The nexus Water Reuse & Sustainable Food

Technical/Scientific session

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Outline

01 The water resource and the SDG's

02 The water management

03 Sustainable Food Chain and the Trade Impact Index

The water resource and the SDG's

6 CLEAN WATER AND SANITATION

Ensure availability and sustainable management of water and sanitation for all

- improve water quality by eliminating landfills, reducing pollution and the release of hazardous chemicals and waste;
- halving the amount of untreated wastewater and **considerably increasing recycling and safe re-use globally.**

40%
Water scarcity affects more than 40 percent of the global population, and that figure is projected to rise.

2.6 billion
2.6 billion people have gained access to improved drinking water sources since 1990, but 663 million people are still without.

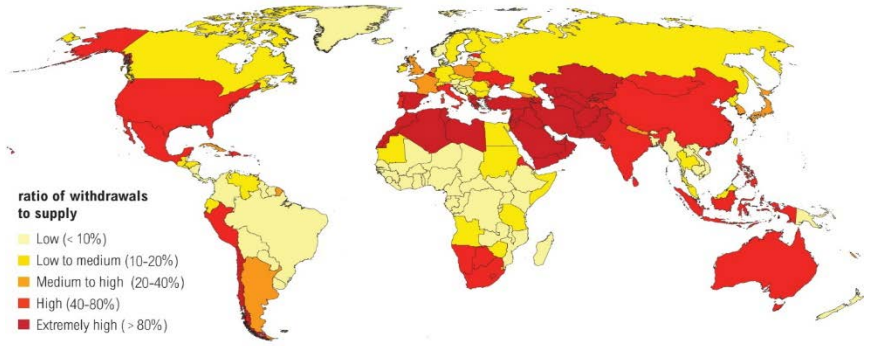
1,000
Each day, nearly 1,000 children die due to preventable water and sanitation-related diseases.

40 billion
Women in sub-Saharan Africa collectively spend about 40 billion hours a year collecting water. This significantly impacts their employment opportunities.

2.4 billion
2.4 billion people worldwide do not have access to basic sanitation services like toilets or latrines.

80%
80 percent of wastewater from human activities is discharged into waterways without any pollution removal.

Water Stress by Country: 2040



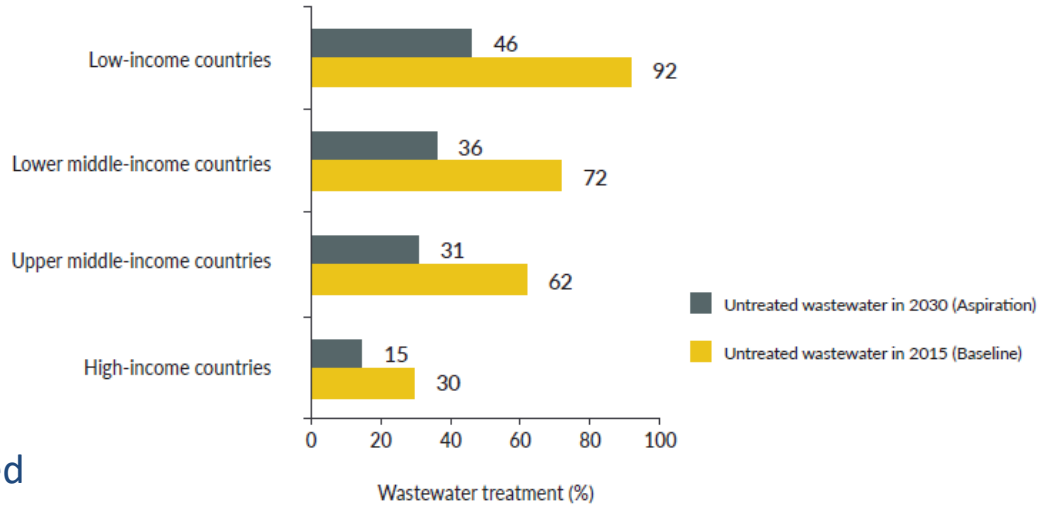
NOTE: Projections are based on a business-as-usual scenario using SSP2 and RCP8.5.

For more: ow.ly/RiWop

WORLD RESOURCES INSTITUTE

Water stress is a problem both for countries with drought problems (low rainfall, high population density), and for **countries with a temperate climate and with intensive agricultural, industrial and tourism activities.**

The water resource and the SDG's



Wastewater, thanks to innovative treatment technologies and nature-based solutions, can be changed from **waste into a resource**

Just few numbers about the volumes of treated wastwater

City wastewater treatment plant	Population Equivalent	L/day	L/year
Potenza*	116 000	23 200 000	8 468 000 000
Perugia San Sisto**	40 000	8 000 000	2 920 000 000
Perugia Ponte S. Giovanni**	30 000	6 000 000	2 190 000 000

*ARPA Basilicata
**ARPA Umbria

The water resource and the SDG's

The water management as an economic opportunity

To create a virtuous system, planned for waste water reusing to reduce waste as much as possible

To foster a strategy to develop economic and sustainable growth according to the goals of the Agenda 2030

To obtain environmental, social and economic advantages by guaranteeing the "system sustainability"

6 CLEAN WATER AND SANITATION

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

2 ZERO HUNGER

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

The water management and Sustainable Food

Sustainable Food Chain

- **The world's population will grow continuously to reach 9.6 billion by the 2050s**
- **The global demand for energy and water will increase by 80% and 55% by 2050 (OECD)**
- **The food production should be increased by 60% in 2050 to cope with population growth (FAO)**

- **Irrigating and feeding plant in a sustainable way is a critical challenge humanity must address and solve;**
- **recent analysis revealed that level of CO2 over 500ppm correlates with lower nutritiousness of food produced*, a challenge that urges new solutions in food production.**

*"*Hidden shift of the ionome of plants exposed to elevated CO2 depletes minerals at the base of human nutrition ",* **Irakli Loladze**

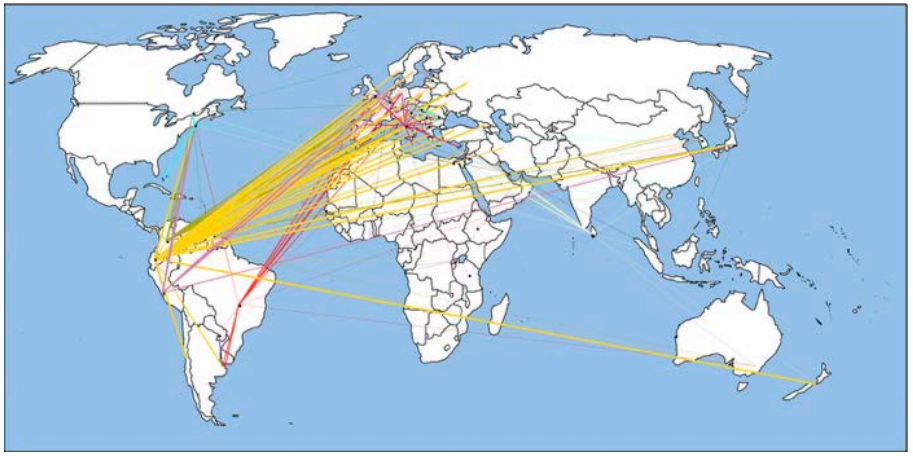
Sustainable Food Chain

The Food-computer Model: an innovative way to re-think the sustainable food production

- The entire climate conditions can be programmed – temperature, light, gas composition, humidity, etc.
- Best scientist and industrial partners to focus on how to scale the model.

- A full energy model is still missing.
- Can distributed local food-computer support the global food chain in reducing its net impact on the ecosystem?

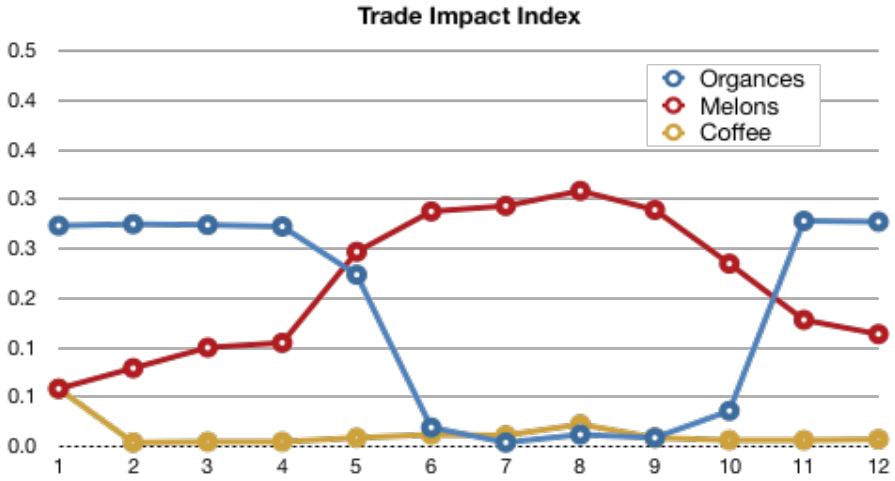
The Trade Impact Index



The Global food Chain: a complex system with energy and environmental costs

- **global logistics allowed world population to access any food in any season.**
- **This results in a large energetic cost of transportation, something hard to distinguish from fossil fuels, but now an impact index is measurable thanks to advance data modeling***

Trade Impact Index quantifies the impact of importing a specific food raw commodity in a specific period of the year and in a specific country of the world.**



*L.Assom, M.Beria, A.Codello, M.Monaco, R.Sabatini
**https://foodcast.sissa.it/

Current global Food-Chain Versus Food-computer Model: strenghts and weakness

Low energy cost for production Climate available *in situ*	**High energy cost for production** Climatization, illumination
High energy cost for transportation Global logistic required	**Low energy cost for transport** Production proximity to consumption
Non-diversifiable energy cost Fossil-fuel for transport	**Highly diversifiable energy cost** Renewables can be used
Risk under extreme climate condition High CO2 impact nutritiounness	**Resilient to any external climate** Controlled CO2 environment
Other risk factors Pesticides, soil depletion, nitrogen, etc	**Other advantage points** No pesticides, soil loops, etc

Conclusions

- Clean and safe water shortage, due to climate change effects and to a variety of factors, such as poor infrastructure and poor management of water services/supplay, represent a global concern.
- Wastewater, thanks to innovative treatment technologies can be changed from waste into a resource and become one of the most important sources of water supply for civil uses and in agriculture, according to circular economy principles.
- Global demand for energy and water will increase by 2050 as well as food production demand by 60% in 2050.
- Feeding the plant in a sustainable way is a critical challenge humanity must address and solve, that comprise the energy strategy and the sustainable water management.
- Recent studies revealed that level of CO2 over 500 ppm correlates with lower nutritiousness of produced food, a challenge that urges new solutions in food production.

FEEM PROJECTS for 2019

- **Projects goal I – Circular Economy model for Food-Computers**
- Evaluate the Food Computer Model in terms of circular economy
- Analyze the comparison between costs / benefits of food production in Food Computer versus traditional agri-food supply chain (carbon impact, agricultural yield, using renewables as energy sources the reduction of emissions related to the products trading)
- **Projects goal II – Tools for global Food-Chain optimization**
- Implement the Trade Impact Index introducing the economic data so to complete the model
- realize a circular economy model applied to food and focused on energy diversification and overall environmental cost
- evaluate the overall CARBON FOOTPRINT of produced food