Serviços de Ecossistemas nas Cidades

A Biodiversidade e a Adaptação Climática ao Serviço da Qualidade de Vida

EXPLORING THE WATER-FOOD NEXUS AND THE WATER-ENERGY NEXUS IN THE CITY

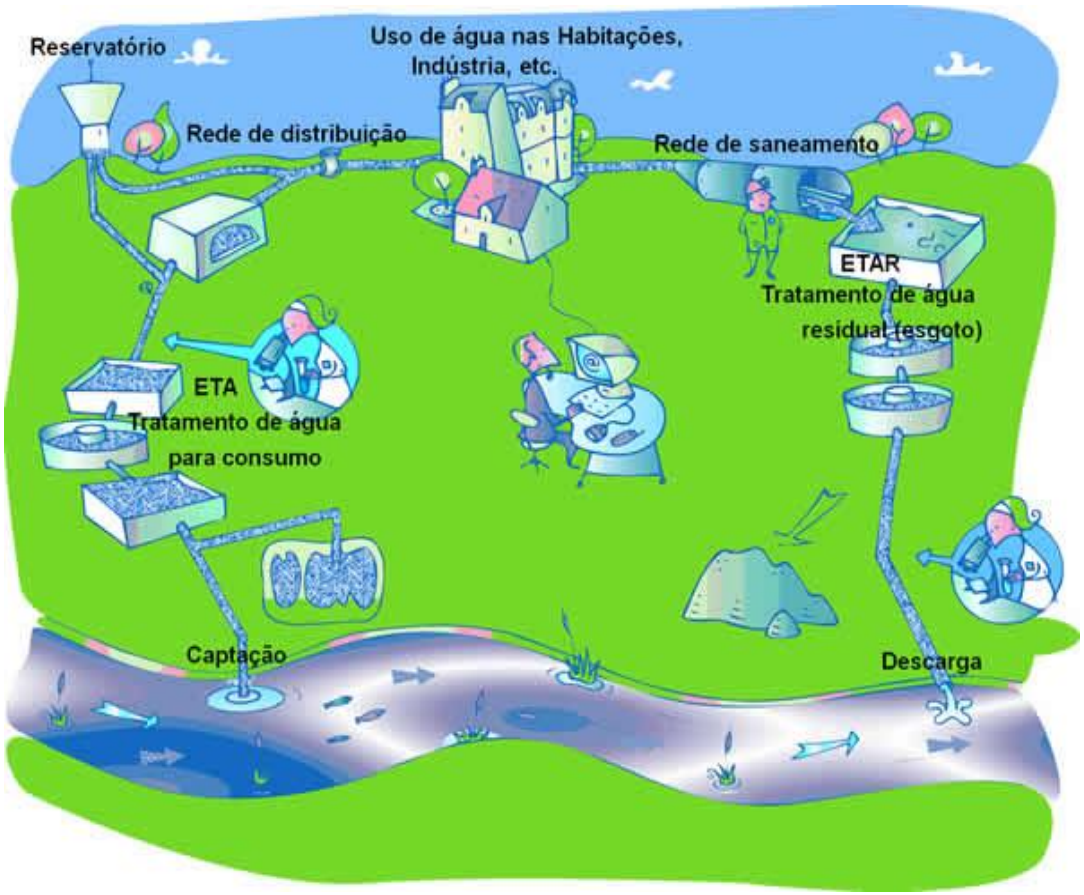
José Saldanha Matos (Prof. IST-UL, EWA)

LNEC, 09 de March 2017

TOPICS OF THE SESSION

- ✓ INTRODUTION
- ✓ GLOBAL TRENDS AND CHALLENGES
- ✓ SANITATION SOLUTIONS AND OPPORTUNITIES
- ✓ CASE STUDIES IN DIFFERENT CONTEXTS: DRAINAGE AND SANITATION MASTER PLAN OF THE GREAT MAPUTO AREA IN MOZAMBIQUE, AND THE LISBON DRAINAGE MASTER PLAN.
- ✓ FINAL REMAKS

Urban Water Cycle – Water moving in the City



Water Supply and Wet or Dry Sanitation

Water Circulation, Use, Reuse and Valorisation

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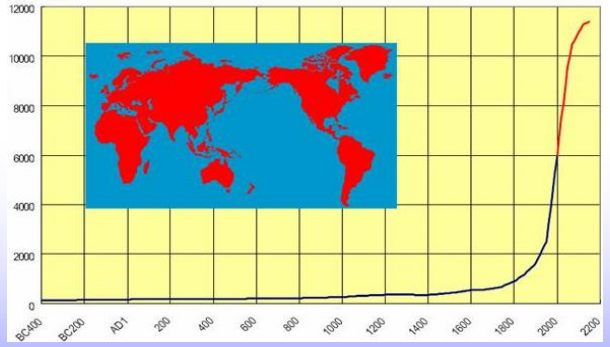
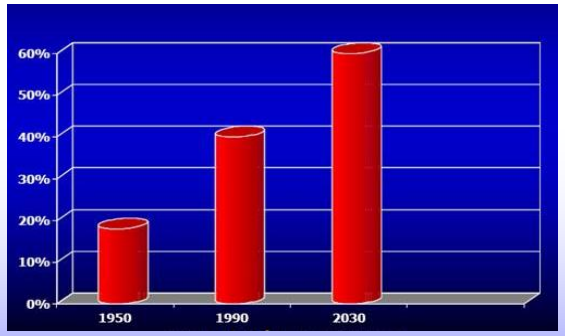
GLOBAL TRENDS AND CHALLENGES

- DEMOGHAPHIC GROWTH, PRINCIPALY IN DEVELOPING COUNTRIES RESULTING IN DIFFERENT STRESSES (MEGA CITIES-55% LIVING IN URBAN AREAS)
- MIGRATION FROM RURAL TO URBAN ZONES (EXPONENTIAL EXPANSION OF UNFORMAL PERI-URBAN SLUMS)
- INCREASING CONSUMPION RESOURCES ; CONTAMINATION RISKS OF WATER SUPLLY SOURCES ;
- MORE DEMANDING AND AMBITIOUS ENVIRONMENTAL LAWS AND REQUIREMENTS



Population Increase (millions)



% Urban/Rural

- SIMILAR AMBITION FOR OF THE WASH SECTOR IN DIFFERENT COUNTRIES OF THE WORLD (VISION, GOALS AND TARGETS) WITHOUT ENOUGH CARE WITH ENSURING RESOURCES FOR ACHIEVING THE GOALS, AND DEFINE INDICATORS/MONITORING .

- ADAPTATION CHALLENGES TO A CHANGING ENVIRONMENT IN A CHANGING WORLD (CLIMATE CHANGE, LAND USE CHANGES, SUSTAINABILITY ISSUES……)

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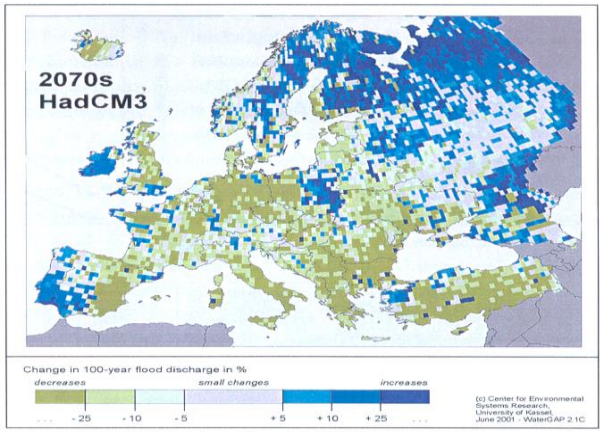
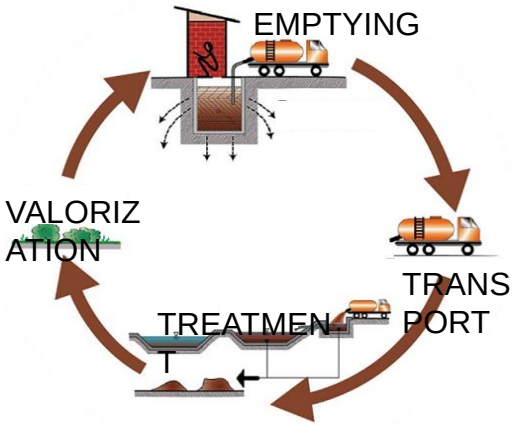
CLIMATE CHANGE PREASSURE - REQUESTING SOCIETAL RESPONSES : FLOODS AND DROUGHTS AND SEA LEVEL RISING



TENDENCIES

✓Clear interactions between the water sector and other sectors: Social sciences, economy,... Bio-based Economy and Solutions, Eco-efficiency, resources recovery (water, nutrients, energy).
✓Importance of natured based solutions (meaning stalilization ponds, constructed wetlands, retention bassins, urban green-food spots,…).
✓Tendencial separation (Brown, yellow, and grey water) and re-use of treatment by-products (ECOSAN- Ecological sanitation)
✓"Descentralization" and "Onsite Sanitation"- Using locally the resources
✓Relevance os services instead of Infrastructures – Infrastructures for serving the services
✓Crucial Role of knowledge and "know-How", to innovate and allow using inteligence to produce Value



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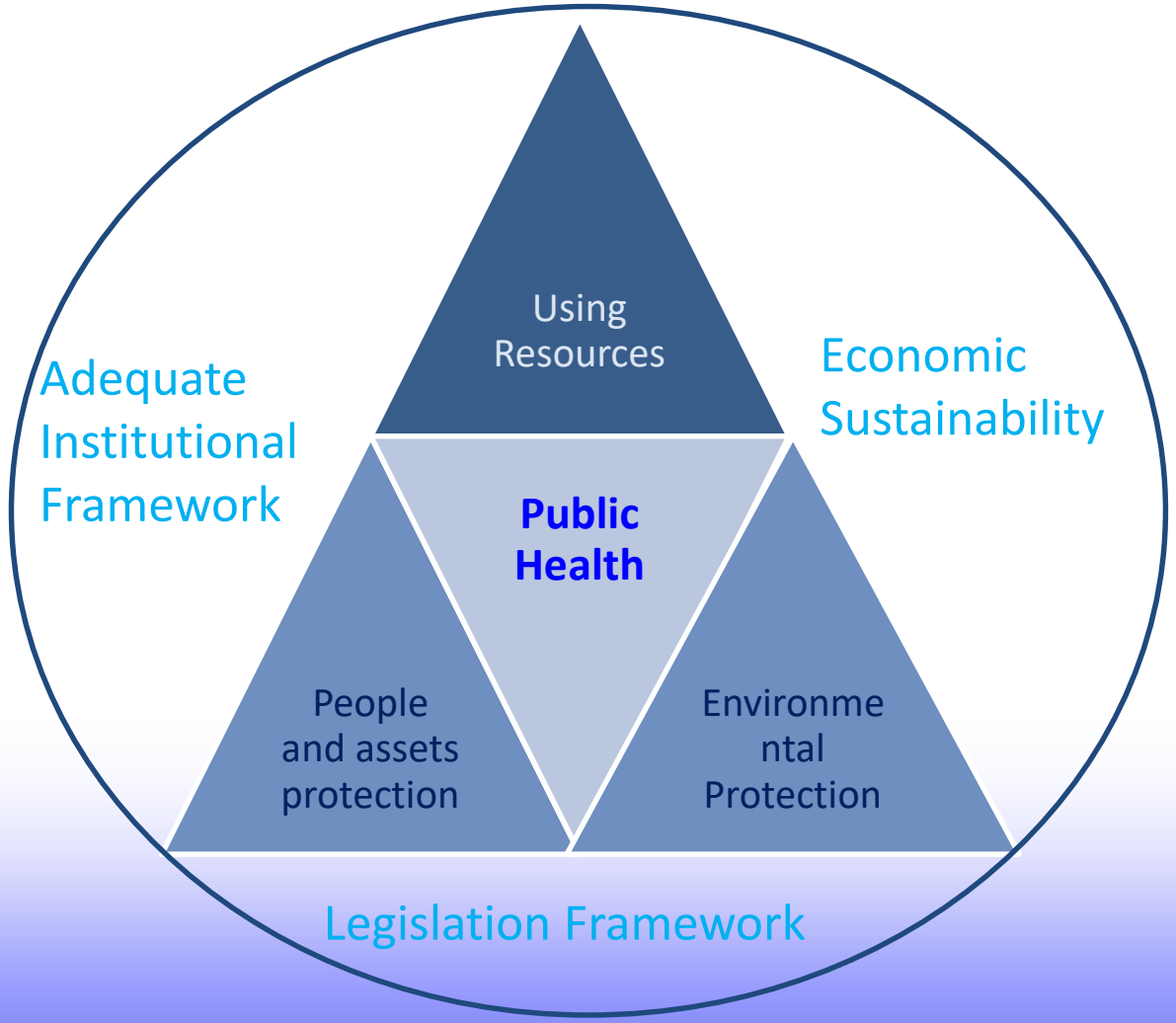
SANITATION SOLUTIONS AND APROACHES, AND OPPORTUNITIES

WATER SECTOR: OBJECTIVES AND SERVICES.



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ADAPTED SOLUTIONS TO CLIMATE, ECONOMIC CONDITION, AND LAND OCCUPATION URBANIZATION

Climate

Arid

Semi-arid

Temperate or wet

tropical

WASH

Urbanization type

Urban

Rural

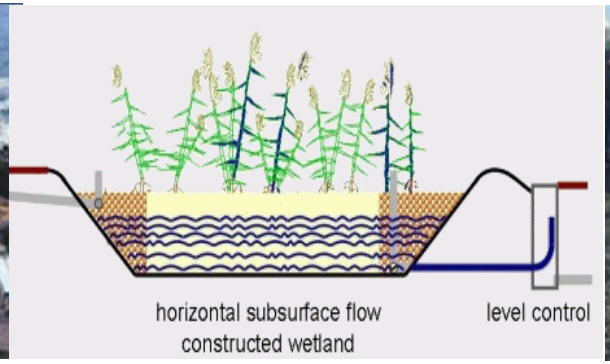
Peri-urban

Economical Condition

High income

Medium income

Low income



Different examples of NBS : Beja 32 constructed wetlands WWTP (12 000 e.p) using the treated effluent for urban park irrigation;
Water-Food nexus: Urban green-food spots (“hortas urbanas”, Quinta do Texugo, Almada; Rio Seco,…Lisbon).
Ameixoeira and Alto da juda retention bassin.. (Lisbon)…

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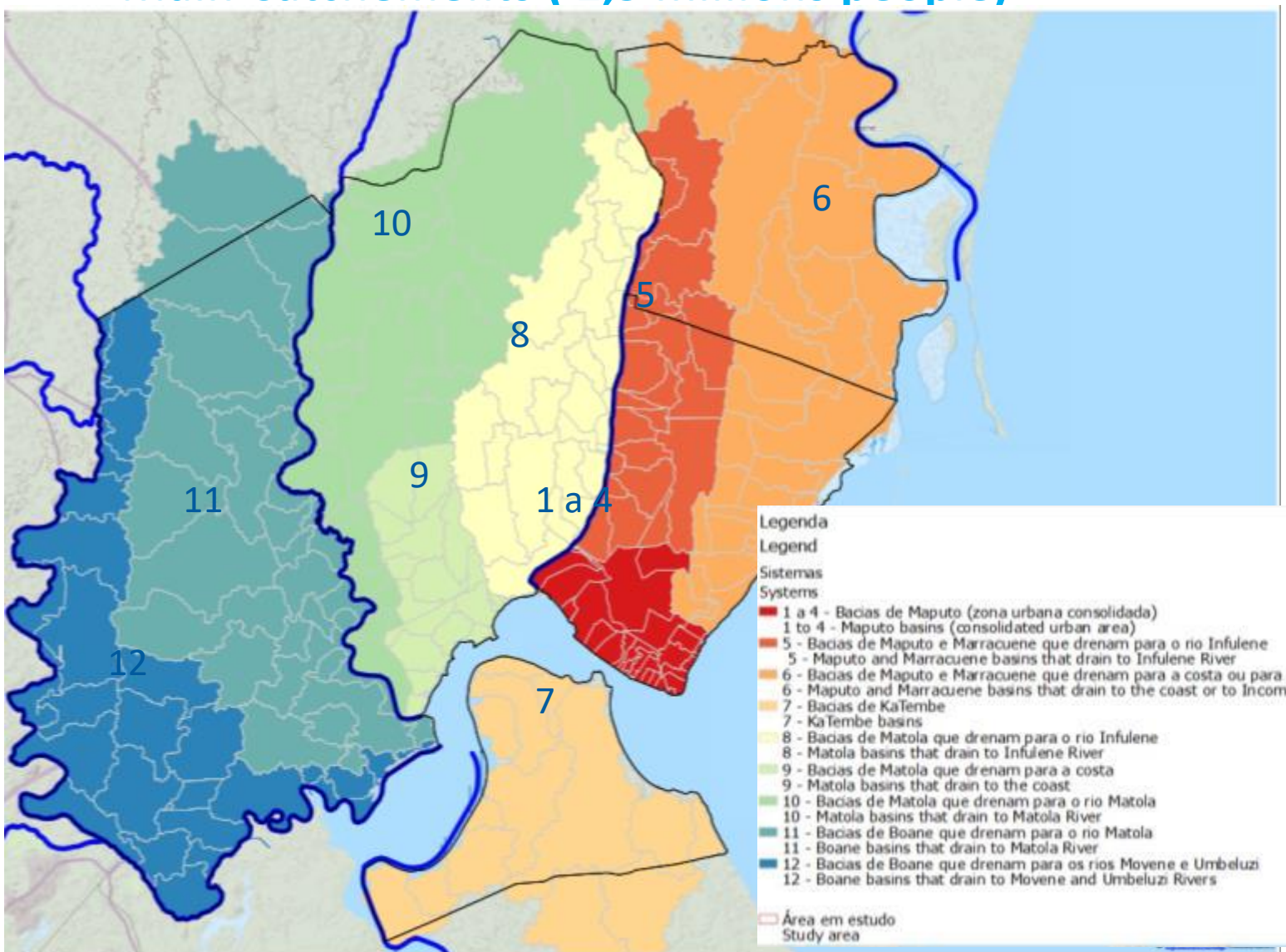
CASE STUDIES IN DIFFERENT CONTEXTS :

DRAINAGE AND SANITATION IN DEVELOPING COUNTRIES: CASE STUDY OF THE GREAT MAPUTO REGION

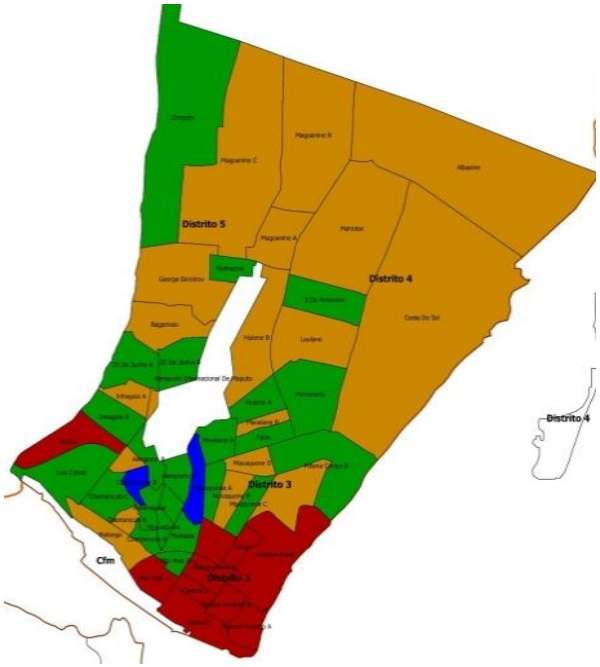
PROJECT FUNDED BY THE WORD BANK, UNDER THE PROGRAMME "CITIES AND CLIMATE CHANGE."

Main Catchements (2,5 millions people)



Sanitation in Maputo Region (2,5 millions inhabitantes, 4 millions in 2030)

Maputo System (sanitation with **sewers (red)**, **septic tank (green)** and **dry sanitation (latrines)** --The main problem: Feacal sludge management. Challenge: Pushing appropriate management, circular economy , employment and development.



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MAIN PROBLEMS AND CHALLENGES

- A MAJOR PART OF MAPUTO (AND OTHER CITIES OF AFRICA) HAS NO WATER PIPES NOR SEWERS. FEACAL SLUDGE MANAGEMENT SERVICES ARE VERY LIMITED;
- MOST OF THE WASTEWATER AND FEACAL SLUDGE IS DISPOSED WITHOUT TREATMENT;
- VERY LIMITED RESOURCES FOR OPERATION AND MAINTENANCE
- NEED OF STRENGHING THE INSTITUTIONAL FRAMEWORK (GOVERNANCE)
- NEEDS OF CAPAPACITY BUIDING
- NEEDS OF INTELIGENCE TO PRODUCE MORE WITH LESS RESOURCES- EXPLORING THE WATER-FOOD NEXUS

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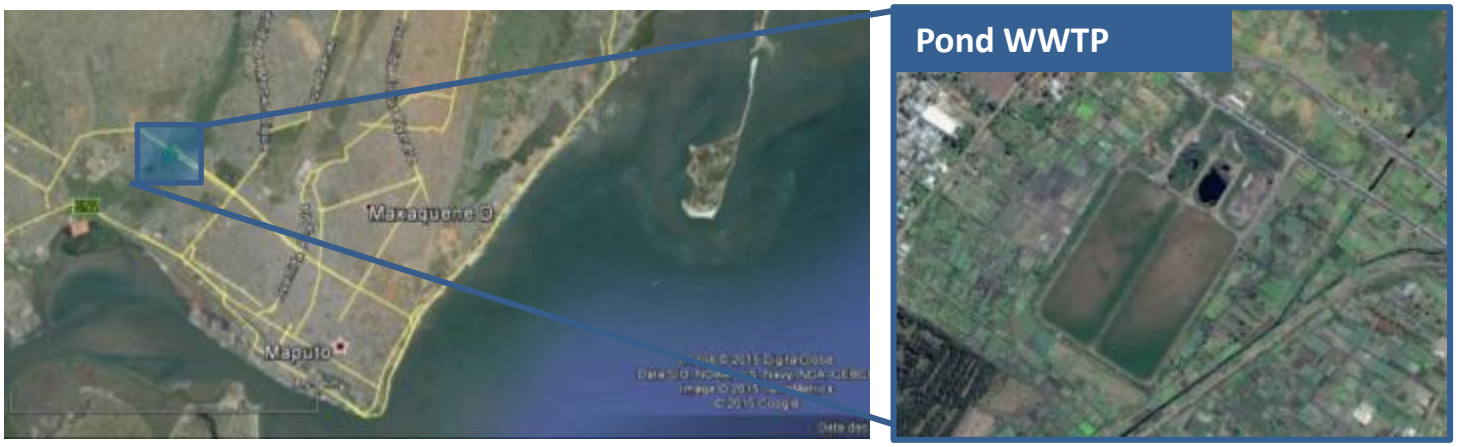
10 ha INFULENE POND SYSTEM FOR WASTEWATER (TO BE EXPANDED)

REUSE FOR URBAN FARMS




ANAEROBIC POND


FACULTATIVE POND


AGRICULURE

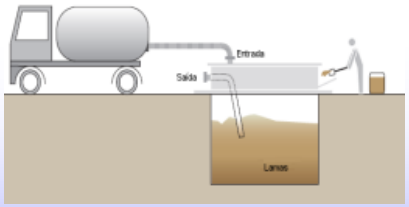
AFRICAN GREEN CITIES IN DRY CLIMATE

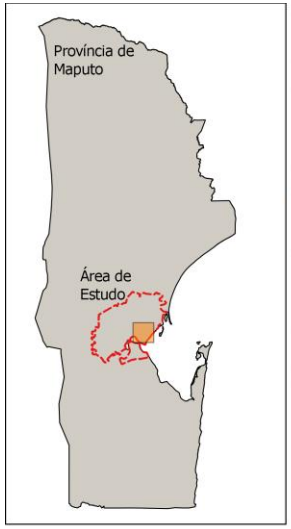
40 000 PEOPLE LIVING FROM URBAN FOOD PRODUCTION IN MAPUTO : (4 USD $/DAY INSTEAD OF 1 USD/DAY) - WASTEWATER REUSE PLAYS A ROLE






DECENTRALIZED SOLUTIONS: SLUDGE TRANSFER STATIONS





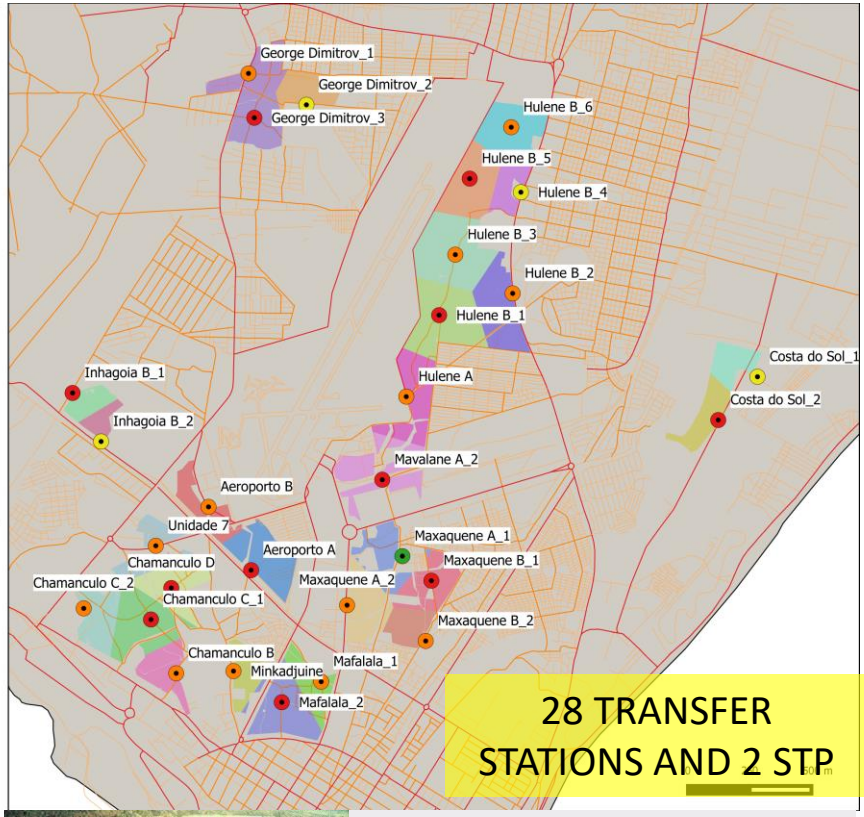
Legenda:

Estação de Transferência de Lamas

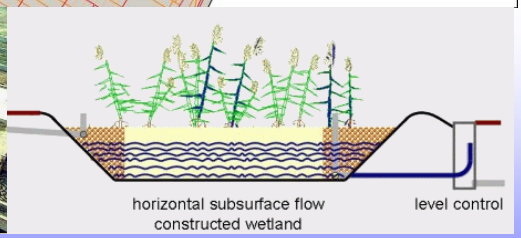
- Existente
- Proposto - 1ª Fase
- Proposto - 2ª Fase
- Proposto - 3ª Fase

Vias de Comunicação

- Principais
- Secundárias
- Terciárias



28 TRANSFER STATIONS AND 2 STP

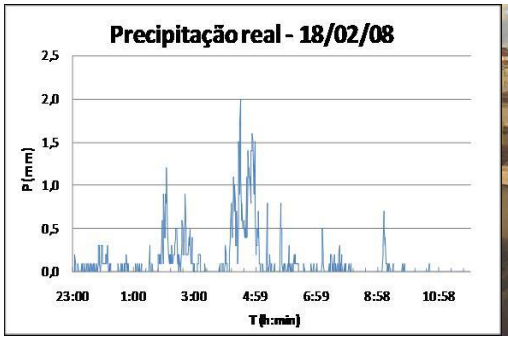


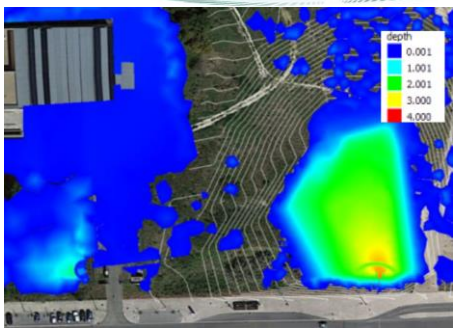
CASE STUDY IN EUROPE:
LISBON
DRAINAGE MASTER PLAN




LISBON DRAINAGE MASTER PLAN (2016-2030).

- Different components: Retention basins, source control techniques, flow control structures in overflows , sewer rehabilitation and two major tunnels (flow transfer between catchments)
- Capacity Building,
- Monitoring and Research.





Example: Stormwater Retention Bassin- Alto da Ajuda

José Saldanha Matos
Filipa Cardoso de Menezes

Peak Flows

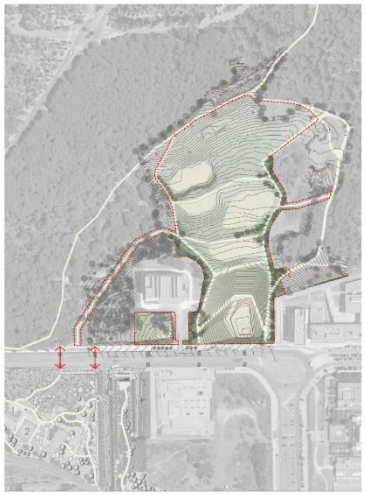
Alto da Ajuda

I-D-F Brandão - Posto IGIDL [mm/h]						
T [anos]	**2**	**5**	**10**	**20**	**50**	**100**
[5 min, 30 min[						
a	176.46	214.32	239.69	264.16	295.96	319.86
b	-0.529	-0.499	-0.486	-0.477	-0.467	-0.461
Curvas I-D-F Regulamento (Zona A) [mm/h]						
T [anos]	**2**	**5**	**10**	**20**	**50**	**100**
a	202.72	259.26	290.58	317.74	349.54	365.62
b	-0.577	-0.562	-0.548	-0.538	-0.524	-0.508

Qp (T 10)= 1,8 m3/s <4 m3/s

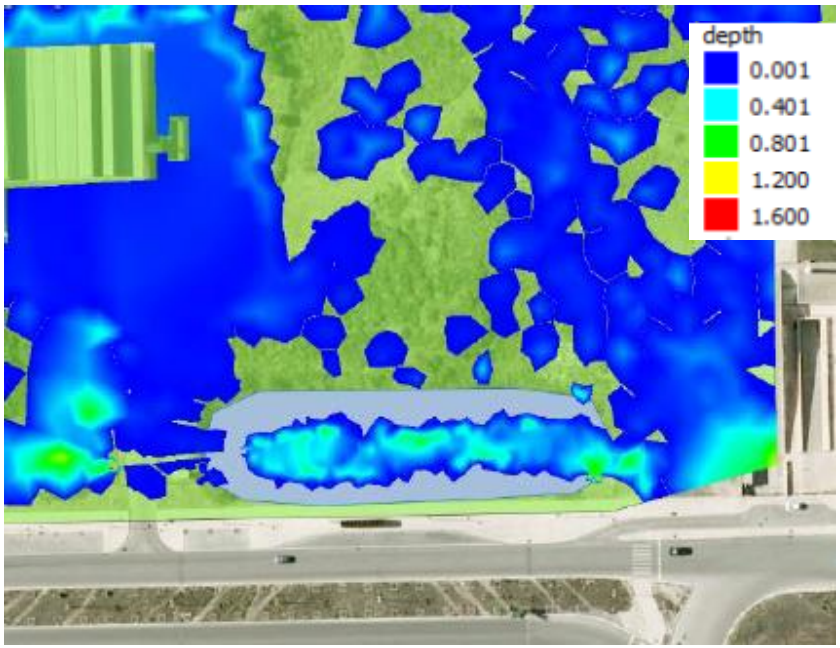
Área	*[ha]*	32.0
Tipo solo	*[-]*	C
L	*[m]*	727.4
i	*[m/m]*	0.088
Class. I.T.	*[-]*	Muito inclinado
ψ1	*[-]*	0.70
A.I.	*[%]*	10%
C	*[-]*	0.35


Fotografia aérea - situação Existente



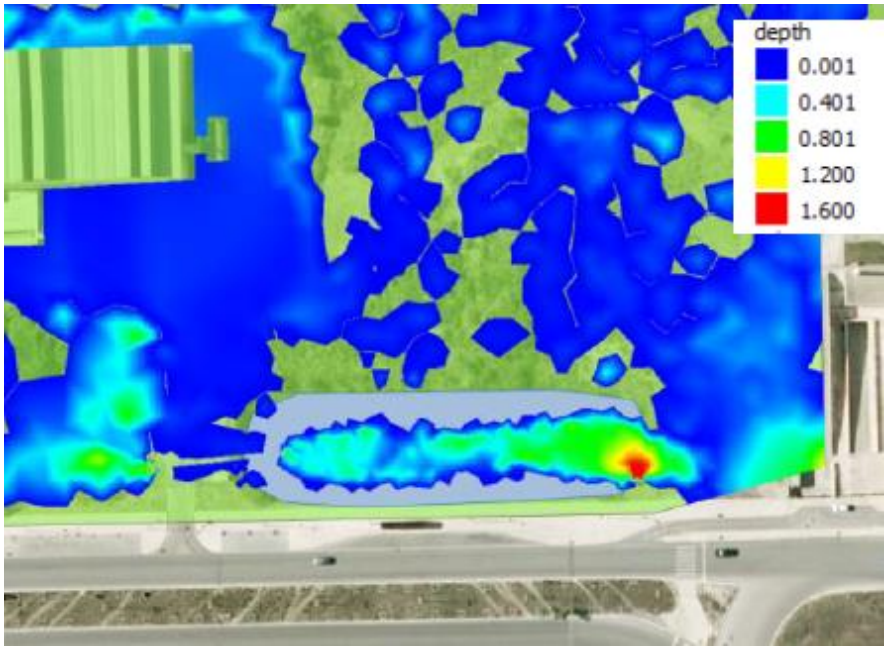
DN 1000, T= 10 e T=100 years

z_{min}= 108.89 m



DN1000, T10

h_{max}= 0.64 m



DN 1000, T100

h_{max}= 1.84 m

Benefits and Services

a) Retention of gross solids (protecting sewer assets and maintenance)

b) Redution of peak flows and flooding risks (80%, for T= 10 years)

c) Explore the potential for creating value

- ✓ With scientific opportunities (Monitoring station – rainfall, flowmeter).
- ✓ Exploring better the space and their excepcional views landscape level) .

VIEW TO THE SOUTH

VIEW TO THE NORTH

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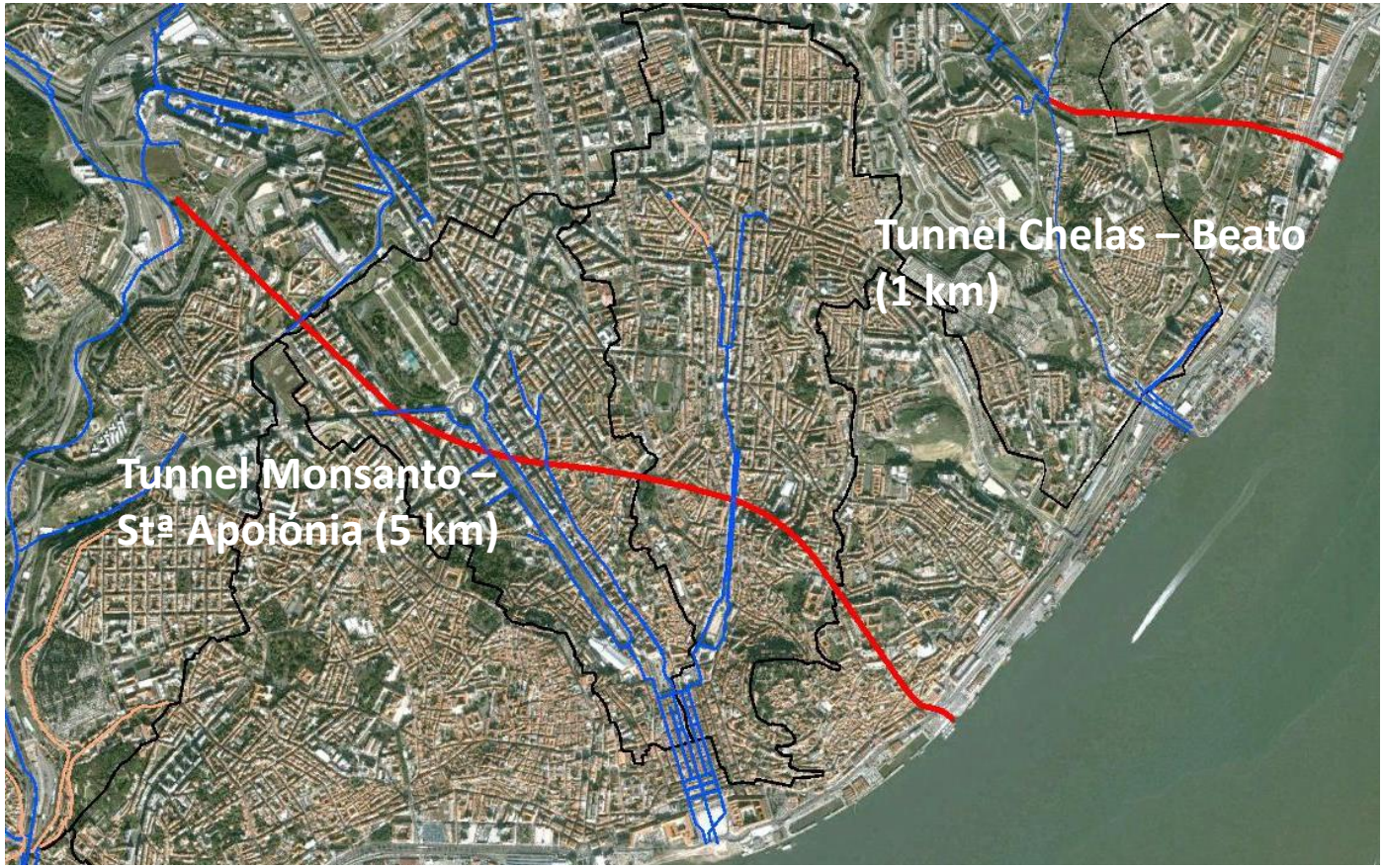
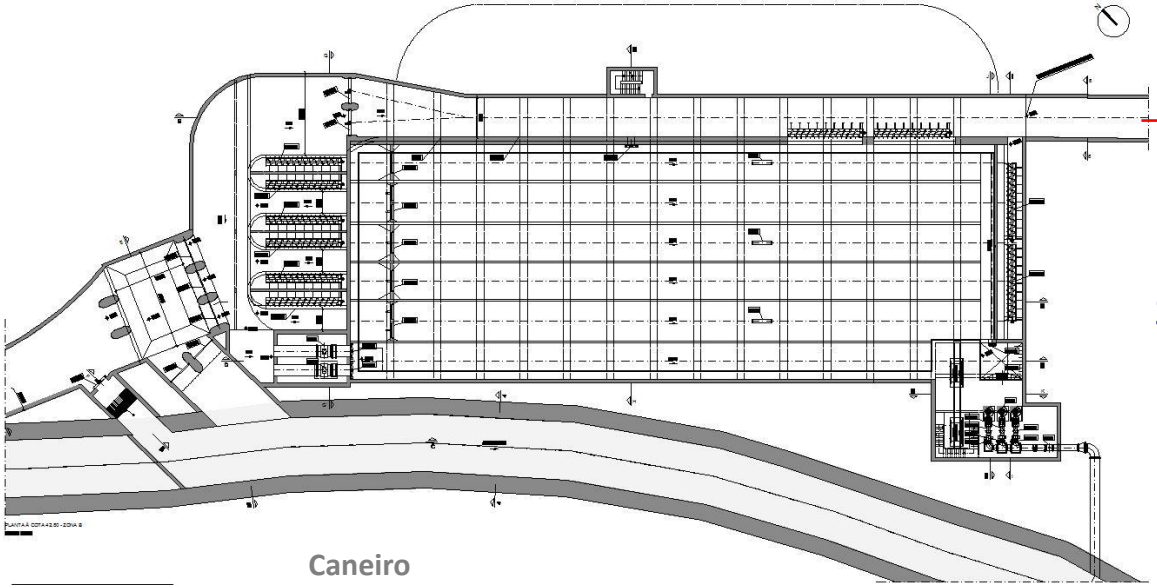
LISBON DRAINAGE MASTER PLAN (2016-2030).



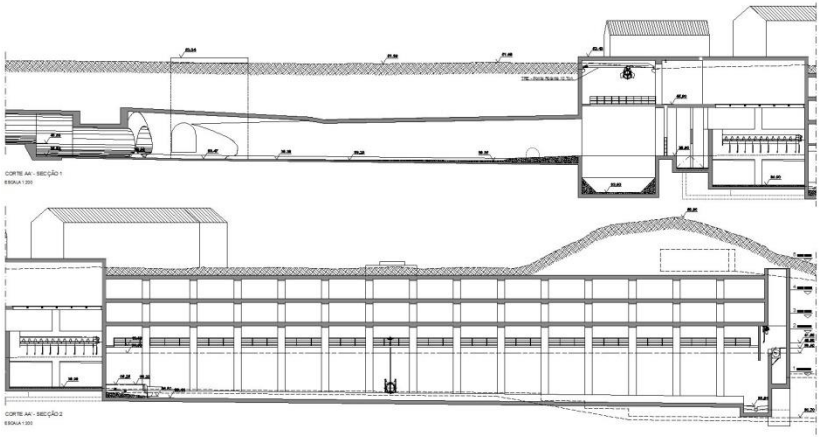


Caneiro

TUNNEL (D= 5,5 m)

Qmax=170 m3/s

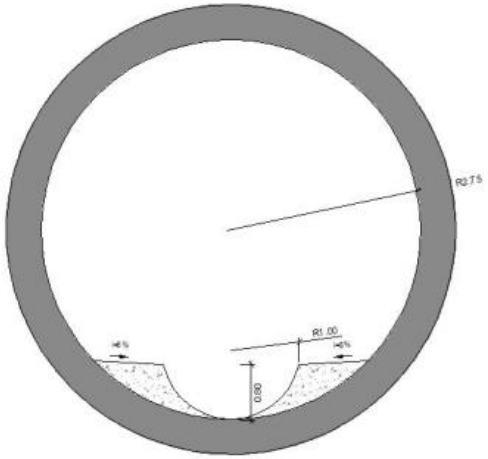
STORMWATER STORAGE TANK (16 000 m3)



ALCANTARA WWTP

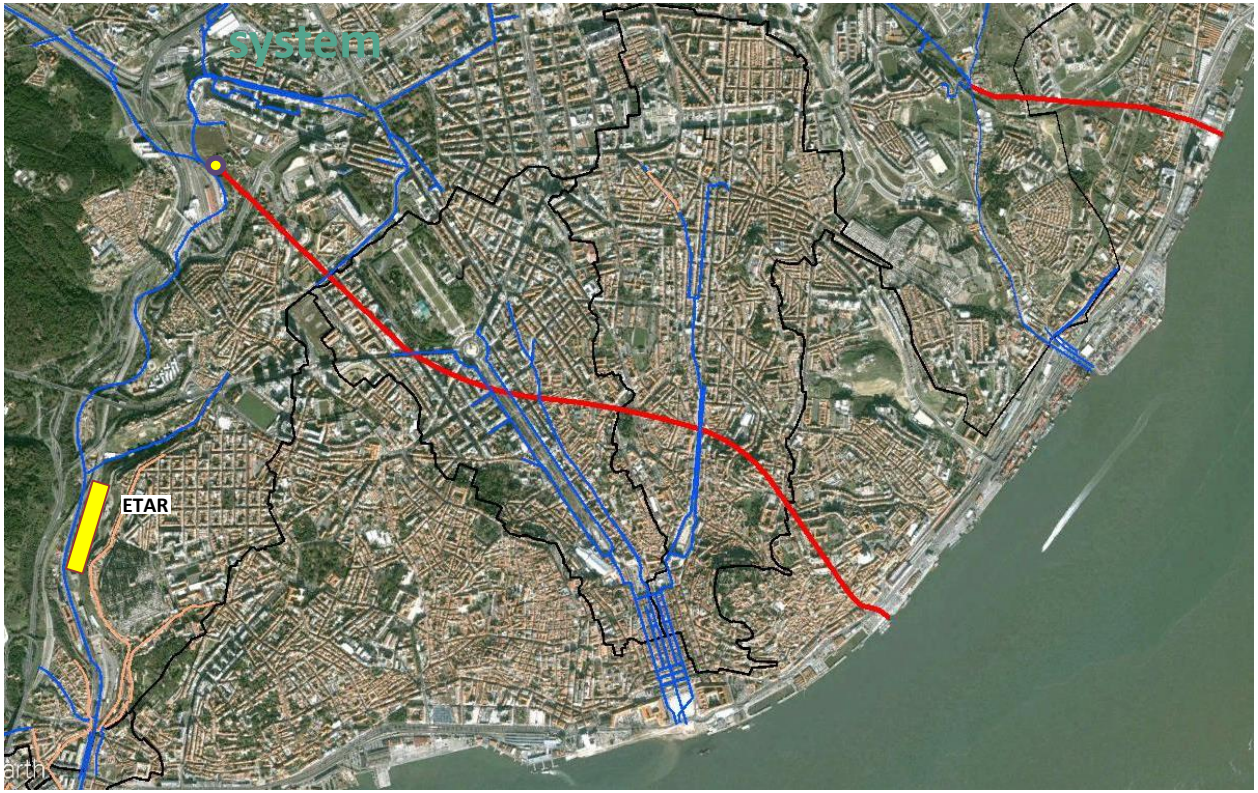
Multi-use Tunnels

Pipe for WW reuse essentially for irrigation green areas



Different utilities inside the tunnels (energy lines, tele communications and a 315 mm pipe for wastewater reuse)(Water supply points: Av Liberdade, Sta Marta, Almirante Reis, Beco do Belo,…)

Multi-use Tunnel- Energy production

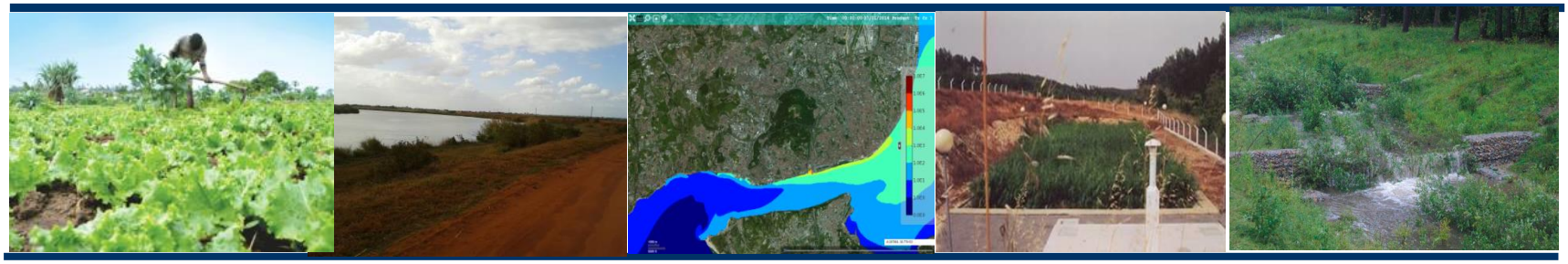


Between the storage tank and the Alcantara WWTP: Available head of about 15 m, Av.flow =1 m3/s - Renewable energy production- Turbines;

FINAL REMAKS

FINAL REMARKS

- ✓ Similar objectives in wash sector in different parts of the world, but with very different approaches.
- ✓ Research is needed on water-food nexus in urban/peri-urban areas (“safety plans” and “food security”).
- ✓ Importance of “redundancy” and “flexibility” of the solutions and adaptation to cope with climate change and all types of land changes. Potential for energy production (i.e. anaerobic digestion at WWTP, available heads).
- ✓ Relevance of sustainable approaches, and potential for creating value out of the solutions (exploring the water-food-energy nexus: business models, employment and development).



THANKS

José Saldanha Matos