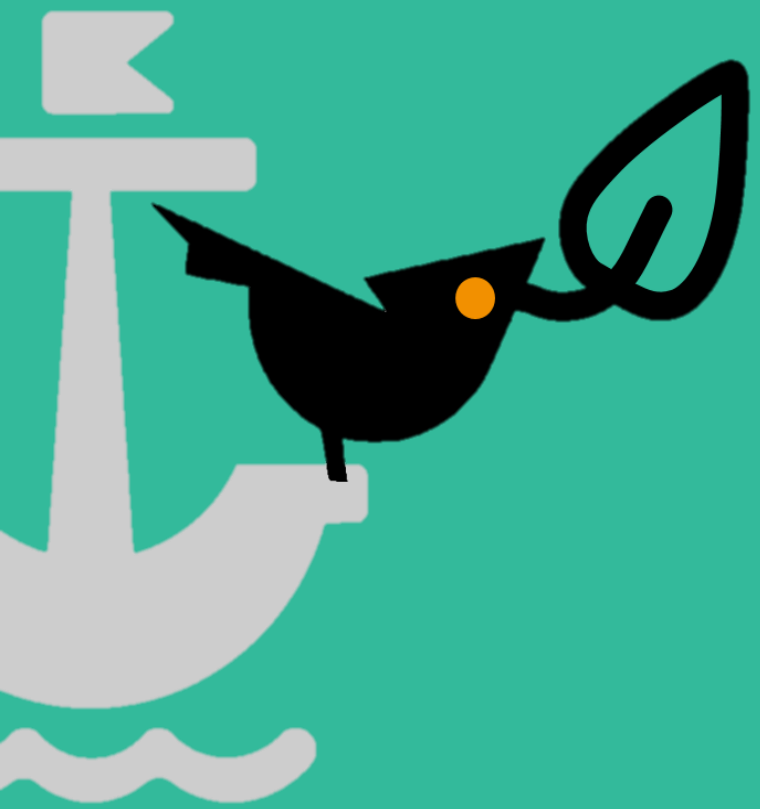


Caminho da Inovação 2023 | 7ª Edição

Água na Ação Climática

10 October 2022

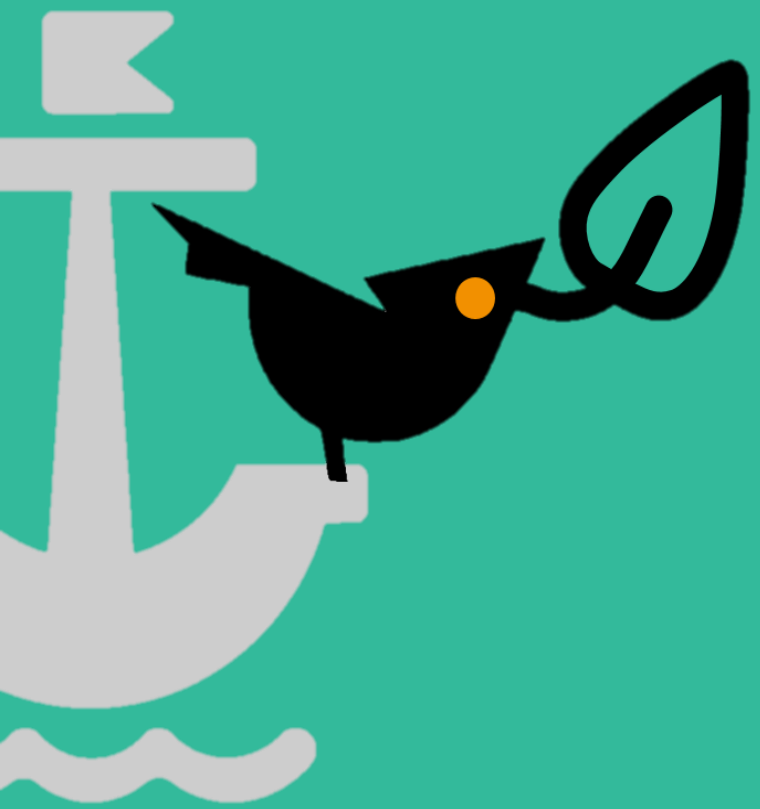
Water-Energy-Food Nexus in Lisbon's Agrosystem: a contribution towards climate transition

Catarina Freitas

Directorate-General for Environment, Green Infrastructure, Climate and Energy

Municipality of Lisbon, Portugal

LISBOA
CÂMARA MUNICIPAL



Topics…

… Big Picture

… How to integrate Water-Energy-Food Nexus in Lisbon

… On going and planned projects to promote Water-Energy-Food Nexus

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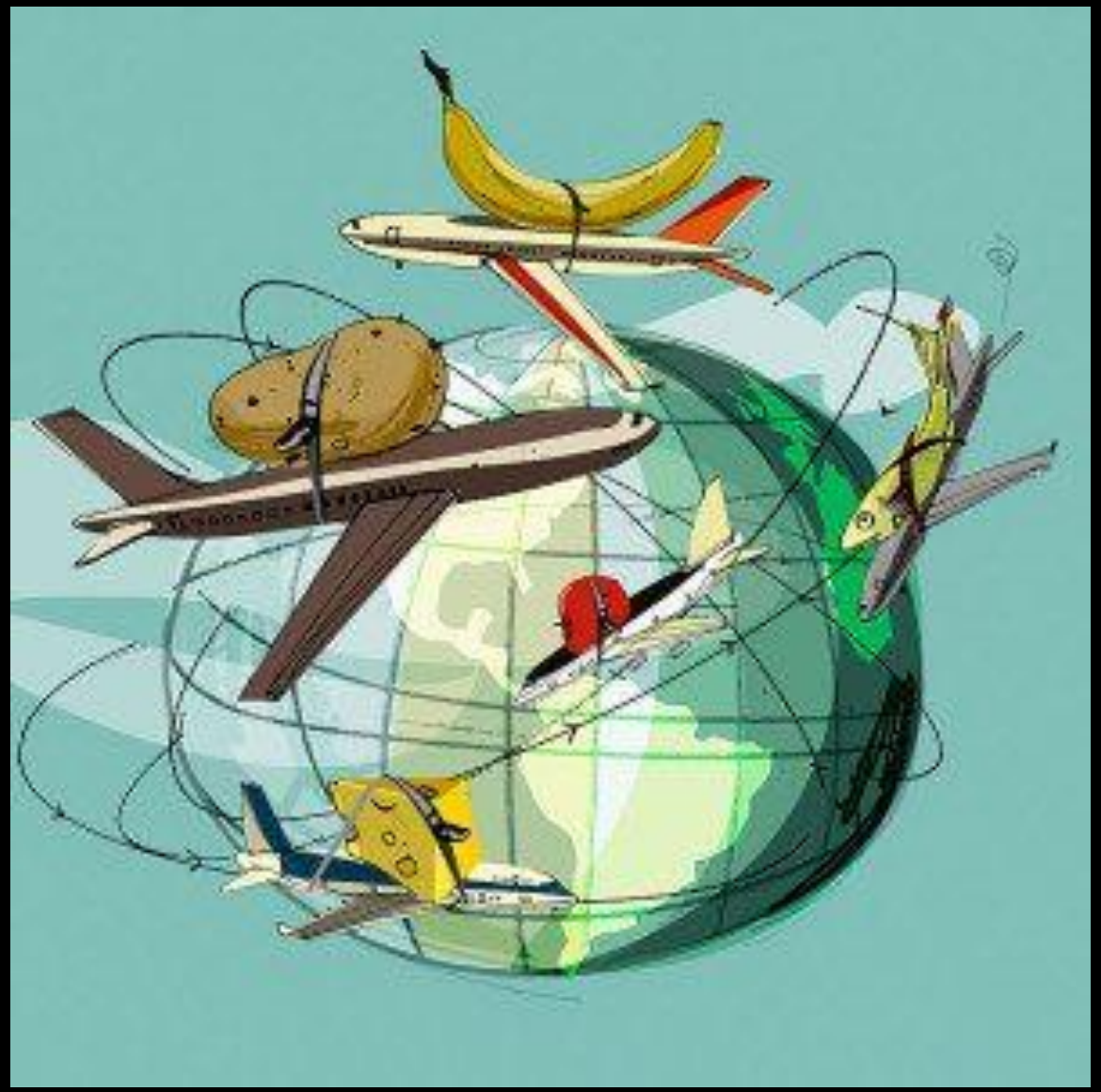
CÂMARA MUNICIPAL




The UK imports roughly
350,000 tonnes of spuds per
year (British Potato Council).
BELGIUM
GB
SPAIN
ISRAEL
NL

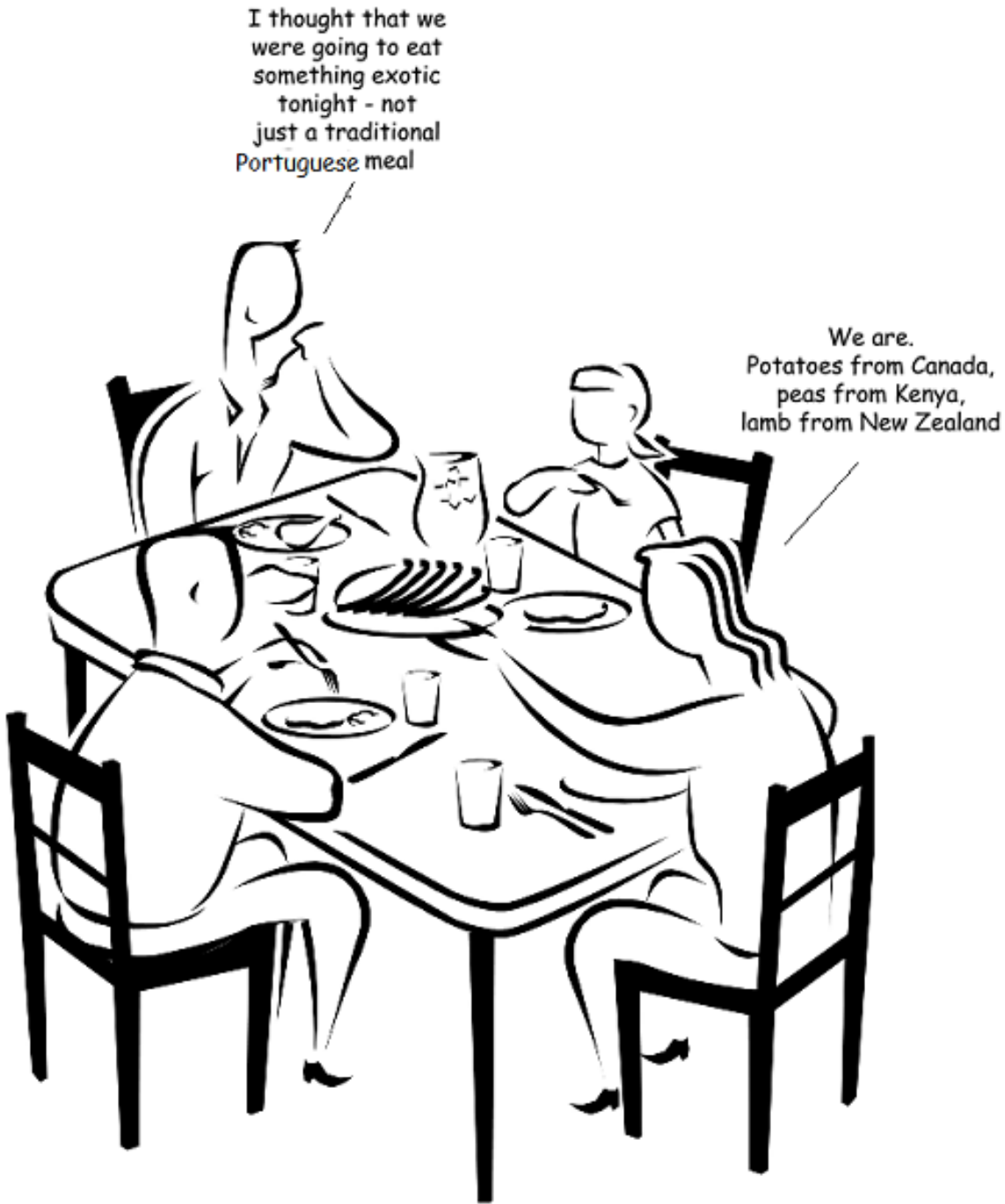
1 Apples

From the USA, a journey of 10,133 miles. 76% of apples consumed in the UK are from overseas. A Friends of the Earth survey of supermarkets found that at the height of the British season, the majority of apples on sale were imported, many from outside the EU. Over 60% of the UK's apple orchards have been destroyed in the last 30 years.

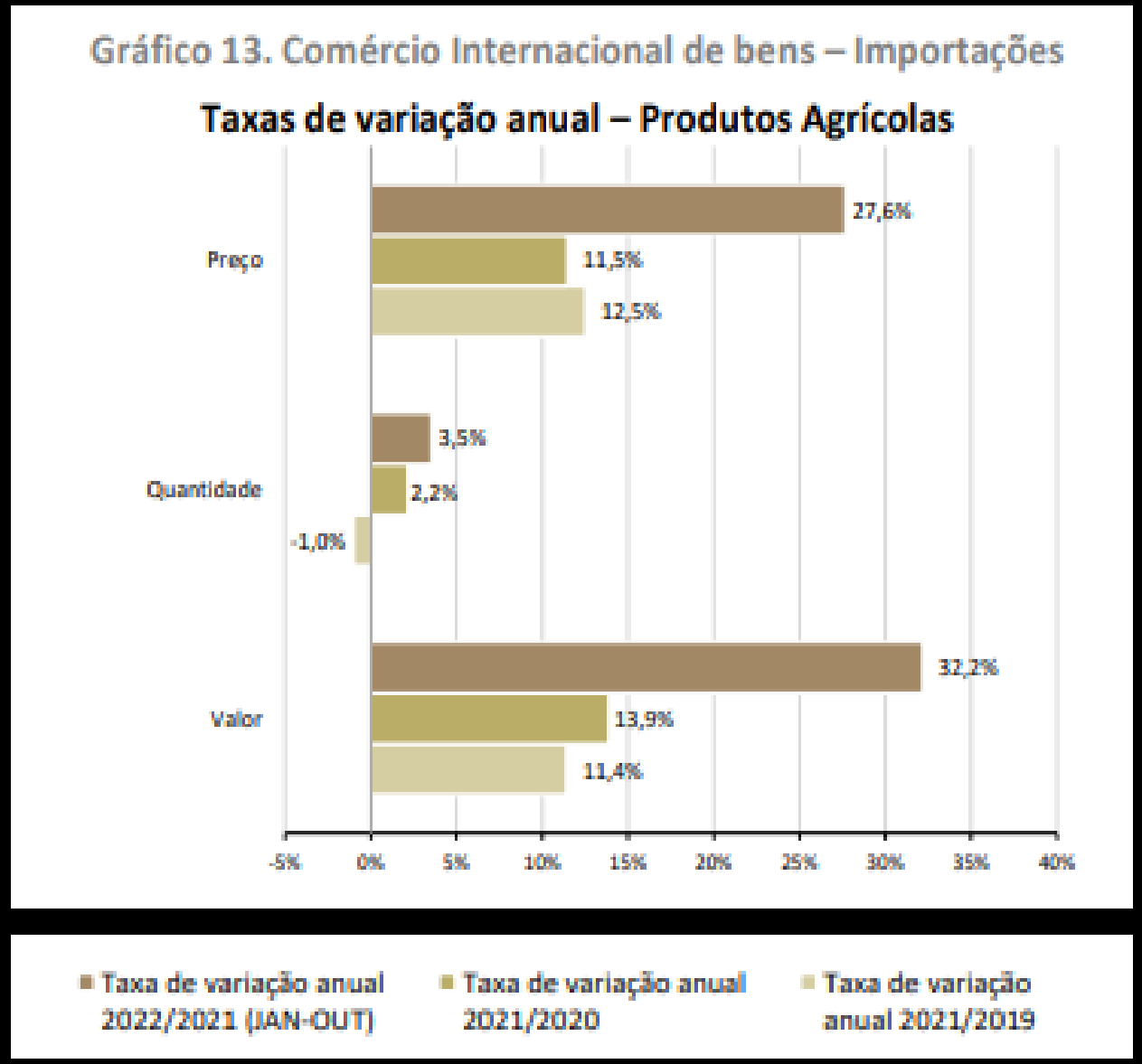
4 Pears

From Argentina, a journey of 6,886 miles. While pears - along with apples - used to be the flagship of British horticulture, now your conference or william is more likely to have been grown abroad than picked from one of our fast disappearing orchards. UK production of pears fell by 22% in the decade to 2000.

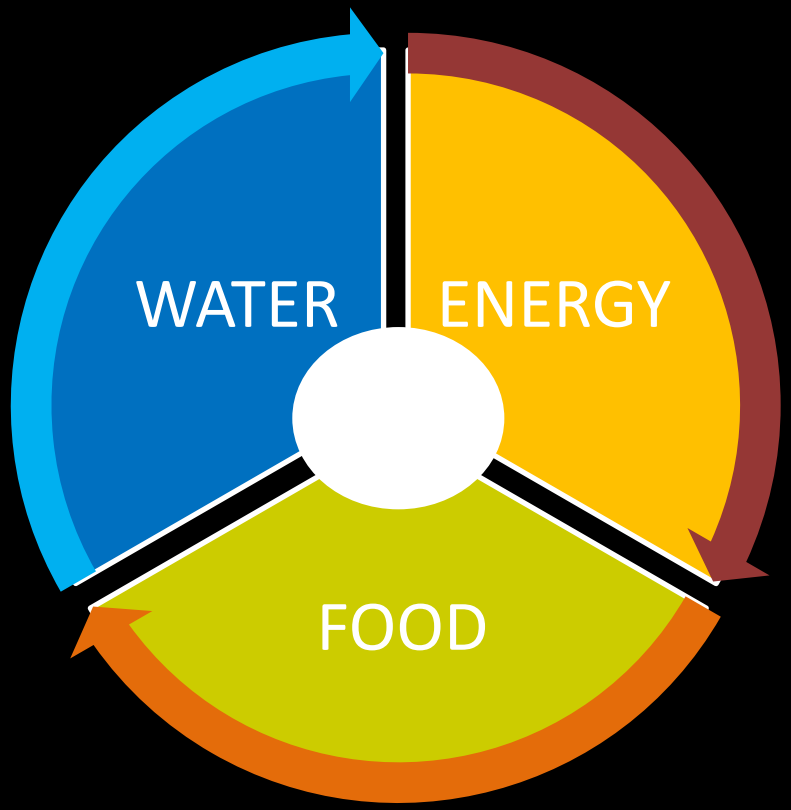
https://www.theguardian.com/lifeandstyle/2003/may/10/foodanddrink.shopping6


I thought that we were going to eat something exotic tonight - not just a traditional Portuguese meal
We are. Potatoes from Canada, peas from Kenya, lamb from New Zealand

January 2021 and October 2022, + 27,6% raise on the price of agriculture products imported



- **Clean water, energy and food production** and **ecosystems** are under **increasing pressure** as a result of different factors, increase of population, food patterns, …
- **Food and energy production** are both **major water users**.
- **Water is used** for **agricultural production** along the **entire supply chain** of the agri-food sector.
- The **production and supply of food** is closely linked to the use of **energy**, accounting for more than 25% of the world's energy consumption.
- **Energy** is needed to **produce, transport and distribute food**, and to **extract, pump, lift, collect, transport and treat water and wastewater**.



- A **Water-Energy-Food Nexus approach** is needed
- **"Nexus thinking"** is understanding that Water-Energy and Food are **not separate areas**
- They are **inseparable** – a single entity.
- It's a simple to understand:
  - ↳ We need **water** to grow **food**.
  - ↳ We need **water** to produce **energy**.
  - ↳ We need **energy** to extract, treat, and distribute **water**.
  - ↳ We need **energy** to transport **food** from field to table.
  - ↳ We need **food** to feed the growing population.
  - ↳ We use **food** for **biofuel**.

How to integrate Water-Energy-Food Nexus in Lisbon

WATER

- Enhance recovery, treatment, and reuse of wastewater (mainly non-potable reuse, e.g., irrigation).
- Promote water mining and establish rainwater harvesting systems in buildings.
- Install a city-wide stormwater management system (this also helps reduce energy use in the city).

ENERGY

- Encourage the implementation of rooftop photovoltaic systems and developing energy self-sufficient housing, buildings, and urban blocks.
- Improve energy efficiency in daily commuting, housing and buildings.
- Reduce energy intensity in services and goods (kWh/ton).

How to integrate Water-Energy-Food Nexus in a City

FOOD

- Reduce food waste.
- Reuse food waste (e.g. organic compost to improve soil)
- Establish new forms of urban agriculture: vertical farms, for example, use 70% less water than conventional farming.
- Encourage the implementation of green rooftop in buildings and in urban facilities (Multi-layer green rooftops)
- Promote City's Green Infrastructure
- Adapt urban green spaces for food production
- Improve biodiversity with re-naturalized areas or restored natural habitats

LISBOA
CÂMARA MUNICIPAL

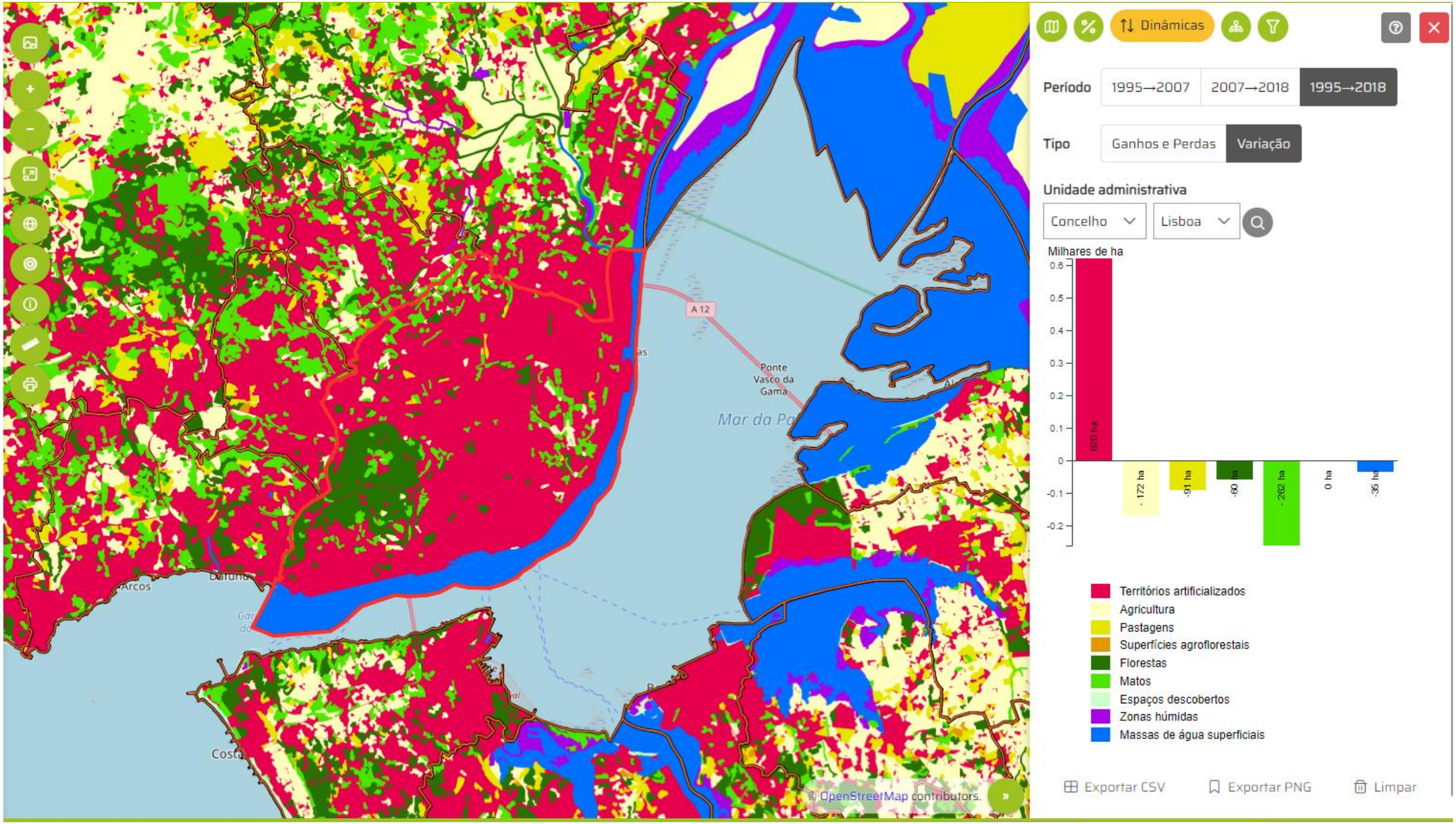
10.000 ha
total area

4.432 ha
green areas

547.733
residents

445 ha
agricultural areas

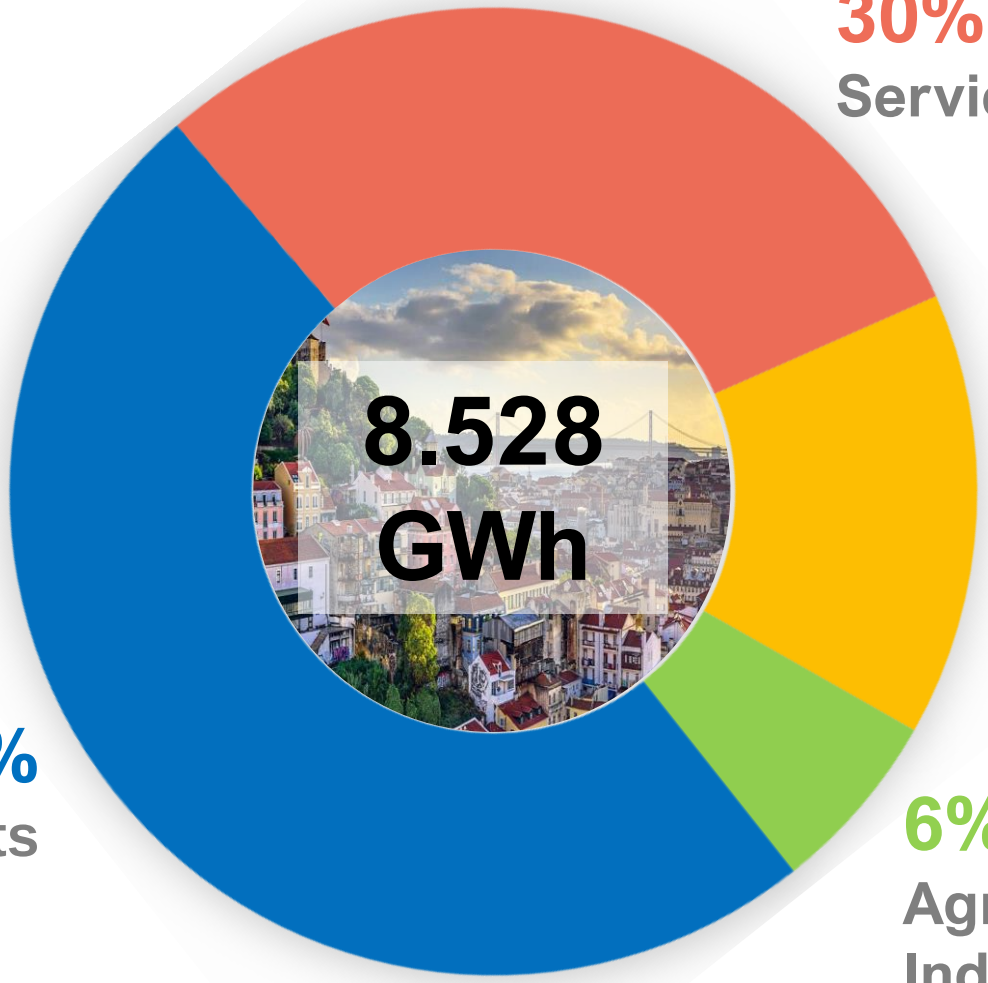
925.959
residents + daily commuters


Dinâmicas
Período
1995→2007
2007→2018
1995→2018
Tipo
Ganhos e Perdas
Variação
Unidade administrativa
Concelho
Lisboa
Milhares de ha
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
620 ha
- 172 ha
-91 ha
-60 ha
- 262 ha
0 ha
-35 ha
Territórios artificializados
Agricultura
Pastagens
Superfícies agroflorestais
Florestas
Matos
Espaços descobertos
Zonas húmidas
Massas de água superficiais
Exportar CSV
Exportar PNG
Limpar
A 12
Ponte Vasco da Gama
Mar da Pa
Arcos
Costa
© OpenStreetMap contributors.

Lisbon Context

ENERGY

Energy use per sector (GWh)



30%
Services

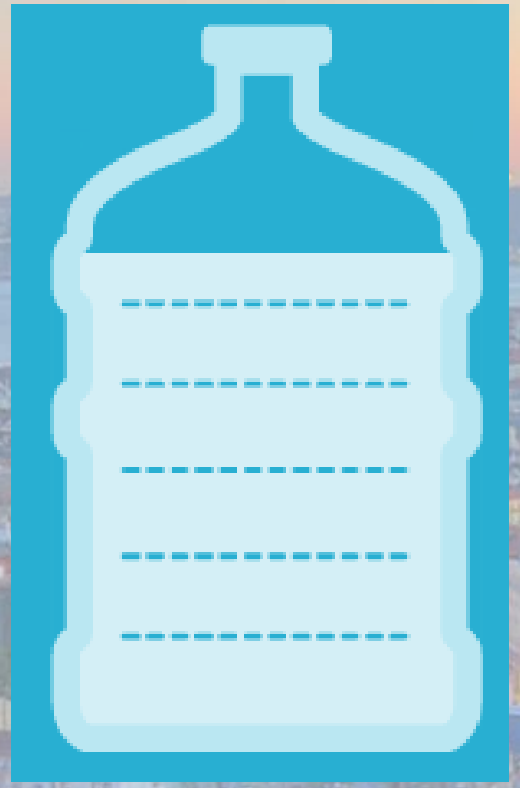
15%
Residencial

6%
Agriculture and Industry

49%
Transports

Lisbon Context

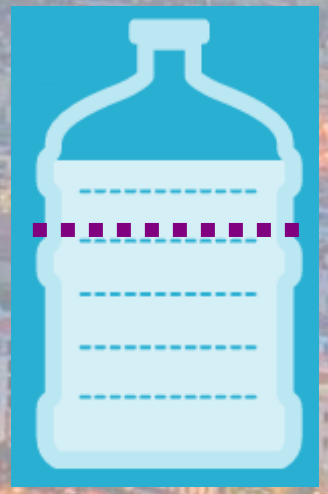
WATER



City of Lisbon

~ 55 millions m³/year

>



> 75%

Non potable uses

Municipality

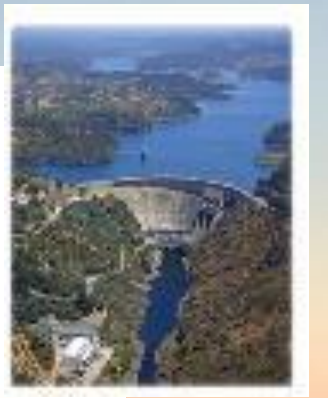
~ 4,4 millions m³/year

Lisbon Context

WATER

Source of Lisbon Drinking Water

aprox. 100 km



Energy needs to transport drinking water for 100 km:

0,53 kWh/m³

▼

2.014 MWh

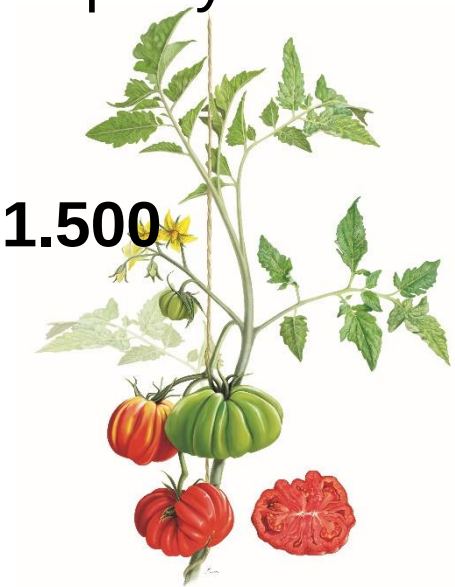
Lisbon Context

FOOD

- **22 Agro-Parks > 947 allotments > 443,69 ha**
- **1 Vineyard > 2 ha** (traditional portuguese grapes)

▼

- Average consumption of **vegetables** per person per year **= 130 kg/person.year**
- Total consumption of **vegetables** per year **= 71.500 ton/year**
- Agriculture land needed (ha) **= 1.430 ha**



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Lisbon Context

FOOD

4.432 ha
green areas

445 ha
Agro-parks

LISBOA
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Parque Hortícola da Quinta da Granja


Parque Hortícola dos Jardins de Campolide

Parque Vinícola de Lisboa

Close Water-Energy-Food Nexus in Lisbon

WATER | ENERGY | FOOD

- Σ Area **= 445 ha** productive land
- **947** families as local producers
- **17.800** t / year of fresh vegetables produced
- Less **23.700** t CO_2 eq / year

+

- **Reclaimed water** (3 Wastewater Treatment Plants) to irrigate the agriculture parks

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On going and planned projects to promote Water-Energy-Food Nexus

Water Smart use in Lisbon

efficiency, monitor, ‘fit-for-purpose’

Reduce the use of drinking water…

- **Control leak losses: fast leakage detection and control**
- **Monitor and Smart metering in large consumption buildings or green spaces** (Water Beep Service, from EPAL)
- **Reduction the working hours of fountains and water elements**
- **Smart irrigation systems in gardens and parks**
- **Adapt green infrastructure to higher temperatures, droughts and changes in rainfall pattern**
  (plant cover **>** dryland meadows)

WATER

LISBOA
CÂMARA MUNICIPAL

Water Smart use in Lisbon

efficiency, monitor, ‘fit-for-purpose’

Reduce the use of drinking water…

- **Diversify non-potable alternative sources** (‘fit-for-purpose’)
  - ↳ **Water mining**
  - ↳ **Urban Water Cycle > Wastewater Reuse Plan**

    Reclaimed Water (class “A”) from 3 Wastewater Treatment Plants (Beirolas; Alcântara and Chelas) **>** low level location uses
  - ↳ **Non potable water from “Aqueduto de Águas Livres” >** elevated location uses

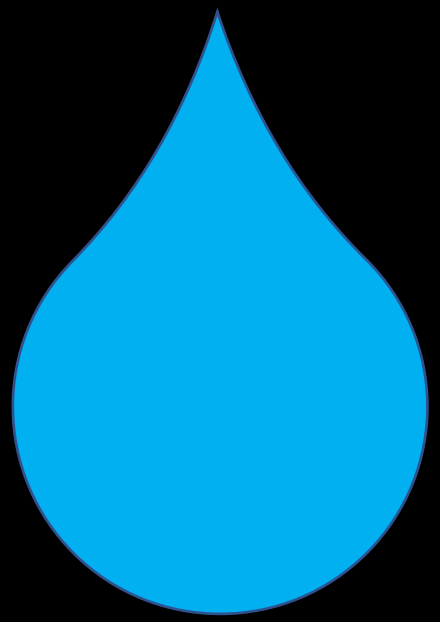
▼

Partnership: AdTA + EPAL + Municipality of Lisbon

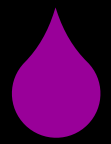
WATER

LISBOA
CÂMARA MUNICIPAL

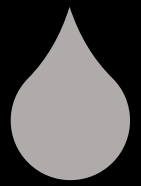
2023



Potable Water

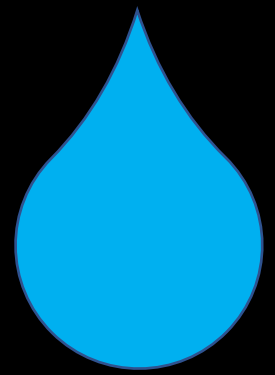


Reclaimed Water

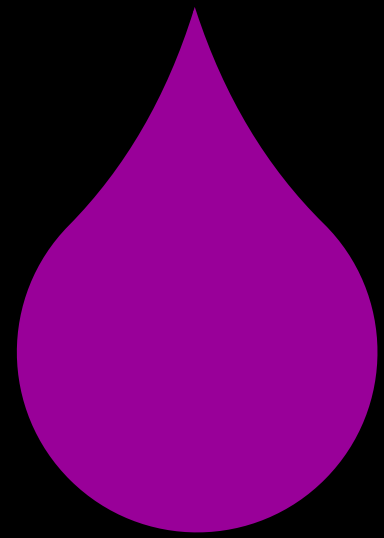


Aqueduto Others

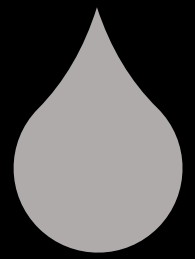
2030 - 2040



Potable Water



Reclaimed Water



Aqueduto Others

LISBOA ESTENDE O TAPETE VERDE AO PAPA!

JORNADAS REGADAS COM ÁGUA RECICLADA água+ reciclada não potável

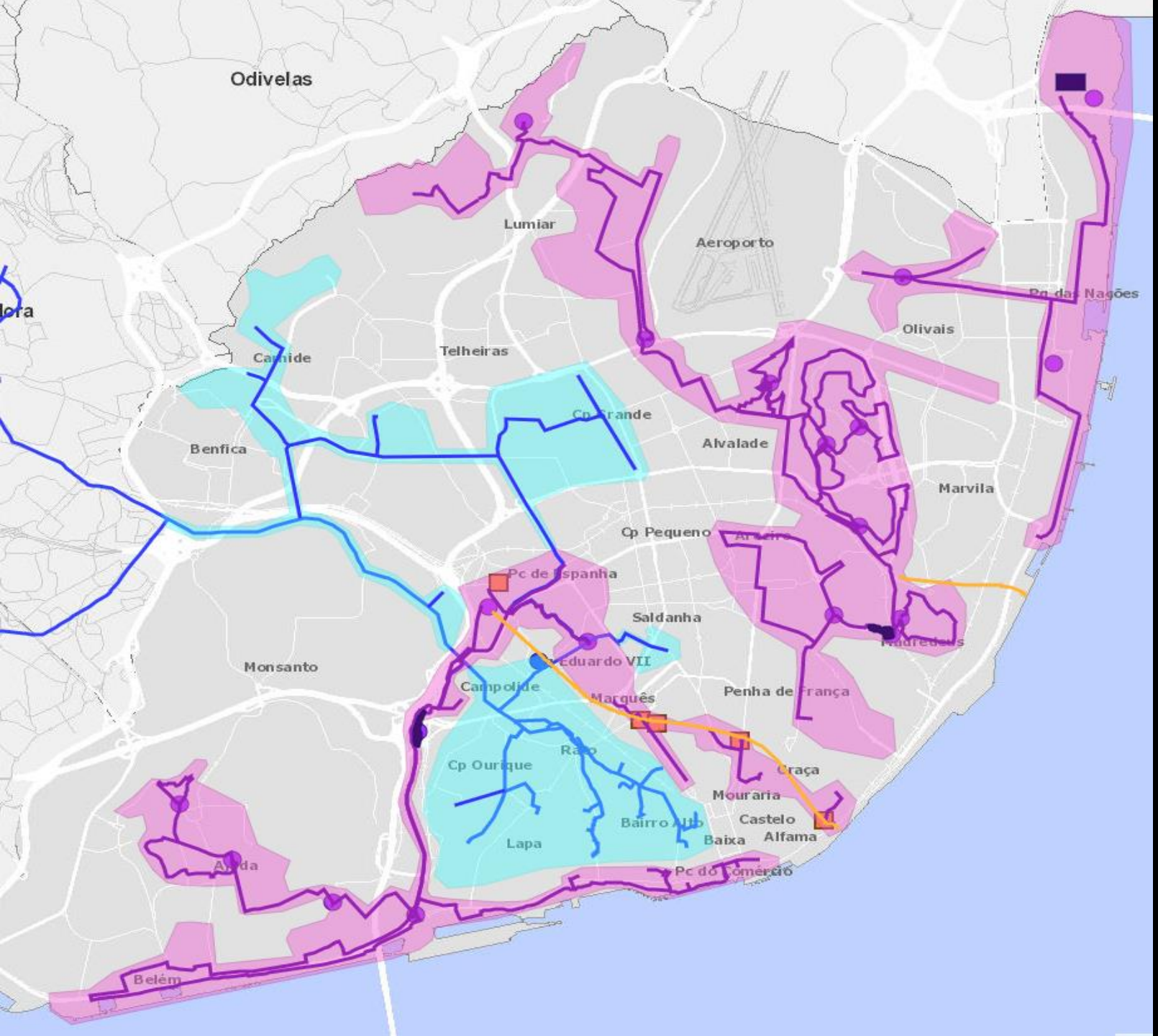
JMJ LISBOA 2023

B-WaterSmart

SRU LISBOA

LISBOA CÂMARA MUNICIPAL

ÁGUAS DO TEJO ATLÂNTICO
Grupo Águas de Portugal



Reclaimed Water

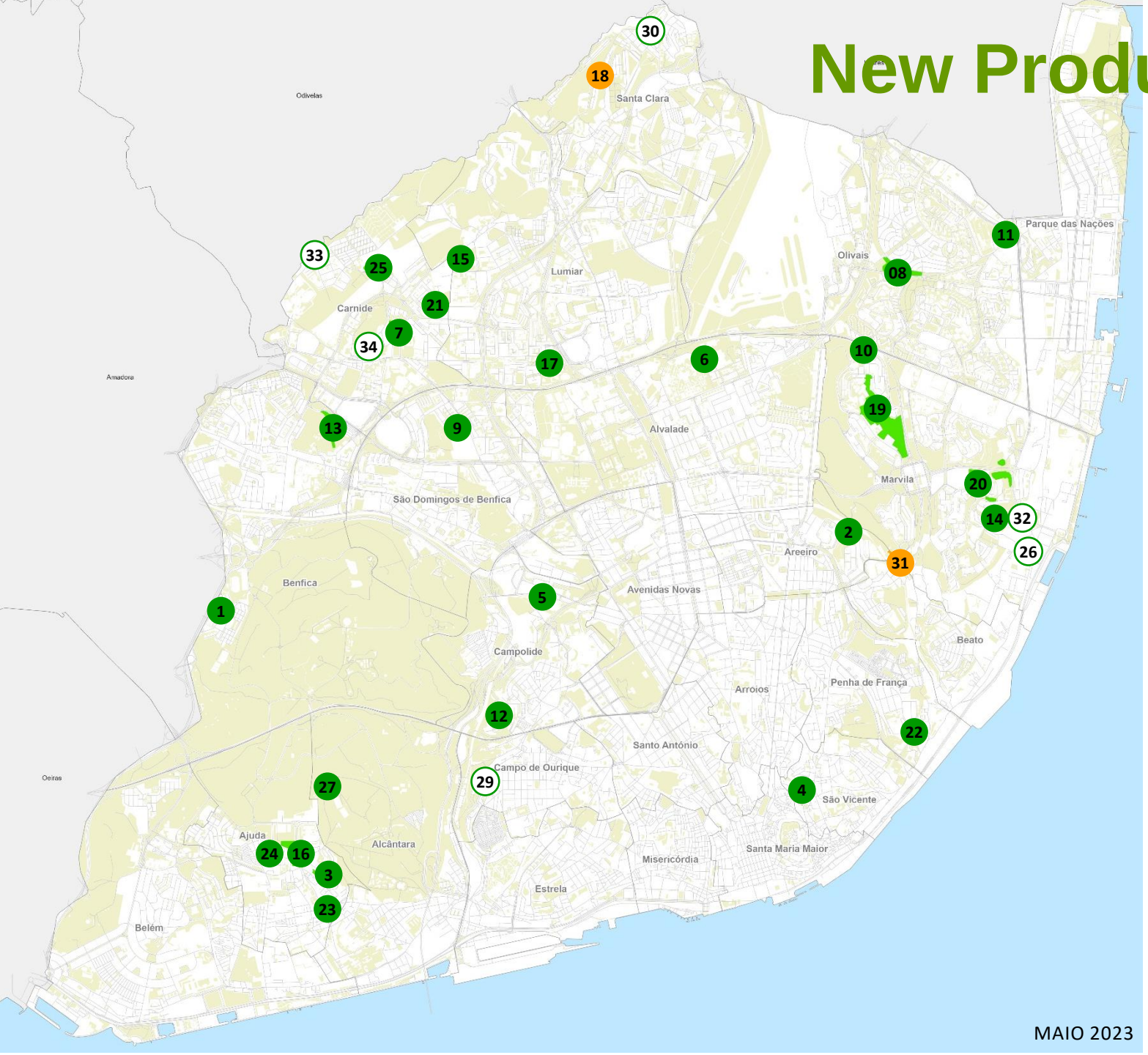
55 km network

Aqueduto

34 km network (Lisbon)

New Productive land in Lisbon

Agriculture Parks



PARQUES HORTÍCOLAS

COD_SIG, NOME, GESTÃO, ÁREA (m2)

Existente

1, Eco-Hortas do Bairro da Boavista, CML, 4200.7
2, Parque Hortícola do Casal Vistoso, CML, 7543.16
3, Casalinho da Ajuda, CML,15089.07
4, Parque Hortícola da Graça, CML, 1362.56
5, Parque Hortícola Jardins de Campolide, CML,10750.77
6, LNEC, JF, 4282.96
7, Parque Hortícola da Quinta das Carmelitas, CML, 23554.47
8, Parque Hortícola dos Olivais, CML, 30274.93
9, Parque Bensaúde, CML, 8594.25
10, Parque Hortícola da Vinha, CML, 8960.57
11, Parque Hortícola da Quinta Conde D'Arcos, CML, 10988.21
12, Quinta da Bela Flôr, JF, 3636.06
13, Parque Hortícola da Quinta da Granja, CML, 23708.79
14, Parque Hortícola da Quinta das Flores, CML, 12922.60
15, Parque Hortícola da Quinta Nossa Sra. da Paz, CML, 1177.66
16, Parque Hortícola do Rio Seco IV, CML, 25298.58
17, Parque Hortícola de Telheiras, CML, 3879.66
19, Parque Hortícola do Vale de Chelas, CML, 141505.36
20, Parque Hortícola do Vale Fundão, CML, 50637.35
21, Parque Hortícola da Horta Nova, CML, 14464.53
22, Parque Hortícola Baluarte Santa Apolónia, CML, 4606.62
23, Parque Hortícola do Rio Seco III, CML, 3495.24
24, Hortas do Bairro 2 de Maio, CML, 6338.79
25, Parque Hortícola de Carnide, CML, 22269.65
27, Parque Hortícola Terra de Minas - Campus da Tapa, CML, 4160.56

Em Obra

18, Parque Hortícola do Vale da Ameixoeira, CML, 10395.34
31, Parque Hortícola do Vale da Montanha II, CML, 6417.07

Em projecto

26, Parque Hortícola da Quinta do Beirão, CML, 3986.86
29, Parque Hortícola de Campo de Ourique, CML, 3827.87
30, Parque Hortícola da Quinta do Grafanil, CML, 3545.91
32, Parque Hortícola da Quinta das Flores II, CML, 9486.56
33, Parque Hortícola da Estrada Militar, CML, 8321.64
34, Parque Hortícola da Azinhaga das Carmelitas, CML, 8207.77

MAIO 2023

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New Productive land in Lisbon

Agriculture Parks

New Agriculture Parks…

- **Being implemented**: Parque Hortícola do Vale da Montanha II + Parque Hortícola do Vale da Ameixoeira **> 55 allotments > 16,81 ha**
- **Planned**: 6 parks **> 118 allotments > 37,38 ha**

26, Parque Hortícola da Quinta do Beirão, CML, 3986.86
29, Parque Hortícola de Campo de Ourique, CML, 3827.87
30, Parque Hortícola da Quinta do Grafanil, CML, 3545.91
32, Parque Hortícola da Quinta das Flores II, CML, 9486.56
33, Parque Hortícola da Estrada Militar, CML, 8321.64
34, Parque Hortícola da Azinhaga das Carmelitas, CML, 8207.77

FOOD

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Lisbon Metropolitan Area

Food Link Network

- **38%** Lisbon Metropolitan Area (LMA) **soil with agricultural occupation**
- **12%** of the **total food** produced in Portugal for national consumption comes from LMA
- Vila Franca de Xira, Sintra, Palmela, Mafra, Montijo and Alcochete produce **temporary crops**, mainly cereals for grain, vegetables, and forage crops
- Setúbal, Sesimbra, Palmela, Montijo and Mafra stand out for **permanent crops**, dedicated to vines, nuts, and fresh fruit.

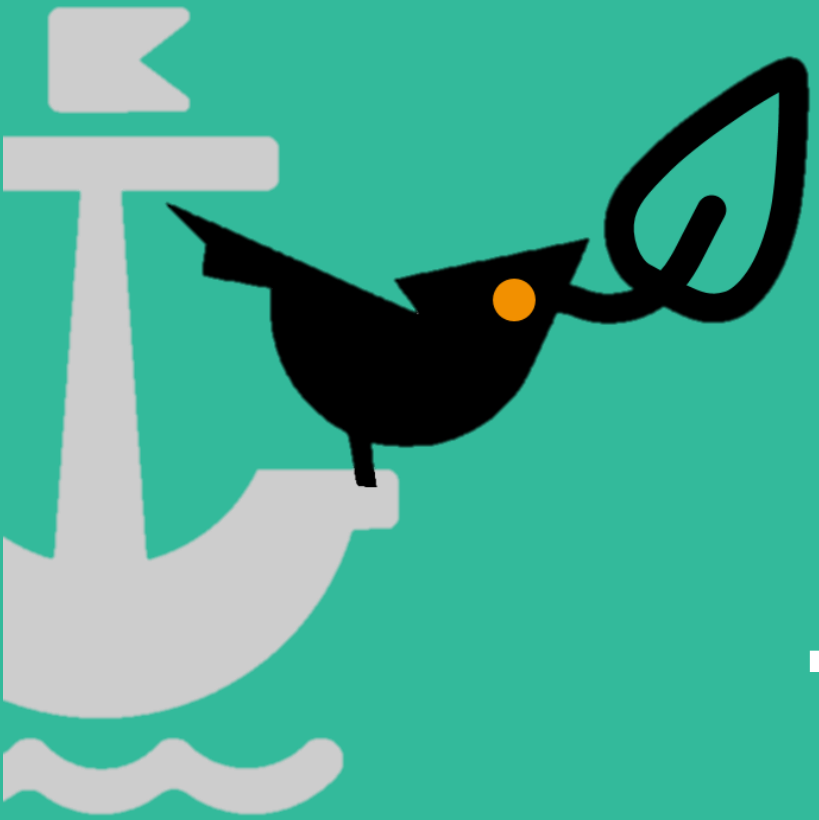
FLOODS, WATER SCARCITY AND EXTREME EVENTS 2023

19 | 20 October

LNEC
LISBON
CONFERENCE

LISBOA
CÂMARA MUNICIPAL

LNEC
LABORATÓRIO NACIONAL
DE ENGENHARIA CIVIL



THANK YOU

catarina.freitas@cm-lisboa.pt

Municipal Directorate for Environment, Green Infrastructure, Climate and Energy
Municipality of Lisbon

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