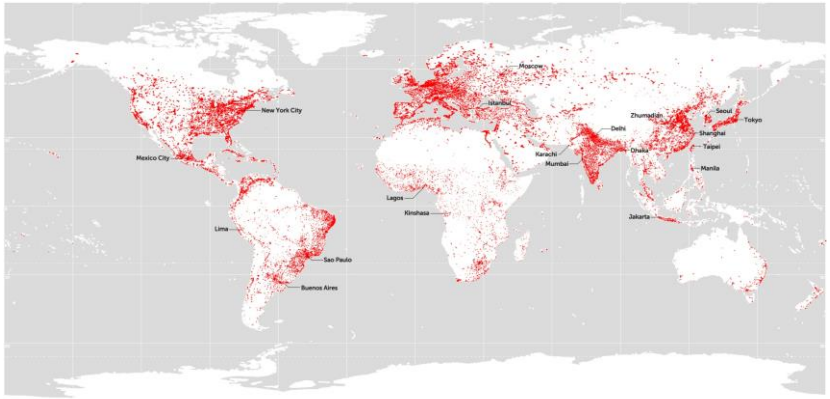
Floating urbanization, the ultimate future proof solution

Karina Czapiewska

3 major trends

- A 40% increase of the total build environment
- Effects of climate change
- Shortage of land, energy, food and resources



FUTURE LAND SHORTAGE

A growing world population consuming more food and resources, will require additional space to expand cities and produce food. Land shortage seems inevitable, mainly due to agriculture and biofuel demand.

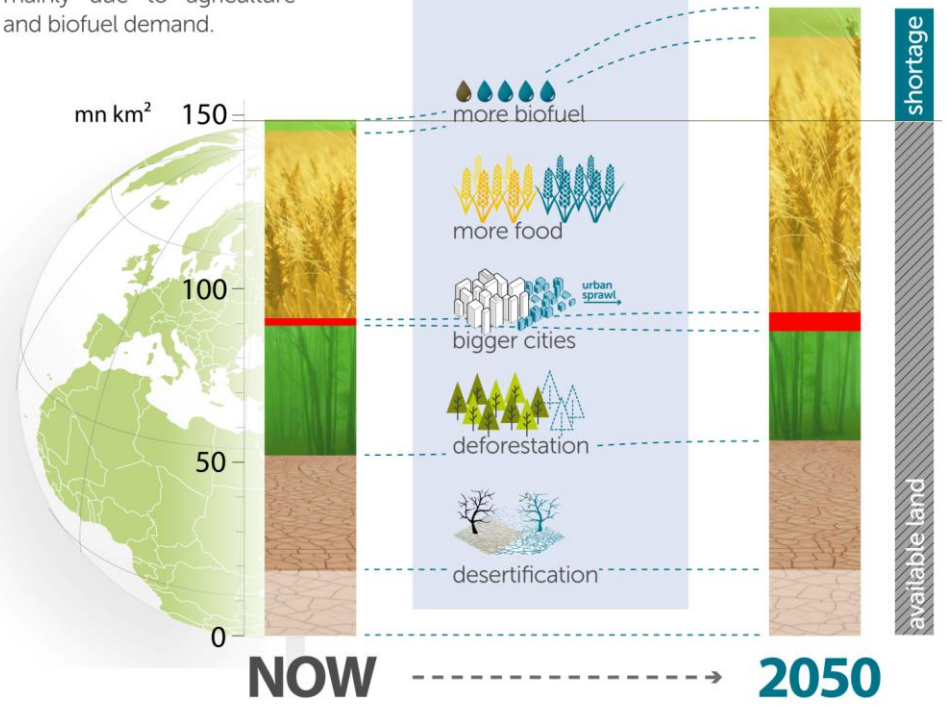
TRENDS AND FACTORS

more people

more consumption

WE WILL BE 22 MILLION sq km SHORT

equal to the area of North America!



Where will we find this space?

?

Where do we find this space

?

MARS ONE

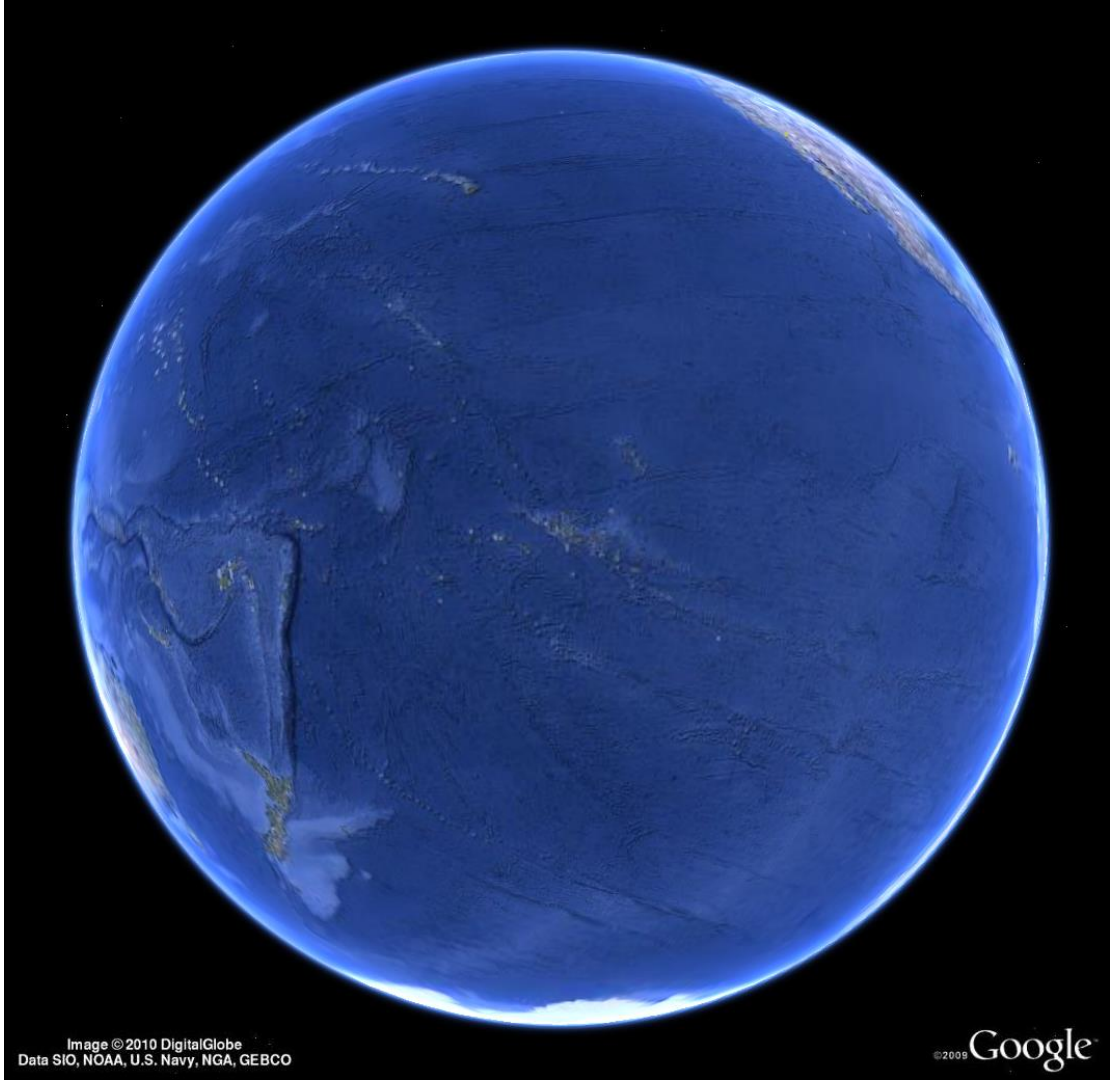


Image © 2010 DigitalGlobe
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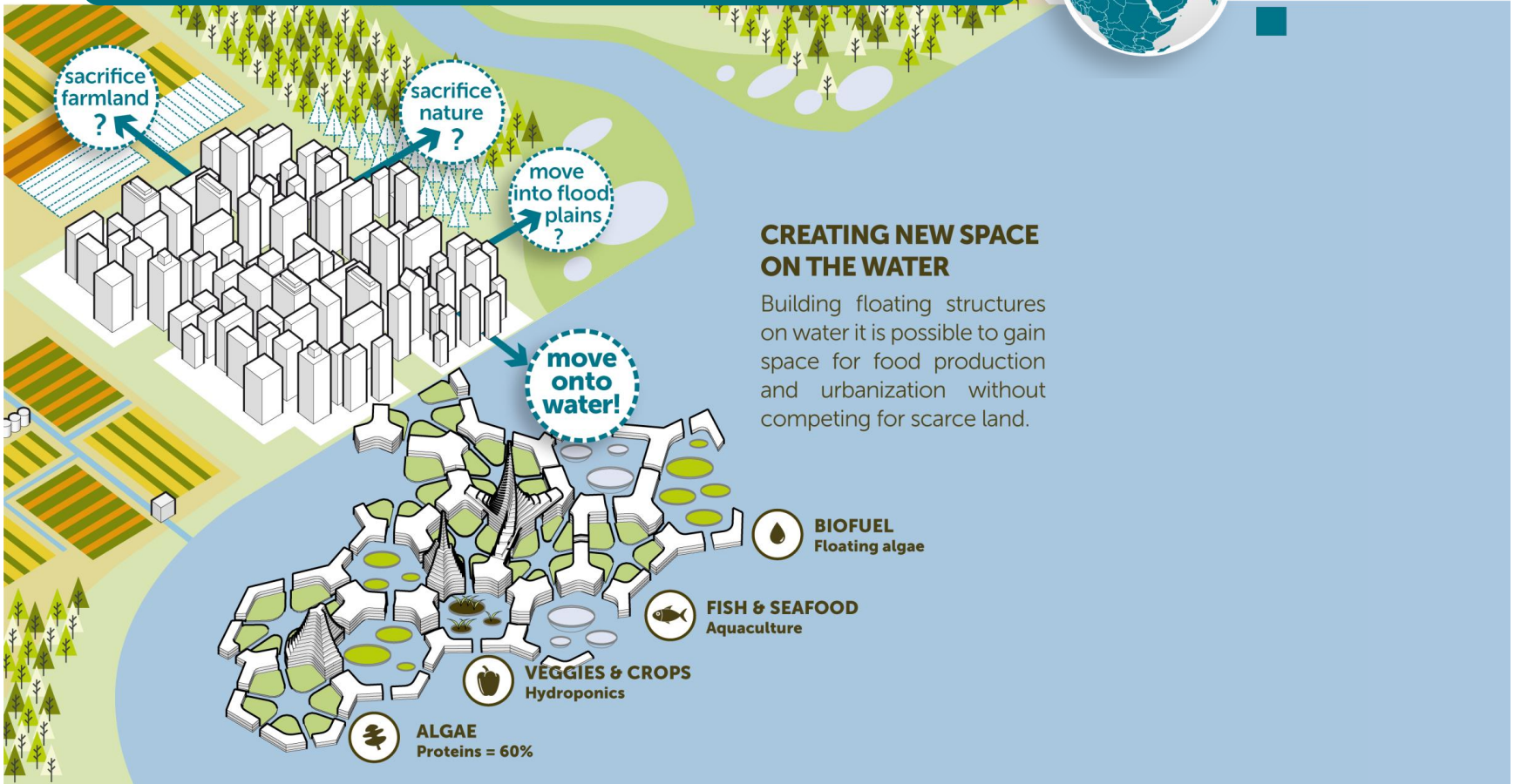
How?


sacrifice farmland ?
sacrifice nature ?
move into flood plains ?
move onto water!
CREATING NEW SPACE ON THE WATER
Building floating structures on water it is possible to gain space for food production and urbanization without competing for scarce land.
BIOFUEL
Floating algae
FISH & SEAFOOD
Aquaculture
VEGGIES & CROPS
Hydroponics
ALGAE
Proteins = 60%

Land reclamation

Characteristics:

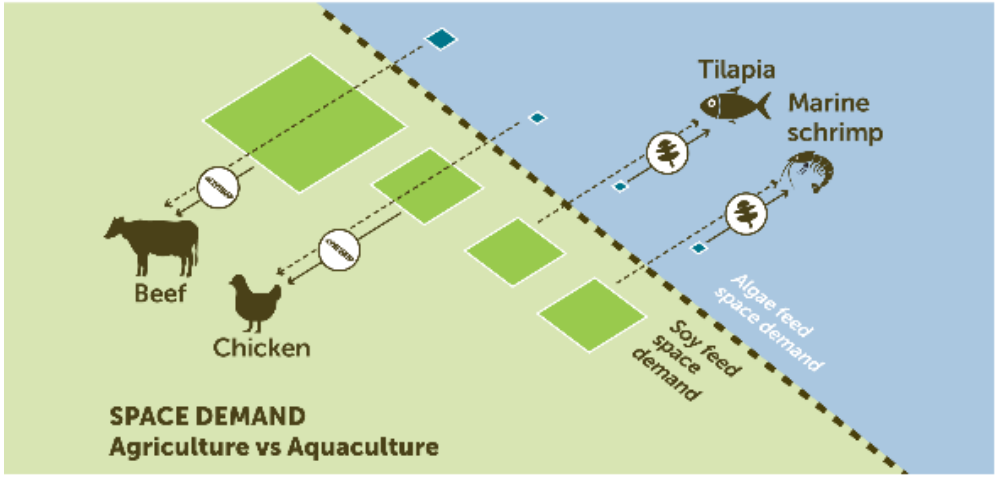
- Large investement needed to start
- Sealevel rise protection with additional dikes
- Destroys local aquatic ecology

Floating urban development

Characteristics:

- Large scale and small scale possible
- Adapts to sealevel rise
- Water quality and ecology benefits

ON WATER WE CAN BE MORE EFFICIENT

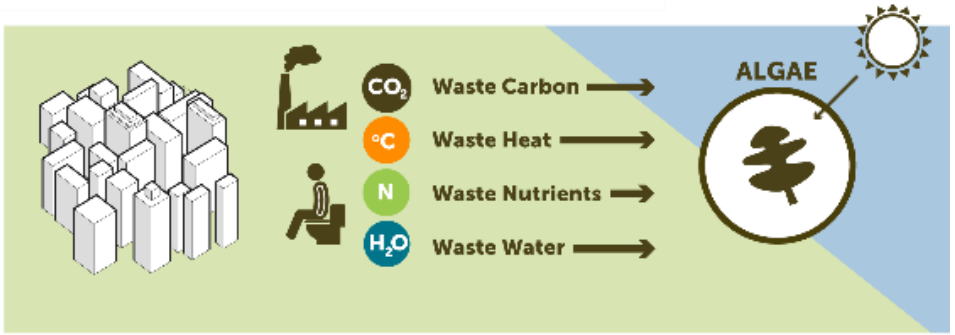


PRODUCE MORE FOOD WITH LESS SPACE

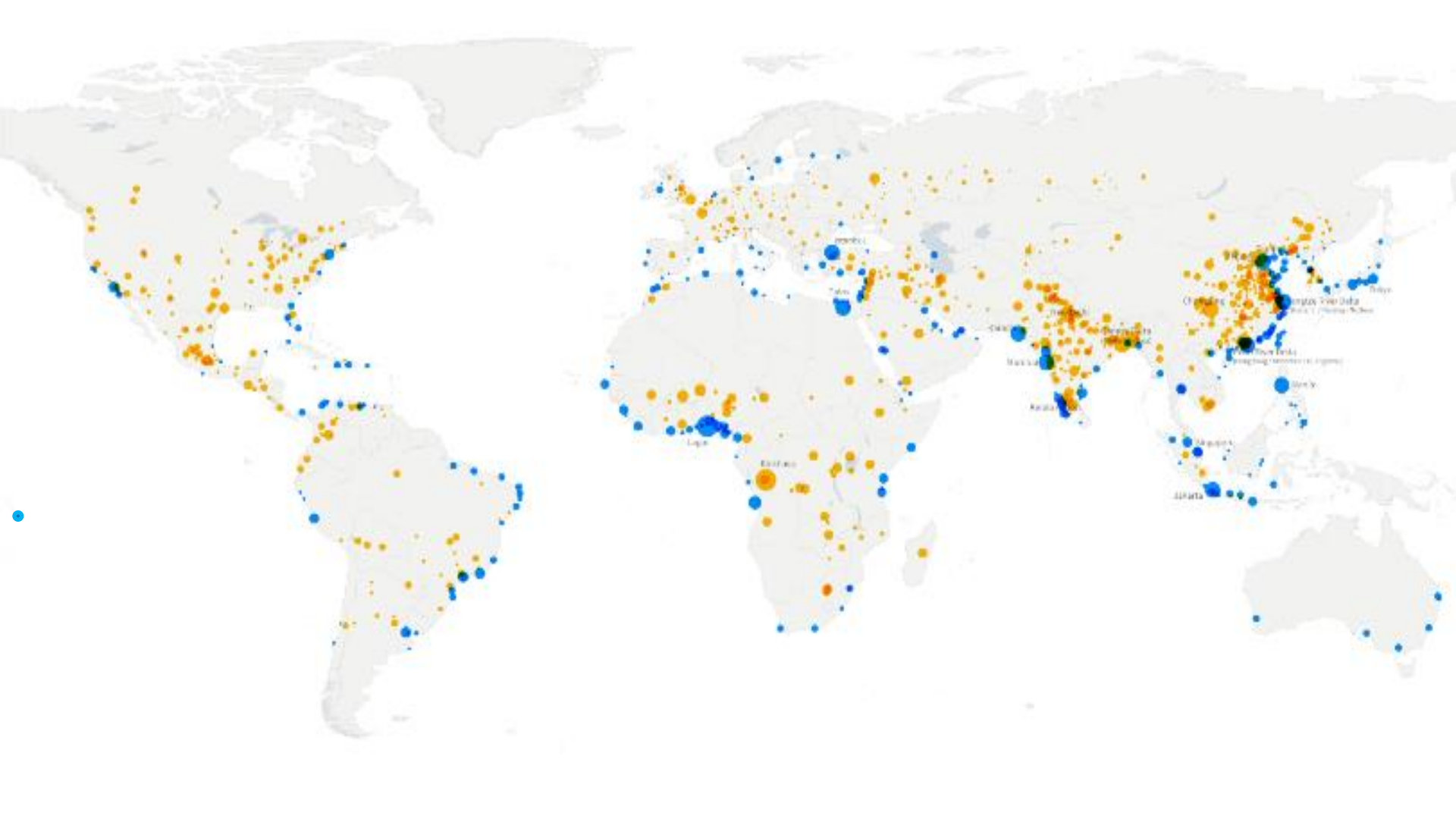
Fish that are fed with algae produce proteins up to **40x more efficiently** than on land. Algae have a higher productivity than soybean and fish have a higher feed conversion ratio than livestock.

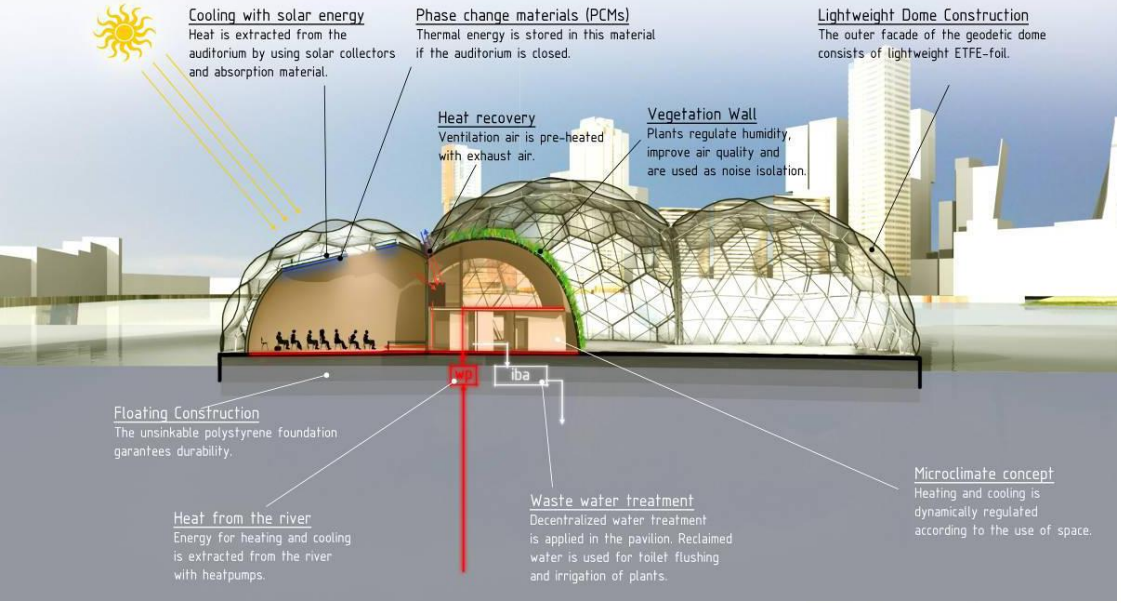
REUSE CITY'S WASTE FOR FOOD

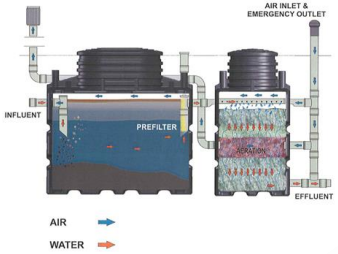
City's outputs that are now considered as "waste" such as carbon dioxide and nutrients, could be used as inputs to grow algae and produce biofuel, feed for fish and food.



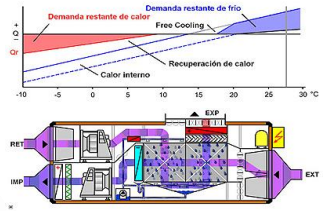
ON LESS THAN 1% OF THE OCEANS





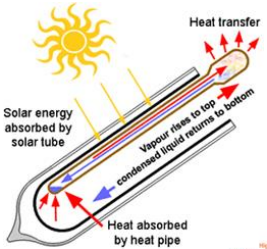


Local waste water treatment

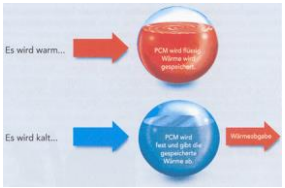


Adiabatic cooling

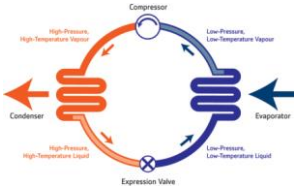
Light weight building



Solar tubes

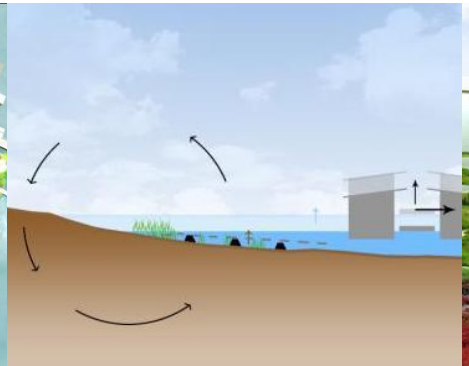


Phase change materials

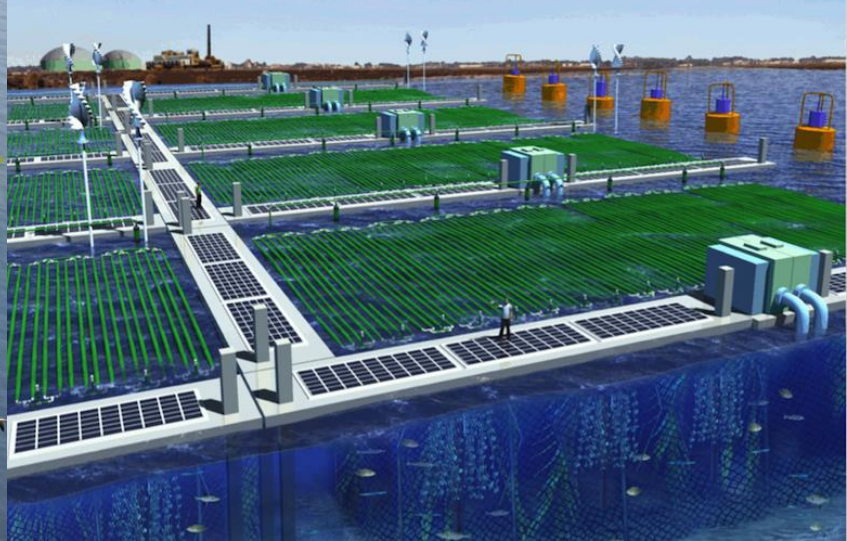


Heat pump

Ecological development and housing




blue21

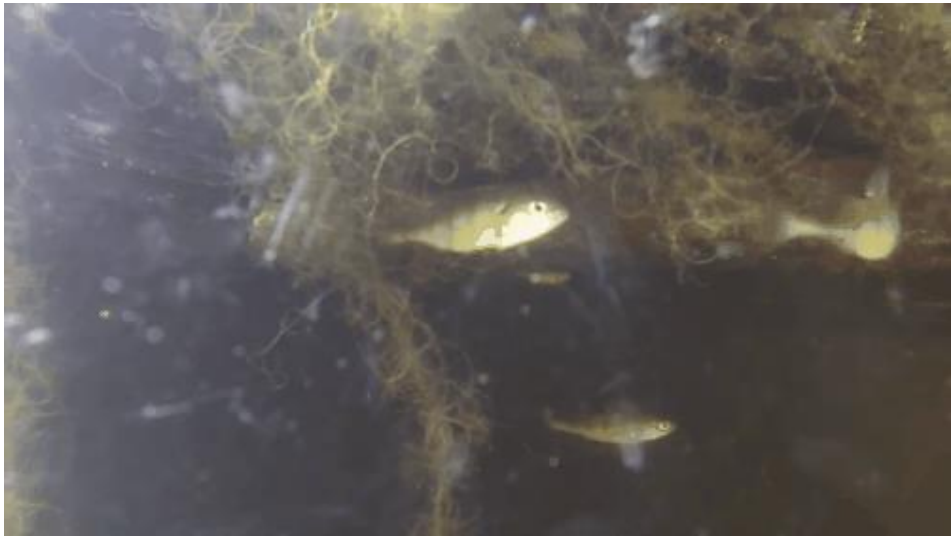


INDYMO – Monitoring water quality

INNOVATIVE
DYNAMIC
MONITORING

Insight into the aquatic environment.

The type of fish and aquatic organisms and biodiversity present, are indicators of the ecological state of water bodies.

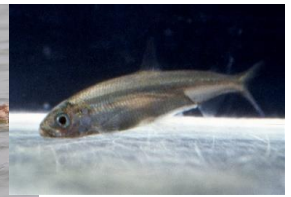


Creating more value for people and planet

People	Prosperity	Planet
Education and knowledge • Monitoring of water quality and biodiversity • Field research about impacts of floating green and structures on ecology • ‘Open-air classrooms’ • Learning by experience (children) **Ethics and culture** • Experience and share of landscape cultural values • Human/nature relationships **Health and wellness** • Clean air • Relax • Outdoor activities **Responsibility** • To species and ecosystems, but also to future generations **Aesthetic** • Emotional response to the beauty of nature	**Job creation** • Research, monitoring, green management, tourism, design, construction **Value creation** • Eco-tourism, recreation, education **Profit** • Business • Contribution to local economy **Innovation** • Integration of technologies • Testing and developing • Global impact: create a new Dutch export product	**Habitat creation and biodiversity** • New habitat for plants (helophytes), mussels, birds and fish • Enhance biodiversity • Improve ecosystem services **Resource efficiency** • Energy efficient houses • Use of renewable energy sources • Combination of systems/functions that can benefit from each other **Waste reduction/recycling** • Reuse of waste and recycle **Life-cycle management** • LCA of materials and buildings







Economy in French Polynesia

Main contributors:

- Financial and welfare transfers from metropolitan France (~55% of French Polynesia's GDP)
- Pearl farming
- Tourism

Sources:
http://cdn.pcwallart.com/images/bora-bora-hotel-map-wallpaper-1.jpg,
https://goo.gl/64zECu

Current challenges

Economic

- Economy based on sensitive industries
- Large import compared to export

Demographic

- Ageing of farming population
- Wage levels and social welfare considerably higher than other countries in the region

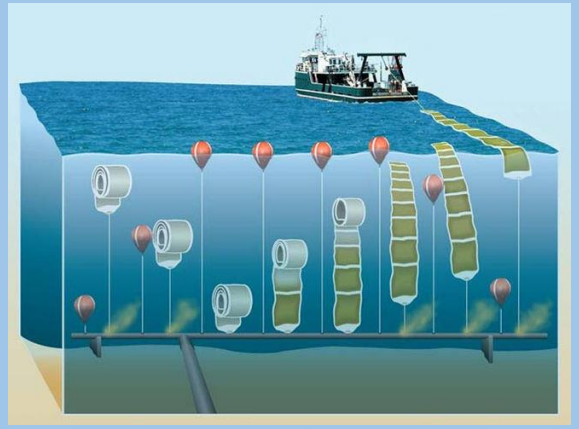
Environment

- Protecting environment from exploitation of resources and invasive species
- Conserving biodiversity
- Waste and waste water
- Climate change

Sources:
http://cdn.pcwallart.com/images/bora-bora-hotel-map-wallpaper-1.jpg,

New economic opportunities

- Eco tourism experience
- Clean technologies
- Cosmetology
- Food and feed industries
- Synthetic chemistry



Sources: https://goo.gl/lKmbSL, https://goo.gl/4LVhjO, https://goo.gl/jdaqes, https://goo.gl/BFKJOx, https://goo.gl/hnZKOJ, https://goo.gl/Z106oD

French Polynesia as leader innovation ground for marine biotechnology

Next to information technology, **biotechnology** is seen as the **next engine of growth** by all governments in industrialized countries.

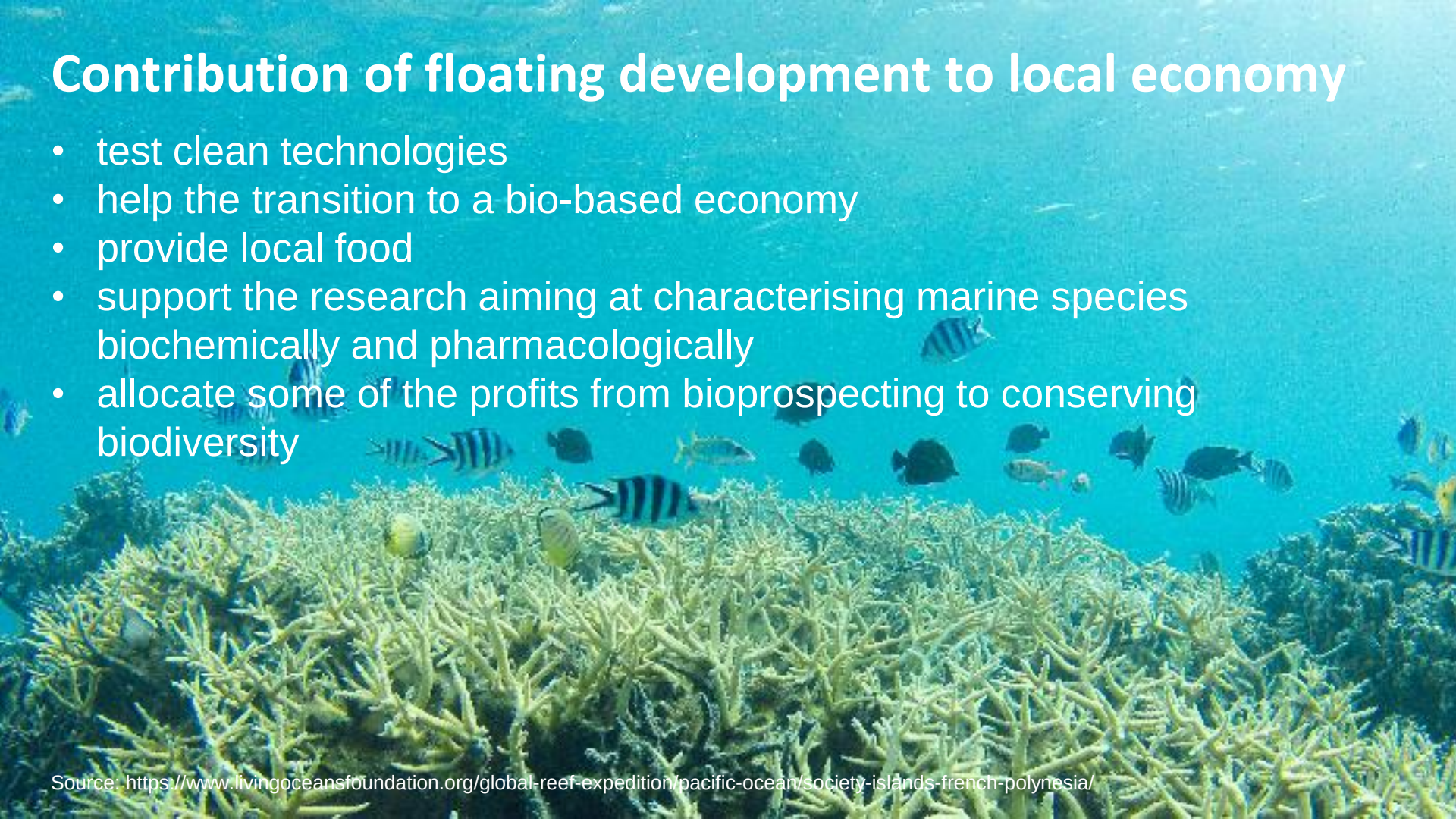
The marine environment is an **inexhaustible source of innovation** for biotechnology specialists.

Because of its wide maritime domain and diversity of ecosystems, **French Polynesia is an unique and privileged area for research and development of marine biotechnologies**.

Sources: http://blogs.nature.com/tradesecrets/files/2015/06/Collecting-sponges.png, http://dorsrv1.fau.edu/CEBMB/img/05a.jpg

Contribution of floating development to local economy

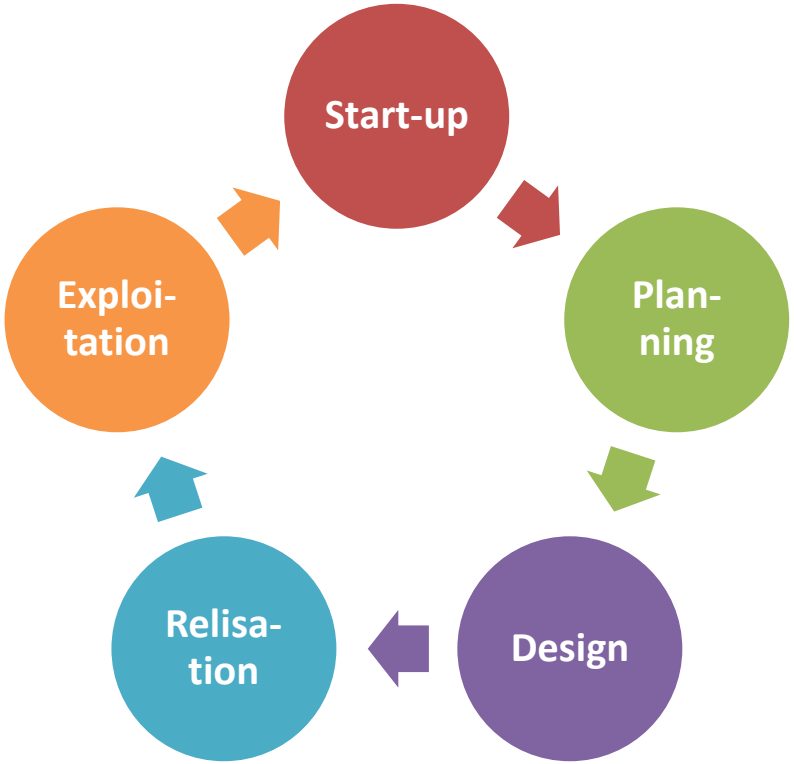
- test clean technologies
- help the transition to a bio-based economy
- provide local food
- support the research aiming at characterising marine species biochemically and pharmacologically
- allocate some of the profits from bioprospecting to conserving biodiversity



Source: https://www.livingoceansfoundation.org/global-reef-expedition/pacific-ocean/society-islands-french-polynesia/

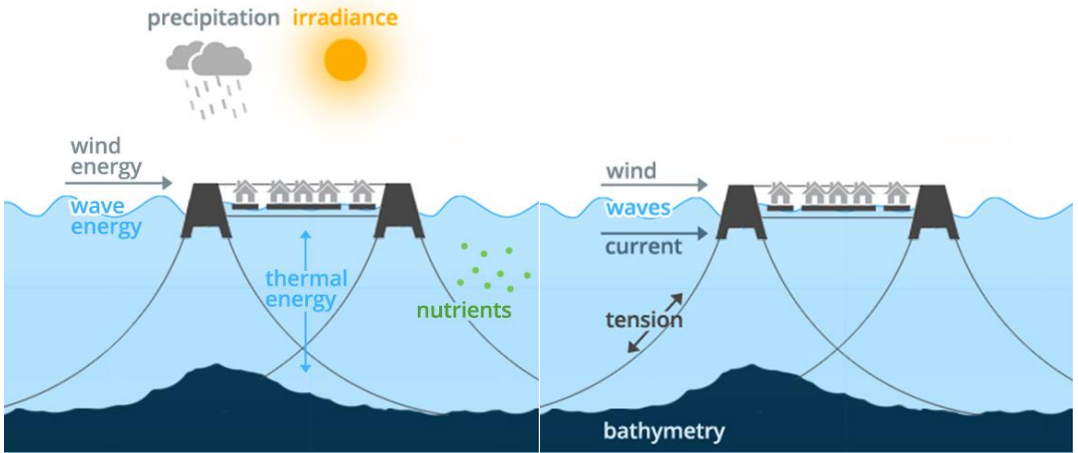
Milestones 2017

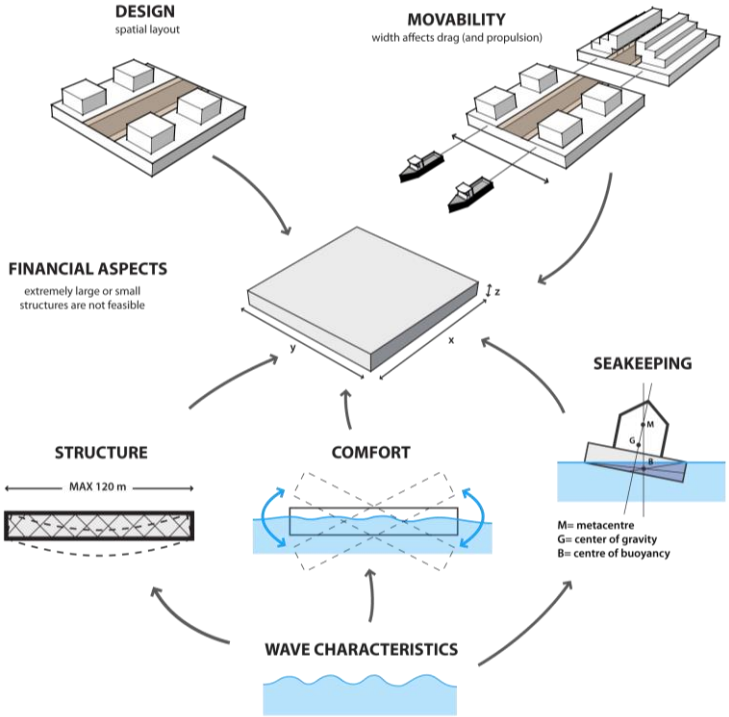
- Legal framework
- Economic SWOT analysis
- Ecological SWOT analysis and impact assessment.
- Involving (local) companies, investors, entrepreneurs and citizen.



Seateading implementation plan FP

- Bathymetry
- Tides and currents
- Waves
- Climate
- Wind
- Ocean energy production
- Nutrients
- Characteristics of a specific location





blue21

Rutger de Graaf
Blue21

WATER INNOVATION ENTREPRENEUR

Bart Roeffen
Blue21

WATER PIONEER AND ARCHITECT

Karina Czapiewska
Blue21

WATER PIONEER AND REAL ESTATE EXPERT

Barbara Dal Bo Zanon
DeltaSync

ARCHITECT AND RESEARCHER

Gabrielle Muris
Urban Impact

URBAN DEVELOPMENT EXPERT

Nico Baardman
Construction Engineering

CONSTRUCTION SPECIALIST

Eva Smits
Blue Revolution Foundation

URBAN DESIGNER

Mirjam van der Ploeg
Blue21

COMMUNICATIONS EXPERT

Rui de Lima
InDyMo

WATER QUALITY EXPERT

Floris Boogaard
Tauw

WATER MANAGEMENT PROFESSIONAL

Michael Capitain
Welwynd Marine

NAVAL ARCHITECT

Jelle Vedder
Bartels&Vedder

FLOATING STRUCTURES & ENGINEERING EXPERT

Sander Berkhout
Visade

PROJECT DEVELOPMENT AND POLICY ADVISOR

Ronald Vuijk
Member of Dutch Parliament

GOVERNANCE EXPERT

Peter Mooij
Delft University of Technology

BIOTECHNOLOGY & ALGAE EXPERT

Pernille van der Plank
Utrecht University

LEGAL EXPERT


Thank you

Cost comparison

Land reclamation		Floating urban development	
	Costs		Costs
Land fill ()	€ 220 /m²	Production floating platforms	€ 300 /m²
Basic flood defense	€ 140 /m²	Mooring / breakwater	€ 110 /m²
Overhead and development	€ 80 /m²	Overhead and development	€ 80 /m²
Costs per m² developed land	€ 520 /m²	Cost per m² developed land	€ 490 /m²
Share of sellable land	65%	Share of sellable land	75%
Cost per m² sellable land	€ 800 /m²	Cost per m² sellable land	€ 650 /m²
Building foundations	€ 75 /m²	Basement space value	− € 100 /m²
Total costs	**€ 875 /m²**	Total costs	**€ 550 /m²**

BlueRevolution main benefits:

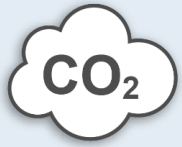
- Improving **resilience**

32% of the passenger car transportation of Rotterdam

66% of vegetal products consumed in Rotterdam

63% of animal proteins consumed in Rotterdam

- Mitigation of **emissions**



8% reduction (Rotterdam+Port)

60% reused

- Reducing **fish depletion**

replace **36%** of wild caught fish (Dutch annual quota)

Other benefits:

- Reducing **water footprint**
- Creating **extra space** without land
- Creating **safe**, **green and climate-proof expansion**
- Providing **economical benefits** and **jobs**

BLUEREVOLUTION

Methodology