# Climate Change Adaptation in Europe and Spain. Cities.

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# Overview

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- City Adaptation in Europe
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# European Regions

**Arctic**
Temperature rise much larger than global average
Decrease in Arctic sea ice coverage
Decrease in Greenland ice sheet
Decrease in permafrost areas
Increasing risk of biodiversity loss
Intensified shipping and exploitation of oil and gas resources

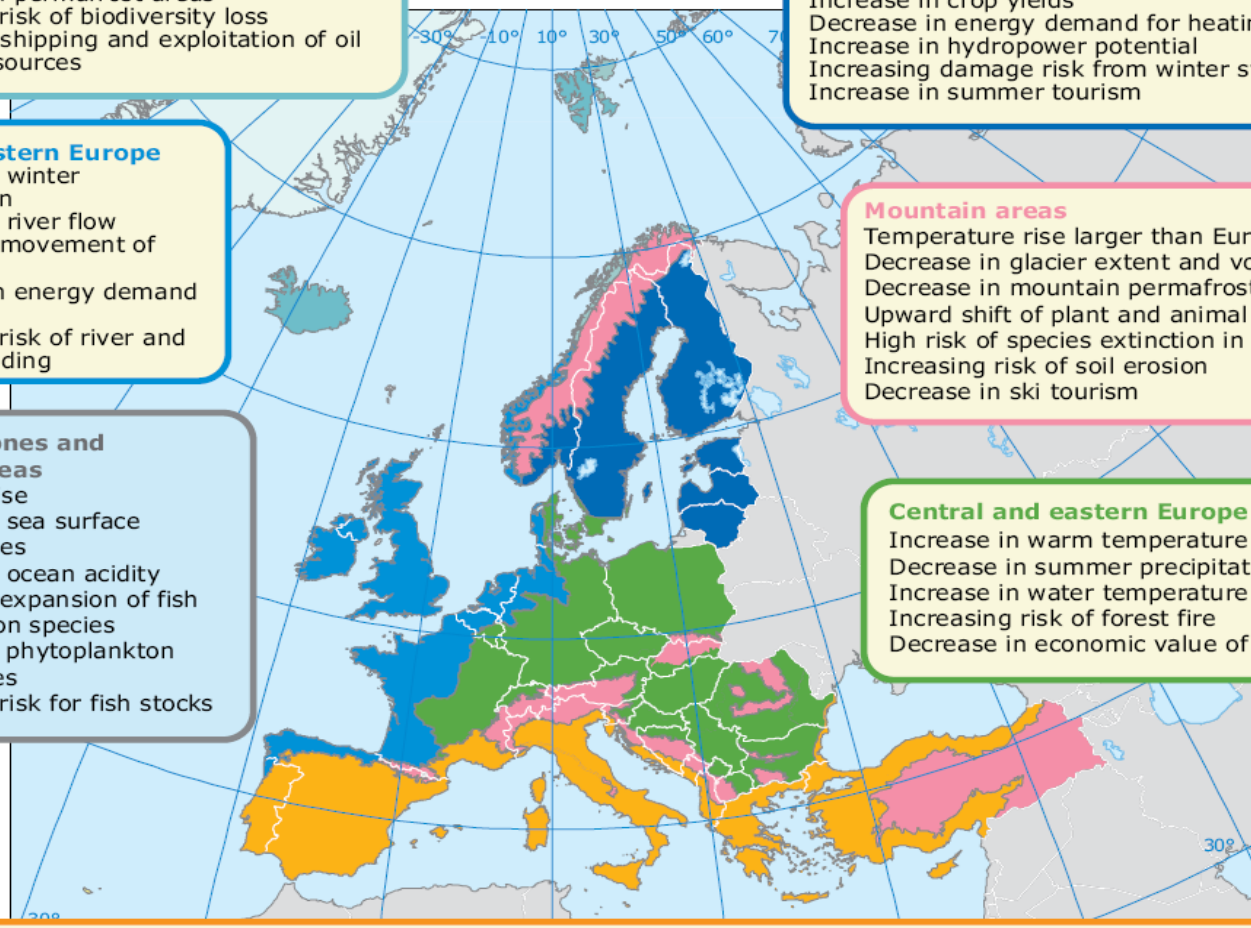
**Northern Europe**
Temperature rise much larger than global average
Decrease in snow, lake and river ice cover
Increase in river flows
Northward movement of species
Increase in crop yields
Decrease in energy demand for heating
Increase in hydropower potential
Increasing damage risk from winter storms
Increase in summer tourism

**North-western Europe**
Increase in winter precipitation
Increase in river flow
Northward movement of species
Decrease in energy demand for heating
Increasing risk of river and coastal flooding

**Mountain areas**
Temperature rise larger than European average
Decrease in glacier extent and volume
Decrease in mountain permafrost areas
Upward shift of plant and animal species
High risk of species extinction in Alpine regions
Increasing risk of soil erosion
Decrease in ski tourism

**Coastal zones and regional seas**
Sea-level rise
Increase in sea surface temperatures
Increase in ocean acidity
Northward expansion of fish and plankton species
Changes in phytoplankton communities
Increasing risk for fish stocks

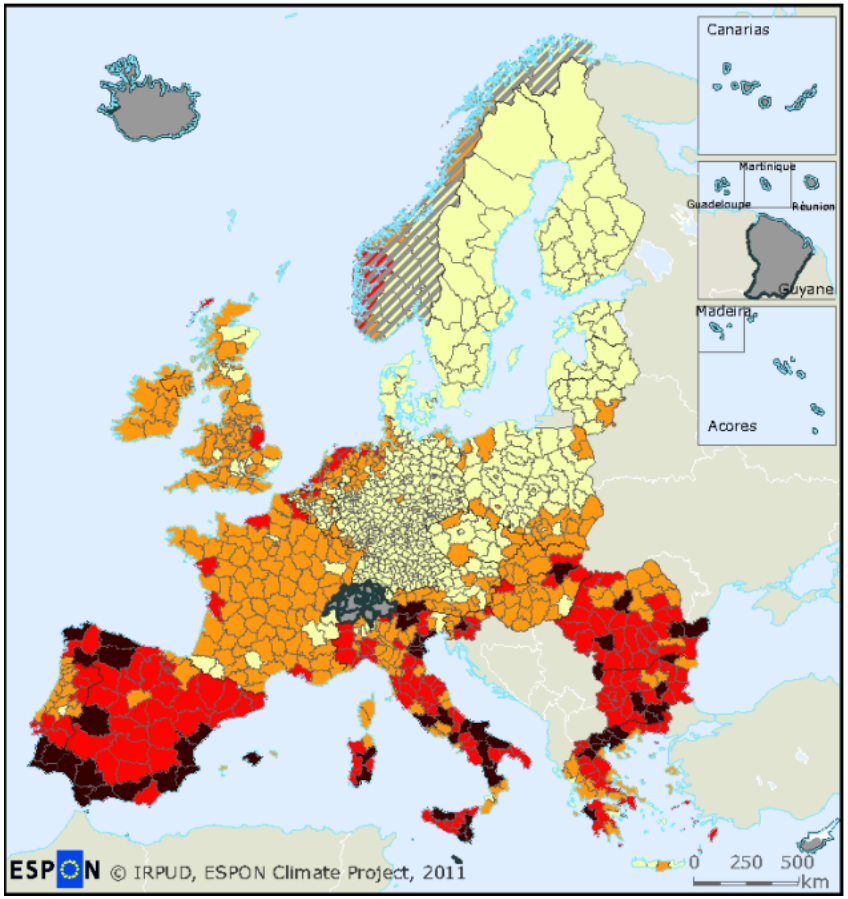
**Central and eastern Europe**
Increase in warm temperature extremes
Decrease in summer precipitation
Increase in water temperature
Increasing risk of forest fire
Decrease in economic value of forests




**Mediterranean region**
Temperature rise larger than European average
Decrease in annual precipitation
Decrease in annual river flow
Increasing risk of biodiversity loss
Increasing risk of desertification
Increasing water demand for agriculture
Decrease in crop yields
Increasing risk of forest fire
Increase in mortality from heat waves
Expansion of habitats for southern disease vectors
Decrease in hydropower potential
Decrease in summer tourism and potential increase in other seasons

# European Regions
# Vulnerability to climate change

Source: Environmental European Agency




**Potential vulnerability to climate change**

- Highest vulnerability
- Medium vulnerability
- Low vulnerability
- No/marginal vulnerability
- No data
- Reduced data

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# City Adaptation in Europe. Funding

- **European Commission provides funding (LIFE instrument) to support capacity building and step up adaptation action in Europe (2014-2020).**

- Adaptation is integrated into the European Sectorial Policies funded by <u>the five European Structural and Investment Funds:</u>

✓ European Regional Development Fund
✓ European Social Fund
✓ Cohesion Fund
✓ European Agricultural Fund for Rural Development
✓ European Maritime and Fisheries Fund

# City Adaptation in Europe. Funding

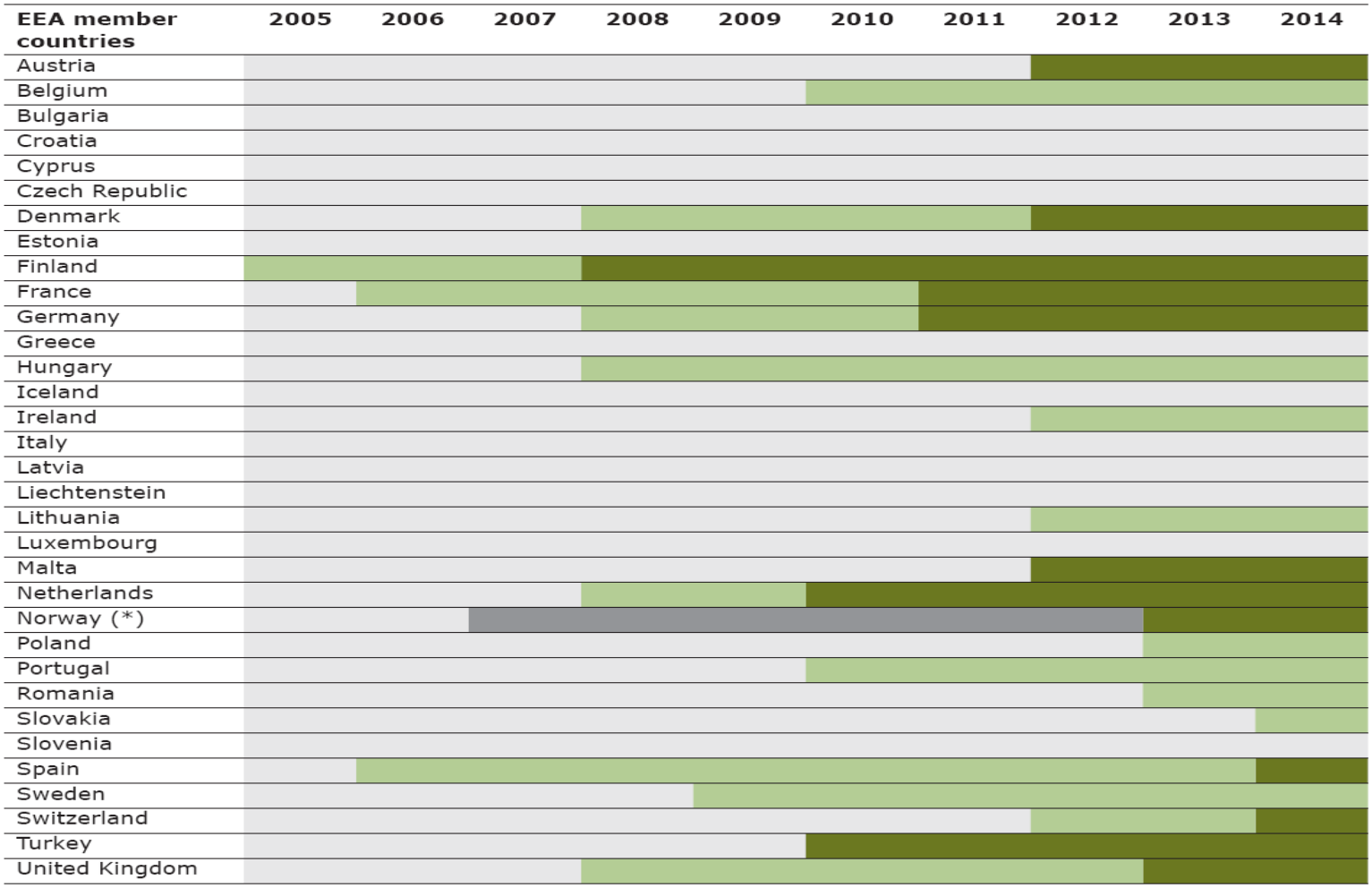
- **Climate adaptation is also integrated into funding and loans from:**

✓ The European Investment Bank and
✓ The European Bank for Reconstruction and Development.

- In 2017, the Commission will assess whether action being taken in the Member States is sufficient. If progress shows insufficient, the Commission will consider proposing a legally binding instrument.

# National adaptation strategies and national adaptation plans in European countries

Source: EEA Report No 4




**Note:** No policy

National adaptation strategy (NAS) in place

National adaptation strategy (NAS) and national and/or sectoral adaptation plans (NAP/SAP) in place

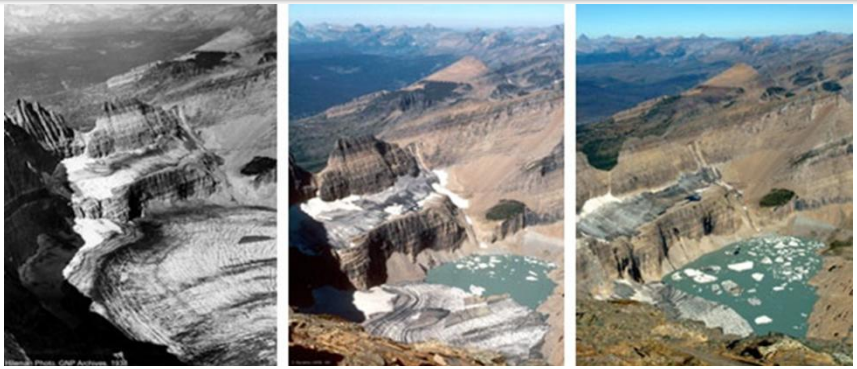
# Adaptation Constraints in Europe

**The most important barriers to adaptation that <u>European cities</u> usually report are**:

- the lack of financial/human resources
- uncertainties and unclear responsibilities
- lack of political commitment
- Interface national/regional/local authorities
- Cost

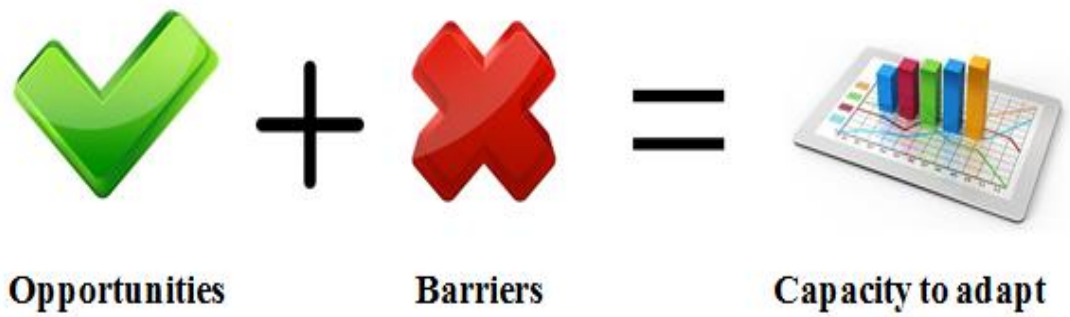
# Adaptation Cost

- Many adaptation actions are costly and non-revenue generating.
- There is as yet no systematic and reliable method to estimate the costs of adaptation.
- The indicators are difficult to develop because there is no specific single variable valid across all regions with which to measure the type and level of adaptation.



*Área afectada por procesos de desertificación. Desierto de Tabernas (Almería).*

# Adaptation brings opportunities and future resiliance




- Innovation
- new technologies
- Research
- Education and training
- Stakeholder engagement
- **Learning from local peoples**

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# City Adaptation in Spain. Funding

**NATIONAL**

- MAGRAMA. Grants. Also subsidizes projects and measures at national and regional level.
- Local Governments. Municipalities.
- Specific funding at regional level. Funds from the communities.
- Private Institutions.

**EUROPEAN**

- LIFE program 2014-2020. "Adapting to climate change" constitutes a priority area with a budget of € 190,389,591.
- European Structural and Investment Funds.
- The European Investment Bank and
- The European Bank for Reconstruction and Development.

# City Adaptation in Spain

# ADAPTATION IN BARCELONA


Source: Barcelona Green Infrastructure and Biodiversity Plan 2020, depiction of existing green corridors in the eastern area of the city

# Adaptation in Barcelona

# Adaptation in Barcelona

*Special Representative of the Secretary-General for Disaster Risk Reduction, Margareta Wahlström and the Vice Mayor of the City of Barcelona, Antony Vives during the the official signing ceremony in Barcelona, 4 April, 2013*

- In 2013, Barcelona obtained recognition from the UN as an international role model city for its focus on urban resilience.

- Barcelona was early involved in developing sustainable principles (*1994, Sustainable Cities & Towns towards Sustainability, City Council).*

Since then some objectives were fulfilled

- 100% treatment of waste water
- the introduction of organic waste collectors
- decrease in water consumption per capita.

**Special attention to the 20 % of the population living below the poverty line and the people at risk of exclusion (Local Gov. law 2016)** : guarantees access to basic energy and water resources for the population under the poverty line and those at risk of social exclusion .

# Adaptation in Barcelona

Metropolitan Climate Adaptation Plan (PACC 2015-2020):

- reducing energy demand and promoting renewable solar energy production.

Green Corridors Plan:

- belts with abundant vegetation, where cyclists and pedestrians are given priority.

**Sea level rise:**

- Integral Coastal Management Program (2004)
- Barcelona's Beach Stability Plan (33 million euro project)

Source: Barcelona Green Infrastructure and Biodiversity Plan 2020, depiction of existing green corridors in the eastern area of the city

# Fresh water: the great challenge
# The Delta is in danger

- The Metropolitan Area gets 61% of its water supply from the ***Llobregat River***.
- A big part of the  Delta will flood with a one meter rise in sea level.
- Desalination plant has been built at the shores of the River to create new supply of drinking water.
- There are 900 desalination plants in Spain, being the companies liders in the western world.
- However, the process of desalination is very energy intensive and expensive.


# Unit of solar desalination

## PSA (www.psa.es) Solar Platform of Almería

Spain is leader in concentrated solar power (CSP)

### UNIDAD DE DESALACIÓN SOLAR

AQUASOL
Enhanced Zero Discharge Seawater Desalination Using Hybrid Solar Technology
Duración: 1.3.2002 – 28.02.2006
Financiación: Comisión Europea, FP5
Referencia : EVK1-CT2001-00102

SOLARDESAL
Tecnología Híbrida de Desalinización Avanzada Solar-Gas Basada en Colectores Solares Estáticos
Duración: 7.11.2001 – 6.11.2004
Financiación: Ministerio de Ciencia y Tecnología
Referencia: REN2000-0176-P4-04

POWERSOL
Mechanical Power Generation Based on Solar Heat Engines
Duración: 1.1.2007 – 31.12.2009
Financiación: Comisión Europea, FP6, prioridad B.1.5.
Referencia : 032344

MEDESOL
Seawater desalination by innovative solar-powered membrane-distillation system
Duración: 1.10.2006 – 30.09.2009
Financiación: Comisión Europea, FP6, prioridad B.1.6.3.
Referencia : 036986

Con participación de la PSA

OSMOSOL
Desalación por ósmosis inversa mediante energía solar térmica
Duración: 31.12.2005 – 30.12.2008
Financiación: Ministerio de Educación y Ciencia
Referencia: ENE2005-08381-C03

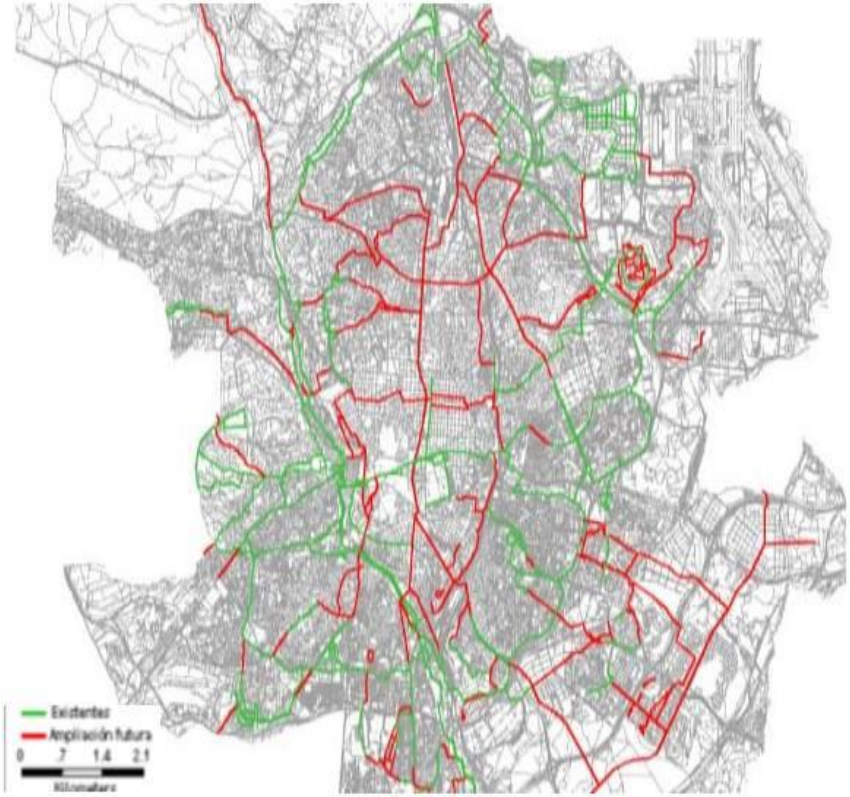
PS10 and PS20

GemaSolar

# *Spain Lider in Concentrated Solar Power (CSP)*

# ADAPTATION IN MADRID

**Madrid biking network**




Propuesta Red Básica Ciclista del Plan Director de Movilidad Ciclista

**Bank of Santander Building**

# Adaptation in Madrid

- **Climate change adaptation** is focused on four areas: water resources, green spaces, edification and urban equipment.

- **Adaptation measures** are being implemented by local and Community governments plus private initiatives.

- **Water is the most critical aspect** but also Urban Heat Island Effect and pollution are also matters of importance to local and regional governments.

- **Madrid as a pioneer city** in water sustainability and management.

# Water: the biggest issue regarding climate change in the region and city of Madrid

- North-Western part of the region has a big number of streams, reservoir and lakes as well as more rainfall.
- The central and southern parts are a lot dryer.
- The city has a social service that provides drinking water to people without resources.

**Community of Madrid. Rivers, streams and reservoirs.**


# Municipal Plan for the Management of Water Demand

**Implemented projects**

- The water motorway
- Improvement of the Manzanares river
- Gomeznarro Park
- Madrid Río – The beach of Madrid

**The water motorway**

# The water motorway

- The city of Madrid has created a network of recycled water (145km).
- It has been called the M-40 of water, referring to the circular M-40 motorway surrounding Madrid.
- It is used to irrigate the centre and south-western areas of the city with recycled water. It aims to save drinking water and increase hydrological resources.
- The network flows between a number of water treatment systems and irrigates parks and streets with reused and regenerated water.
- This network allows transferring water from any point of the city in a bidirectional way.
- There are 36 storage deposits with a total capacity of 156.000 $m^3$, as well as 33 loading docks. 70 parks are currently irrigated with this kind of water, which brings savings of about 23 $hm^3$ of water per year.
- Most of the costs have been financed by the cohesion fund of the EU (100 of 130 million Euros) and the community and local governments.

# Improvement of the Manzanares River

- The city built up a system of storm ponds and water pipes in order to reduce contamination caused by the first rain water.
- The water can be now poured directly into the river during strong rain periods and will then be regenerated in a purification system downstream.
- There are 37 of these water ponds with a storage capacity of 1.370.250m³ of water.

**Underground storm ponds**

# Green spaces

**Madrid is the first capital in EU and 2nd in the world with more trees since it has a total of 300,000, of which 260,000 are placed on the sidewalks of the city.**

**Vertical garden in Caixa Forum with tiene 24 m height and y 15.000 plants**

# European Platforms for city information

- **Climate ADAPT platform**, providing indications, case studies and further information for adaptation, with an specific area dedicated to urban adaptation: Http://climate-adapt.eea.europa.eu/web/guest/cities

- **EU Cities Adapt**: The most important parts of the contents have been integrated into the Climate ADAPT platform.

- **Mayors Adapt** - The Convention of Mayors' Initiative for Adaptation: http:// mayors-adapt.eu

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# Final reflections

- There is still lack of coordination between European Regions at all levels.

- The adaptive capacity is directly related to the status of natural resources and the level of socio-economic development:

- A great part of the developing world lacks of financial resources and suffers more intensively the climate change impacts.

# Final reflections

- We have a climate debt and an adaptation debt with developing countries.
- If we do not adapt we'll put in danger our economic growth and the stability and security of communities and countries.
- Adaption is the responsibility of this generation.