings methodology adapted from *Silva et al. (2015)*

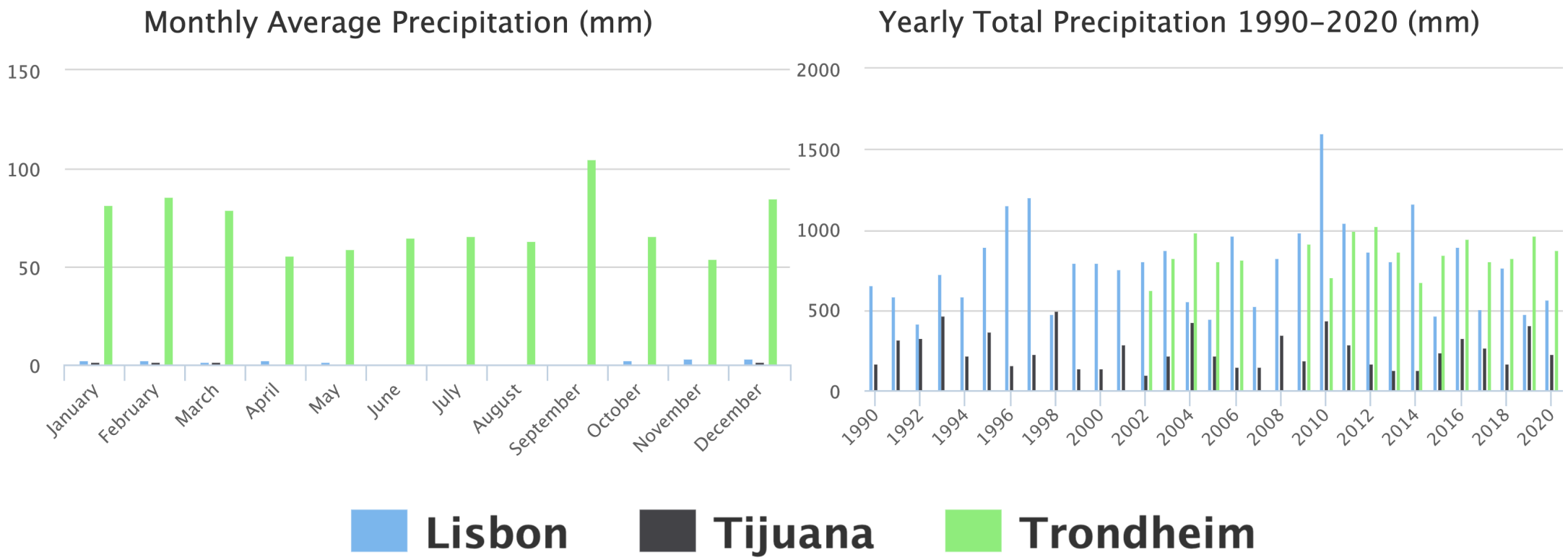
CLIMATE CHARACTERIZATION



Present and Future Köppen-Geiger Climate Classification Maps

Source: Beck et al., 2018

PRECIPITATION REGIMES



DOMESTIC WATER CONSUMPTION

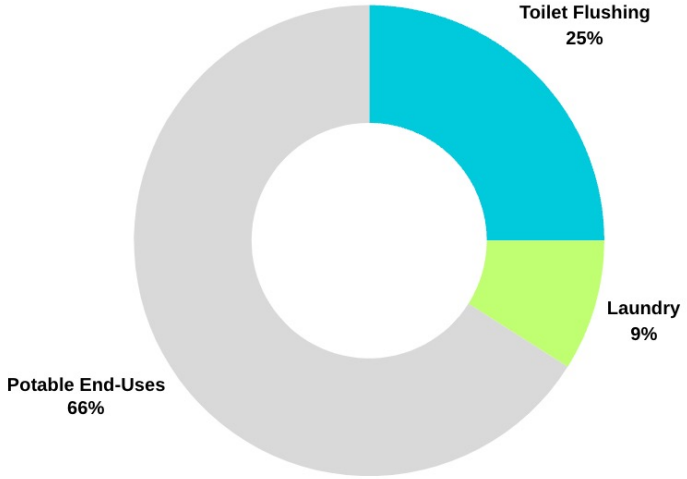
CONSUMPTION	LISBON	TIJUANA★	TRONDHEIM
TOTAL DOMESTIC CONSUMPTION (M3)	0.149	0.144	0.157
NON-POTABLE CONSUMPTION (M3)	0.051	0.098	0.054
NON-POTABLE FRACTION	34%	68%	31%
TOILET FLUSHING	24.7%	40%	21%
LAUNDRY	9.3%	24%	10%
HOUSEKEEPING	-	4%	-

MONTHS	TOTAL CONSUMPTION	NON-POTABLE CONSUMPTION
MAR, APRIL, MAY, JUNE, OCT, NOV	0.144	0.098
JULY, AUG, SEPT	0.154	0.105
DEC, JAN, FEB	0.138	0.094

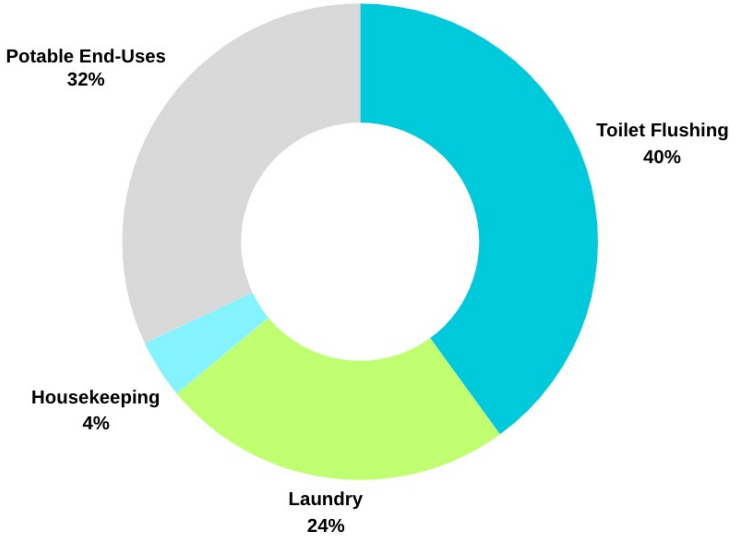
★ Tijuana has variable consumption

WATER END-USE DISTRIBUTION

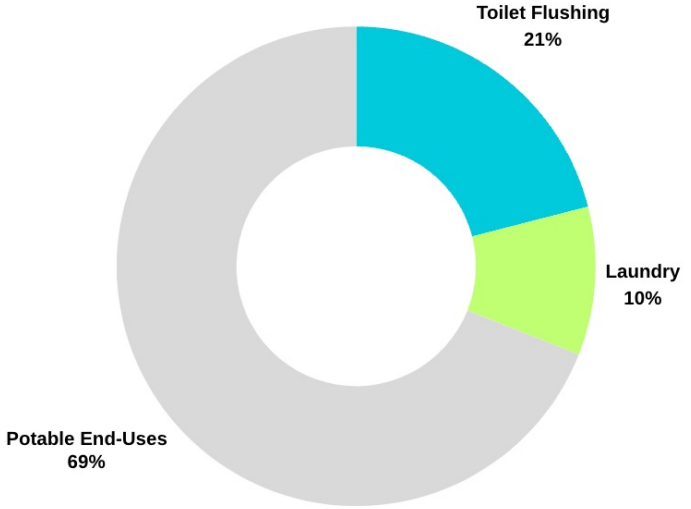
Lisbon



Tijuana

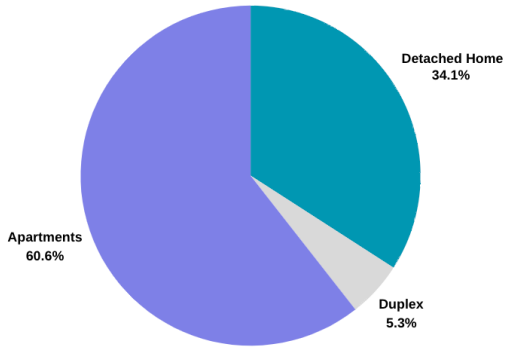


Trondheim

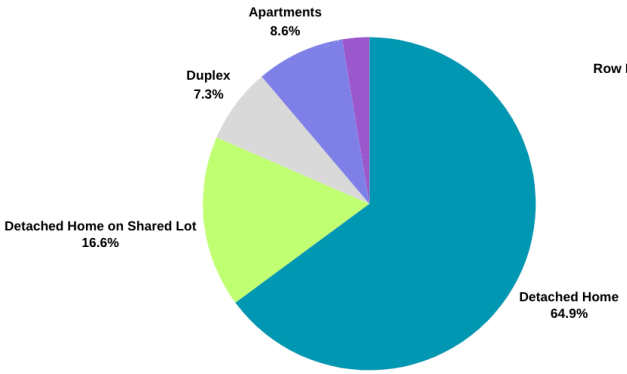


BUILDING TYPOLOGIES

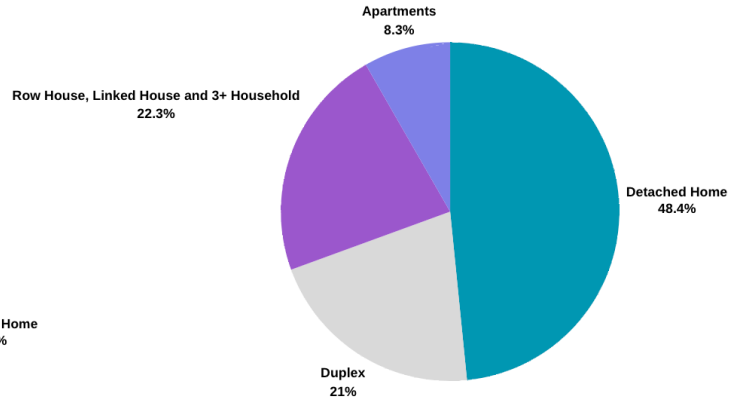
Lisbon

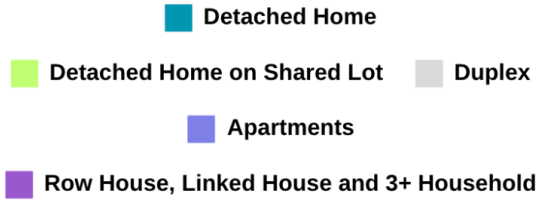


Tijuana



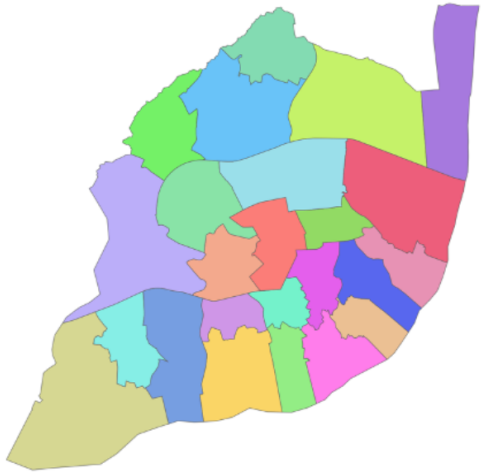
Trondheim





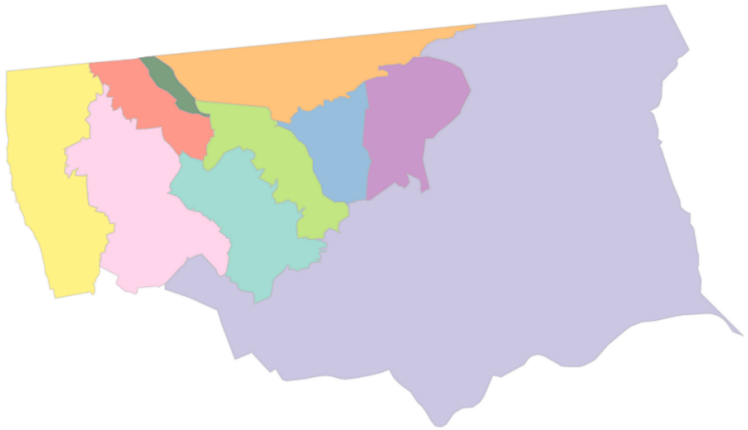
Urban Zones

Lisbon



24 Zones

Tijuana



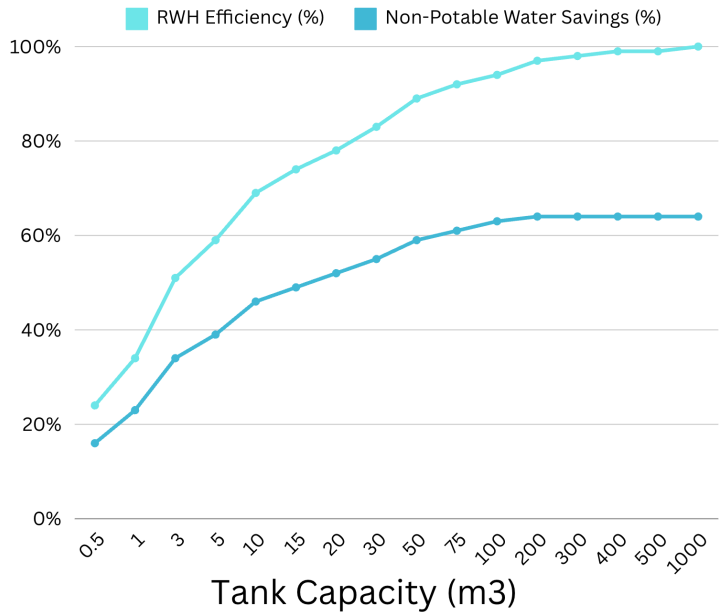
10 Zones

Trondheim

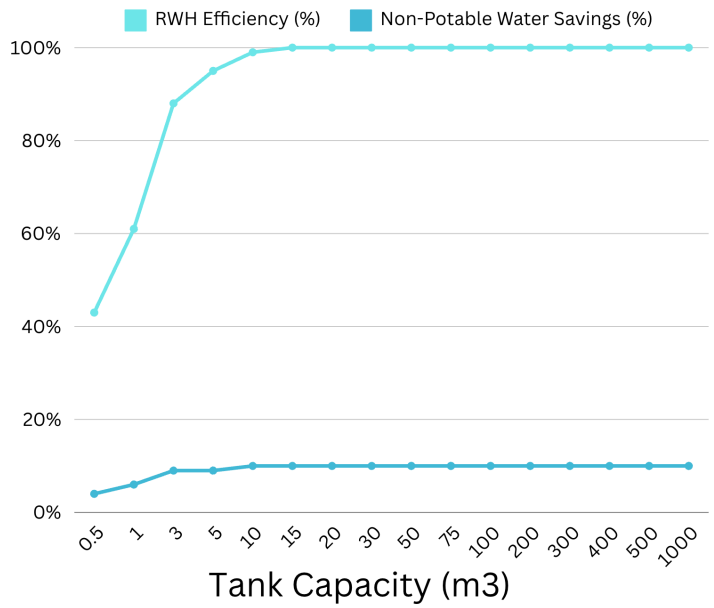
No Zones

TANK CAPACITY

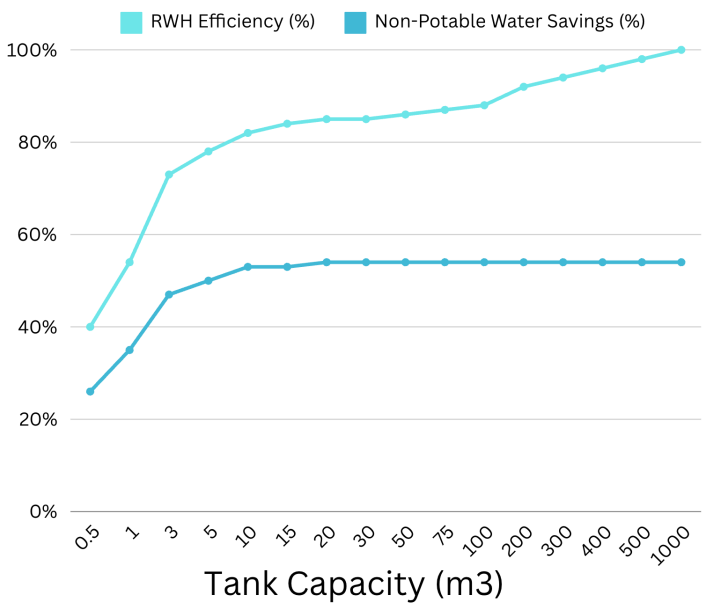
Lisbon



Tijuana



Trondheim



RESULTS

RESULTS	LISBON	TIJUANA	TRONDHEIM
RAINWATER HARVESTING EFFICIENCY	97%	100%	85%
WATER SAVINGS POTENTIAL	64%	10%	54%
OPTIMAL TANK CAPACITY (M3)	200	15	20
MOST EFFICIENT BUILDING TYPOLOGY	LOW-RISE APARTMENT COMPLEX	DETACHED HOME	DUPLEX
TOTAL HARVESTED WATER (M3)	37,897.06	2,029.94	4,878.95

EVERY BIT COUNTS.

EFFICIENCY how can we make these systems more efficient?

CLIMATE CHANGE what is the impact of changing precipitation regimes?

SNOWMELT how does snowmelt effect efficiency?

DATA more data leads to greater accuracy!

INTEGRATION how do we integrate harvesting systems into our cities?

Iceland Liechtenstein Norway grants

EVIDENCE

ACKNOWLEDGEMENTS

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THANK YOU!

For questions/comments, please contact:

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