



# A INFRAESTRUTURA VERDE DE LISBOA

22.06.2017

**DUARTE D'ARAÚJO MATA**  
ARQUITECTO PAISAGISTA | LANDSCAPE ARCHITECT

PELOURO DA ESTRUTURA VERDE E ENERGIA  
GREEN INFRASTRUCTURE AND ENERGY DIRECTORATE  
DEPUTY MAYOR'S OFFICE

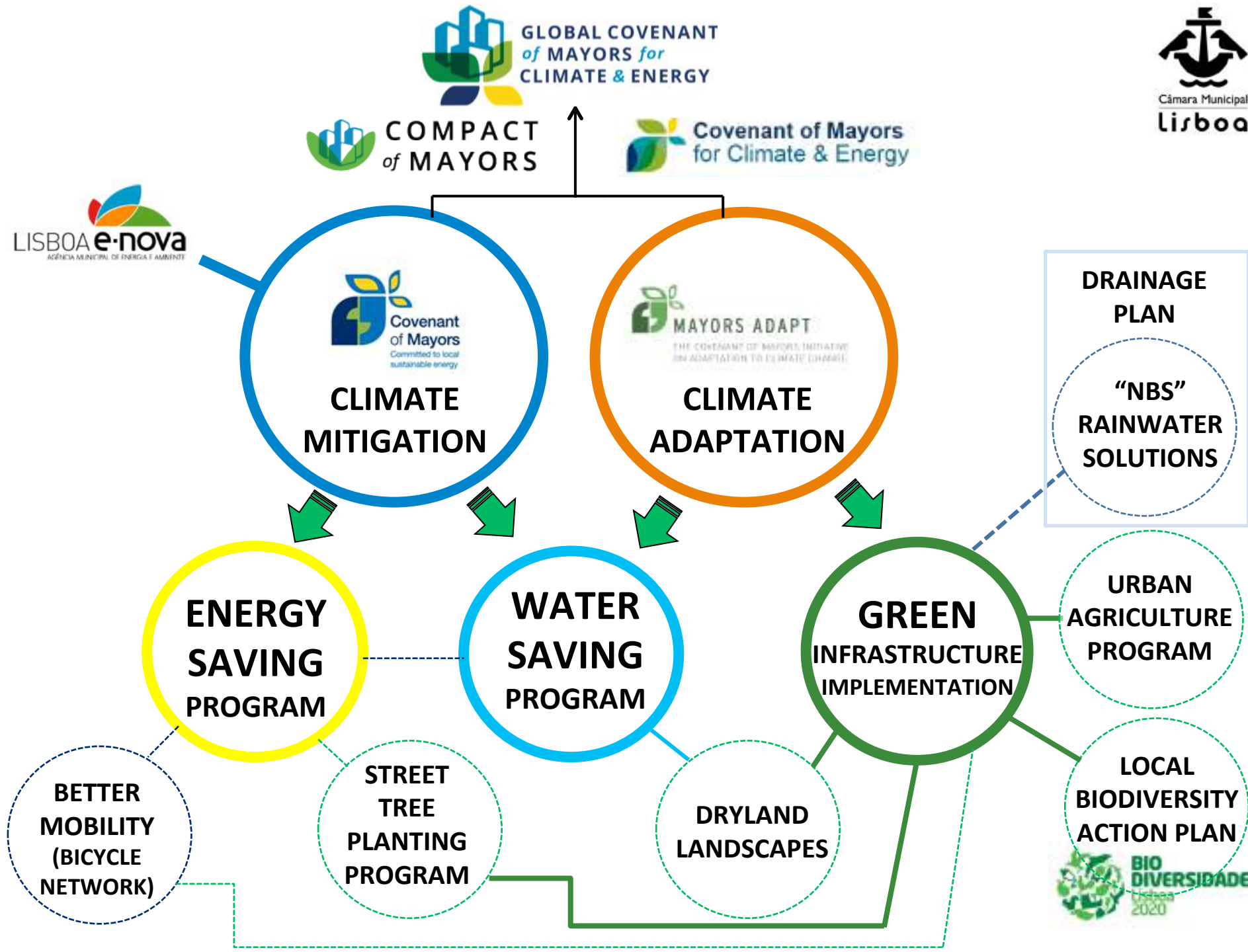
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# **HOW LISBON IS ORGANIZED TO RESPOND TO CLIMATE CHALLENGES?**



# OUR EVOLUTION IN LISBON



**GREEN  
AREAS**



**GREEN  
STRUCTURE**



**GREEN  
INFRASTRUCTURE**



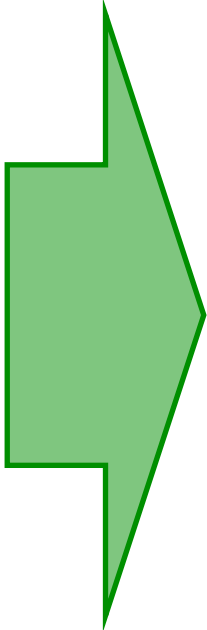
**ECOLOGICAL  
CONTINUITY**



**ECOSYSTEM  
SERVICES**

# GREEN INFRASTRUCTURE

## URBAN ECOSYSTEM SERVICES



A) WATER CYCLE  
B) AIR DRAINAGE  
C) CO<sub>2</sub>, NO<sub>2</sub> CAPTION  
D) SHADOW AND HUMIDITY  
E) BIODIVERSITY

RECREATION

FLASH FLOODS RESPONSE

(RESPIRATORY) DISEASES MITIGATION

(PSYCHOLOGICAL) DISEASES MITIGATION

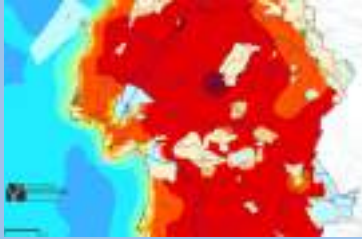
URBAN HEAT CLIMATE MITIGATION

LOCAL FOOD PRODUCTION

SPORT / HEALTH QUALITY

ACTIVE MOBILITY

# LISBON'S CLIMATE ACTION: SOLUTIONS TO SOUTHERN EUROPEAN CITIES



**HOT DAYS  
&  
URBAN HEAT  
ISLAND EFFECT**



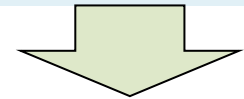
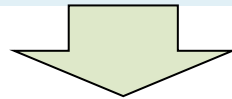
**URBAN  
FLOODS**



**FREQUENT  
DROUGHTS**



**+ GREEN  
INFRASTRUCTURE  
+ TREE PLANTING  
+ AIR HUMIDITY**








**READY LOW-COST  
NATURE BASED SOLUTIONS**



**BIODIVERSITY  
ECOSYSTEM SERVICES**



**HOW TO USE  
GREEN INFRASTRUCTURE  
TO REACH URBAN  
SUSTAINABLE  
CLIMATE GOALS?**



**RESILIENT  
CLIMATE ADAPTATION**



**PUBLIC  
PARTICIPATIVE**



**USEFULL TO  
CITIZENS**





**LISBON'S GREEN INFRASTRUCTURE:  
(Green Infrastructure from the Master Plan 1994)**

**9 LISBON'S  
GREEN  
CORRIDORS:  
THE  
UMBRELLA  
TOOL  
FOR TAKING  
CLIMATE  
ACTION**

**+ 20%  
+400HA  
GREEN  
UNTIL  
2022**



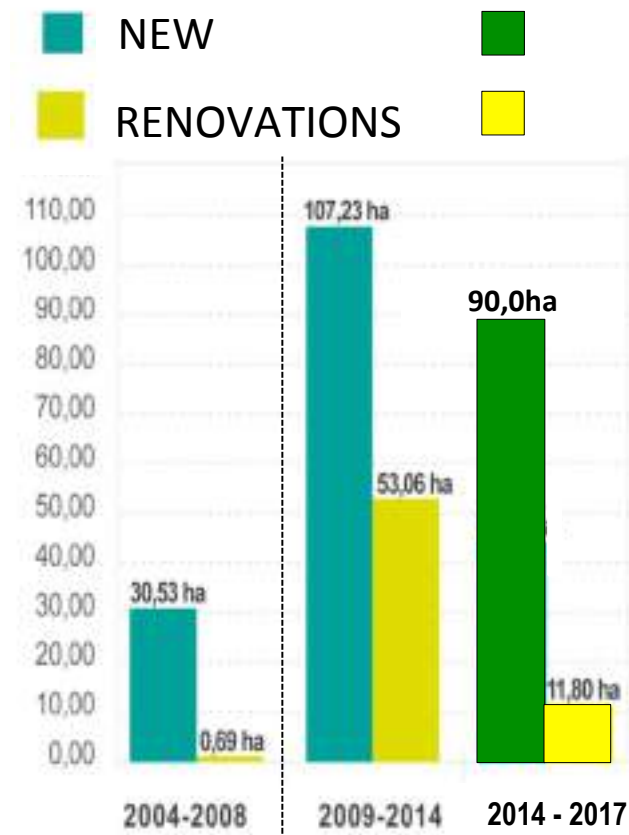




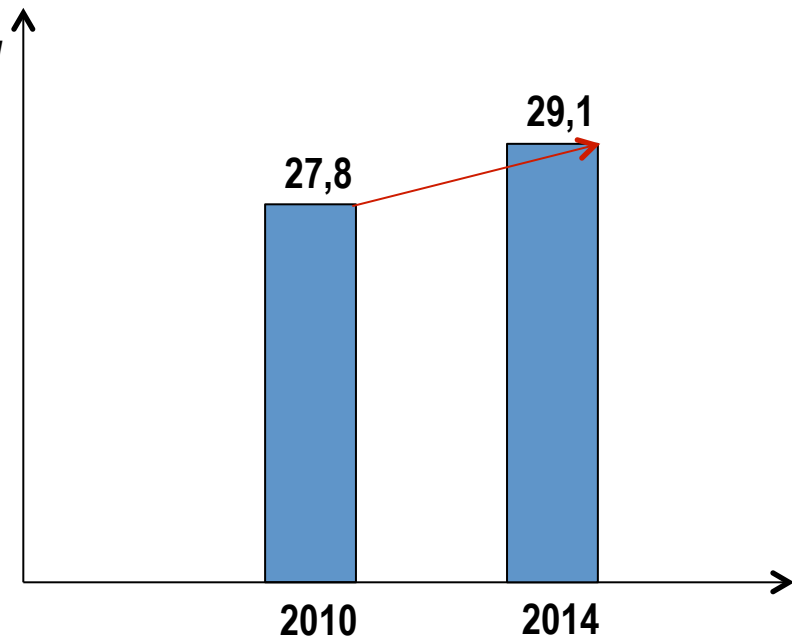
**LISBON'S GREEN INFRASTRUCTURE:**  
(Green Infrastructure implemented 2008-2017)



# ECOSYSTEM SERVICES & NATURE BASED SOLUTIONS (NBS)



Green areas (m2) / inhabitants  
(considered only parks > 0.75ha)



GREEN AREAS EVOLUTION (2004-2017)

# NEW GREEN INFRASTRUCTURE

## IMPLEMENTATION COSTS

10,00 €/m<sup>2</sup>

75,00 € / m<sup>2</sup>

EXTENSIVITY

INTENSITY



TRANSITION TO GREEN CORRIDORS

TRANSITION TO NBS

data from Lisbon Municipality

# GREEN INFRASTRUCTURE MANAGEMENT

GREEN AREAS = MAINTENANCE COSTS

**LISBON OVERALL COSTS :**  
5.473.943,81 € (w / VAT)

## > INTENSIVE

	€ / m <sup>2</sup> / Year	
	Min	Max
MAIN GARDEN	1,47000	3,30000
MONUMENT LANDSCAPING	1,47000	3,30000
RECREATIONAL PARK	0,98004	2,19996
SMALL GARDEN	0,98004	2,19996
GARDEN SCHOOL	0,98004	2,19996
CEMETERY	0,48996	1,10004
HOUSING LANDSCAPING	0,48996	1,10004
URBAN PARK	0,36804	0,82500
HERITAGE AND CENTRAL GARDEN	9,80004	21,99996

## < INTENSIVE

	€ / m <sup>2</sup> / Year	
	Min	Max
MAIN AVENUE OR ROAD LANDSCAPING	0,36804	0,82500
EXTENSIVE LANDSCAPES AND URBAN ALLOTMENT GARDENS	0,09804	0,21996
NATURAL AND CONSERVATIVE AREAS	0,09804	0,21996
WILD AND REMNANT AREAS	0,02496	0,05496

data from Lisbon Municipality 2015



# GREEN INFRASTRUCTURE MANAGEMENT

0,05 €  
/m<sup>2</sup>/Year

0,10 - 0,20€  
/m<sup>2</sup>/Year

0,50€  
/m<sup>2</sup>/Year

1,00€  
/m<sup>2</sup>/Year

2,00€  
/m<sup>2</sup>/Year

<20,00 €  
/m<sup>2</sup>/ Year

WILD & REMNANT AREAS

NATURAL LANDSCAPES  
EXTENSIVE LANDSCAPES  
URBAN ALLOTMENT GARDENS

URBAN PARK

CEMETERY

RECREATIONAL PARK  
SMALL LOCAL GARDEN

HERITAGE GARDENS  
INTENSIVE MAIN GARDEN

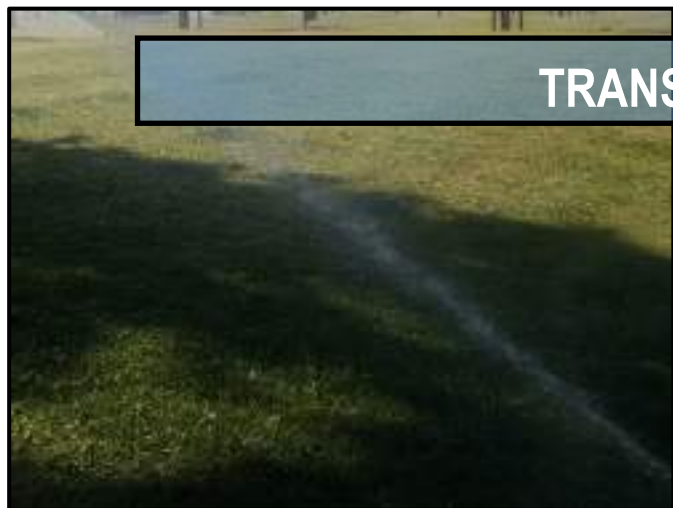
TRANSITION TO GREEN CORRIDORS

TRANSITION TO NBS

# PROXIMITY GREEN SPACES = INTENSIVE

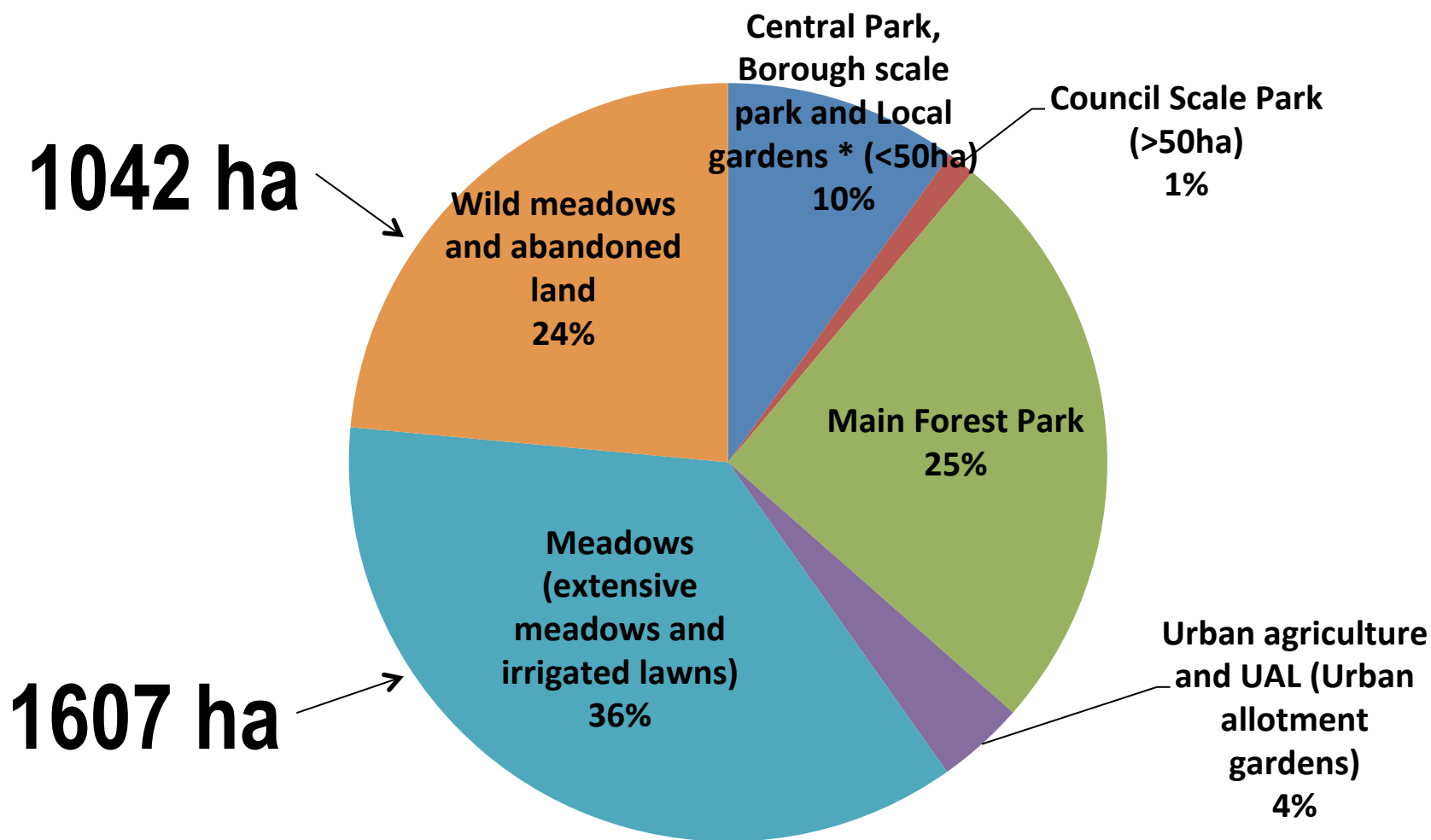


## MAIN GREENWAYS = SHIFT TO EXTENSIVITY



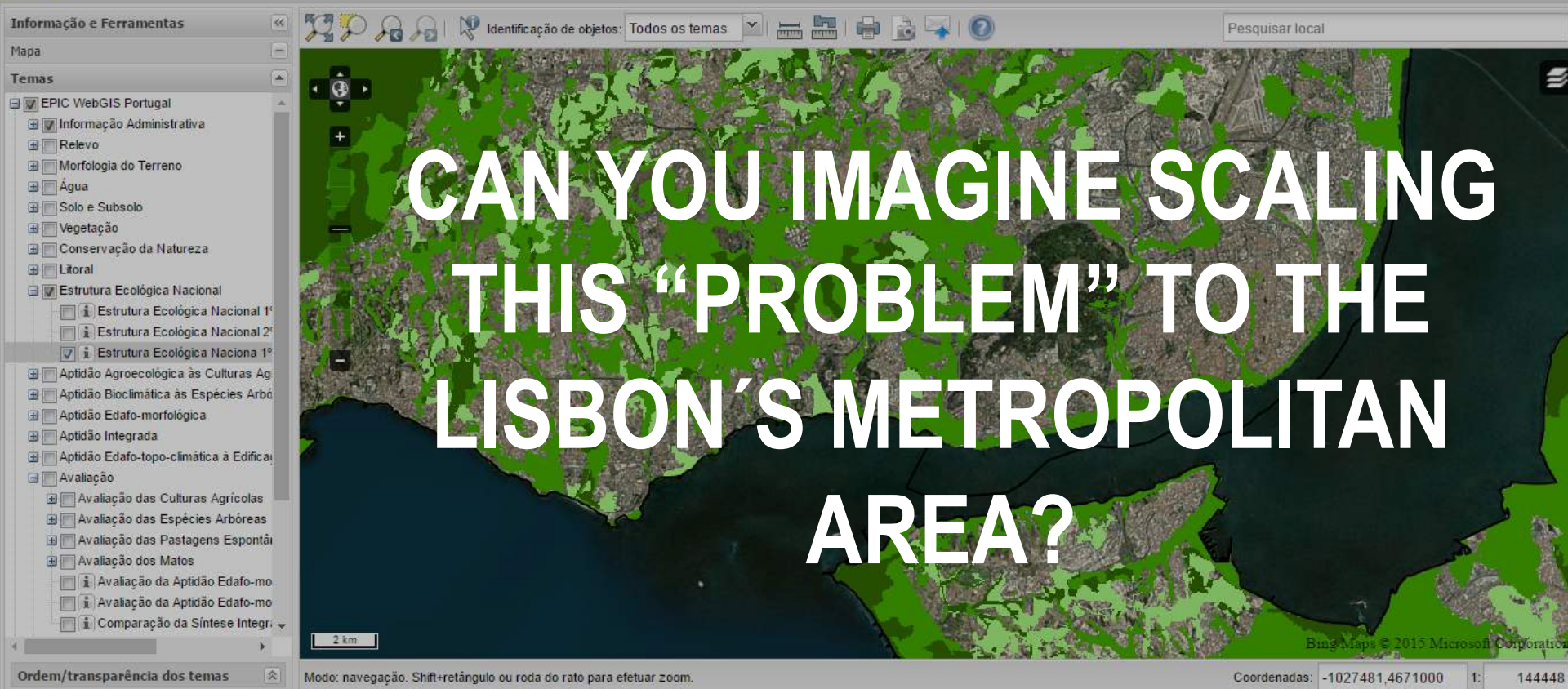
TRANSITION



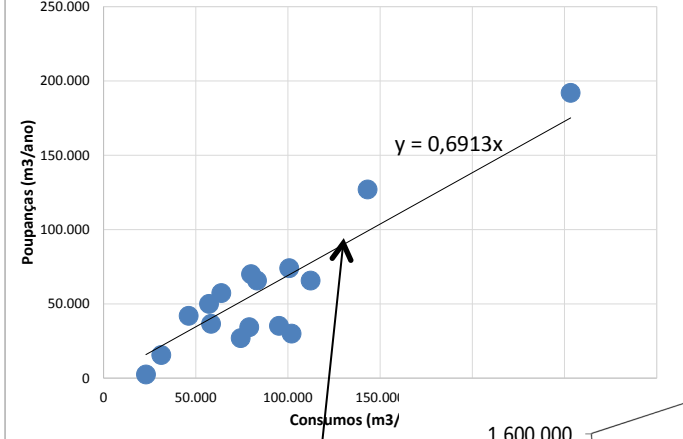
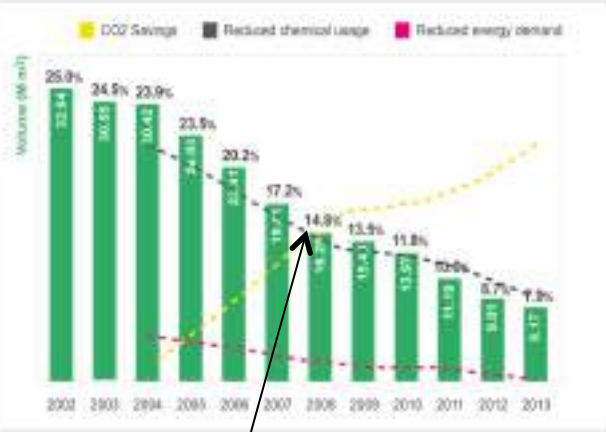


TOTAL GREEN AREAS: 4.432,26HA





...AND TO THE  
SOUTHERN EUROPEAN SCALE?

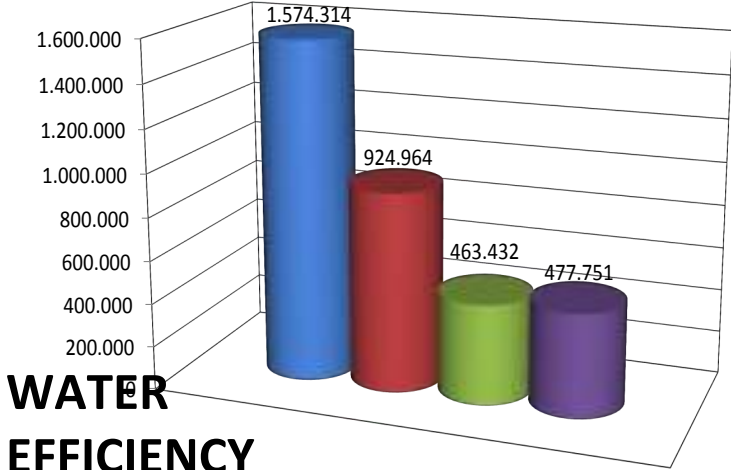


REDUCING  
LOSSES

SAVING POTENTIAL  
vs CONSUMPTION

aprox. 2.500.000 € / Year  
**WATER** COSTS IN GREEN AREAS

Annual Water Consumption (m3/year)



**WATER  
EFFICIENCY**

(16 case studies)

RECYCLED WATER



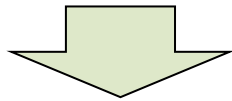
**MORE EFFICIENT  
IRRIGATION  
SYSTEMS IN PARKS  
AND GARDENS**



# LISBON at THE CORE GROUP of the URBAN WATER AGENDA to 2030

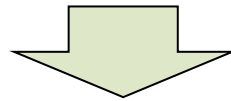
CLOSING THE URBAN WATER CYCLE  
WATER SCARCITY, WATER POLLUTION, FLOODS

**+ 25%**  
CONSUMPTION  
**EFFICIENCY**  
COMPARED  
WITH  
2015 DATA



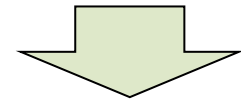
REDUCE LEAKAGE  
REDUCE CONSUMPTION  
DRYLAND LANDSCAPES

**50% OF**  
STORM WATER  
OVERFLOW  
COMPARED WITH 5  
YEAR AVERAGE  
PRIOR TO 2015



FLOOD PREVENTION  
AND  
“NBS” WATER LANDSCAPES

**40%**  
OF NON-DRINKING  
WATER COMING  
FROM  
**REUSED  
WATER**



CIRCULAR  
ECONOMY  
CONCEPT



## CLIMATE ADAPTATION AND MITIGATION STRATEGY

### CLIMATE ADAPTATION STRATEGY & NBS

#### URBAN ALLOTMENT GARDEN PROGRAM

#### EXTENSIVE GREEN TYPOLOGY

(CROP FIELDS, VINYARD PARK, NATIVE PLANTS,...)

#### NBS WATER EFFICIENCY + WATER ALTERNATIVES

(BIODIVERSE EXTENSIVE MEADOWS, (SMART IRRIGATION SYSTEMS, RECYCLED WATER, GREEN DRAINAGE SOLUTIONS)

#### MASSIVE TREE PLANTING PROGRAMME

(+28.000 TREES)

## BIODIVERSITY LOCAL ACTION PLAN

### INCREASING BIODIVERSITY “SPOTS”

#### PLANS AND RUGLEMENT FOR TREE PLANTING AND MANAGEMENT

#### RAISING CONTINUITY AMONG GREEN AREAS

#### MONSANTO 1.000 HA FOREST PARK RENOVATION WITH NATURE

(FOREST MANAGEMENT PLAN, TRAFFIC CALMING,  
TRAILS AND EQUIPMENTS RENOVATIONS)

### GREEN INFRASTRUCTURE

#### GREENWAYS IMPLEMENTATION

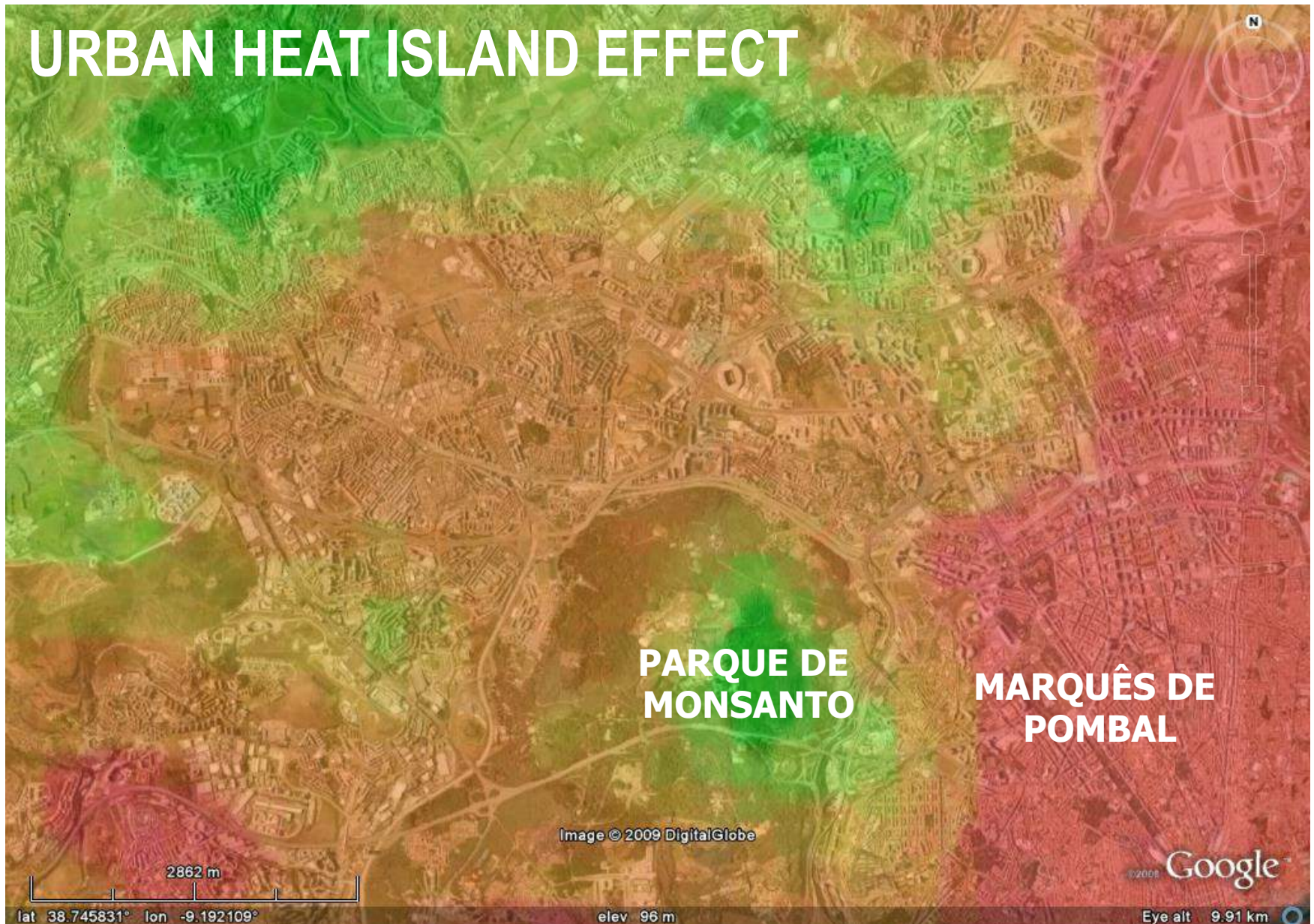
(MULTI-TASK URBAN GREEN SPACES SYSTEM)

#### BICYCLE NETWORK

#### EXISTING GREEN AREAS REFURBISHMENTS

Temperatures 2003-08-01:00

# URBAN HEAT ISLAND EFFECT



Grupo de Previsão Numérica do Tempo, IST, 2009 em:

[http://jddomingos.ist.utl.pt/Urbanismo/Factores\\_Cimaticos-Planeamento-Urbano\\_20090402.pdf](http://jddomingos.ist.utl.pt/Urbanismo/Factores_Cimaticos-Planeamento-Urbano_20090402.pdf)



**BIO  
DIVERSIDADE**  
Lisboa  
2020

## BIODIVERSITY LOCAL ACTION PLAN



## GREEN INFRASTRUCTURE

## SPECIFIC MANAGEMENT TO TARGET SPECIES

## RUGLEMENTS

## INFORMATION ON SITE

(EX: HOTSPOTS,...)

NATURAL CONTINUITY AT  
MUNICIPAL LEVEL AND  
CONNECTIONS WITH REGIONAL  
SCALE

BETTER CONTINUITY

ECOSYSTEM RESTAURATION

GREEN STRUCTURE  
RE-NATURALIZATION

RUGLEMENTS TO GREEN AREAS  
DESIGN

RUGLEMENTS TO GREEN AREAS  
MANAGEMENT

BIODIVERSITY HAZARDS



# FROM 1.000 HA FOREST PARK TO “EDUARDO VII” CENTRAL PARK





# FROM 1.000 HA FOREST PARK TO “EDUARDO VII” CENTRAL PARK





**WATER FREE**



**SAVING ENERGY IN  
MAINTENANCE**



**FERTILIZERS**



**HIGH CO2 SINK**



**HIGH NO2 SINK**



**URBAN BIODIVERSITY**



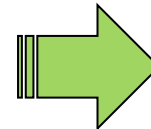
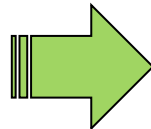


# CLOSING THE CYCLE

ADAPTATION + BIODIVERSITY + ECONOMY

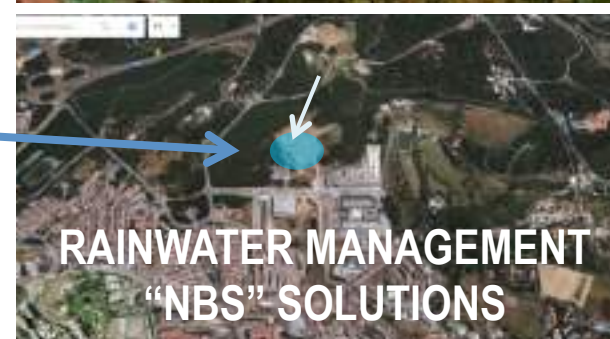
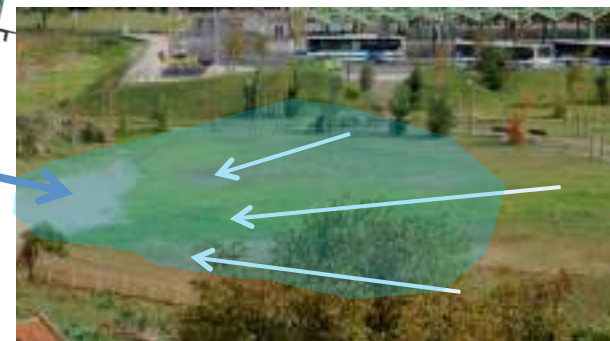
URBAN GRAZING IN PARKS MANAGEMENT:

## WHY NOT?





# CLIMATE ADAPTATION TO URBAN FLOODS





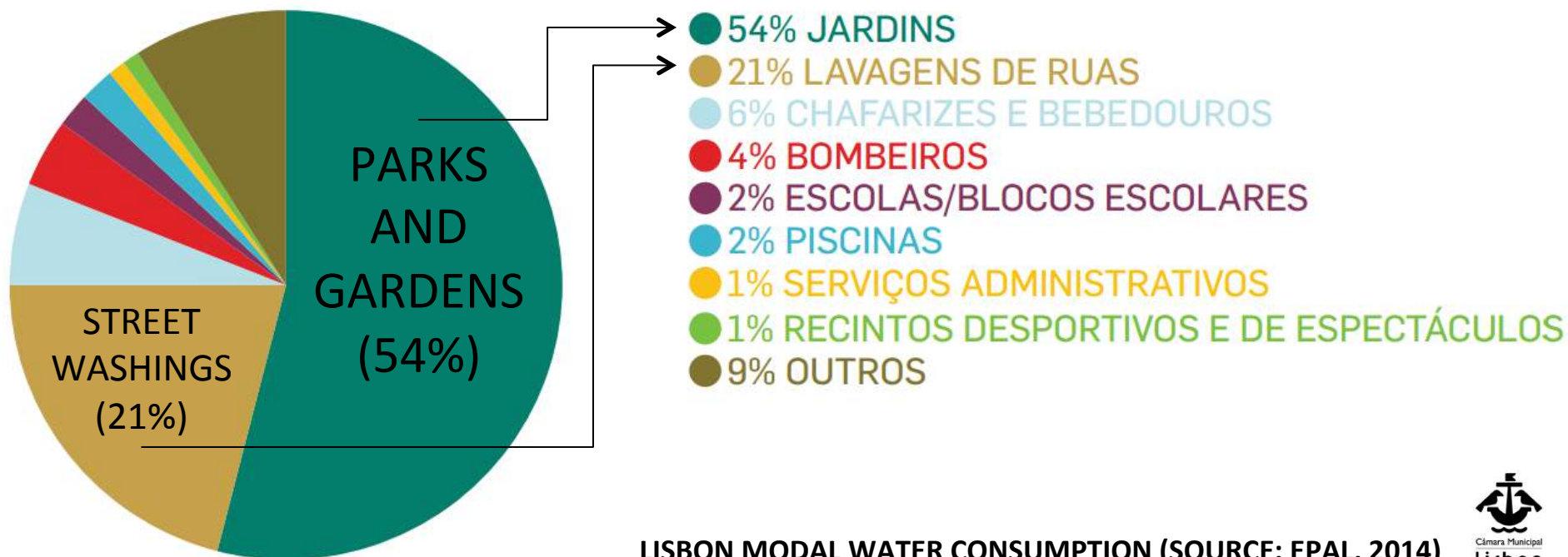
# RAINWATER MANAGEMENT “NBS” SOLUTIONS



# FUTURE AMUSEMENT PARK IS BASED ON RAINWATER “NBS” SOLUTIONS



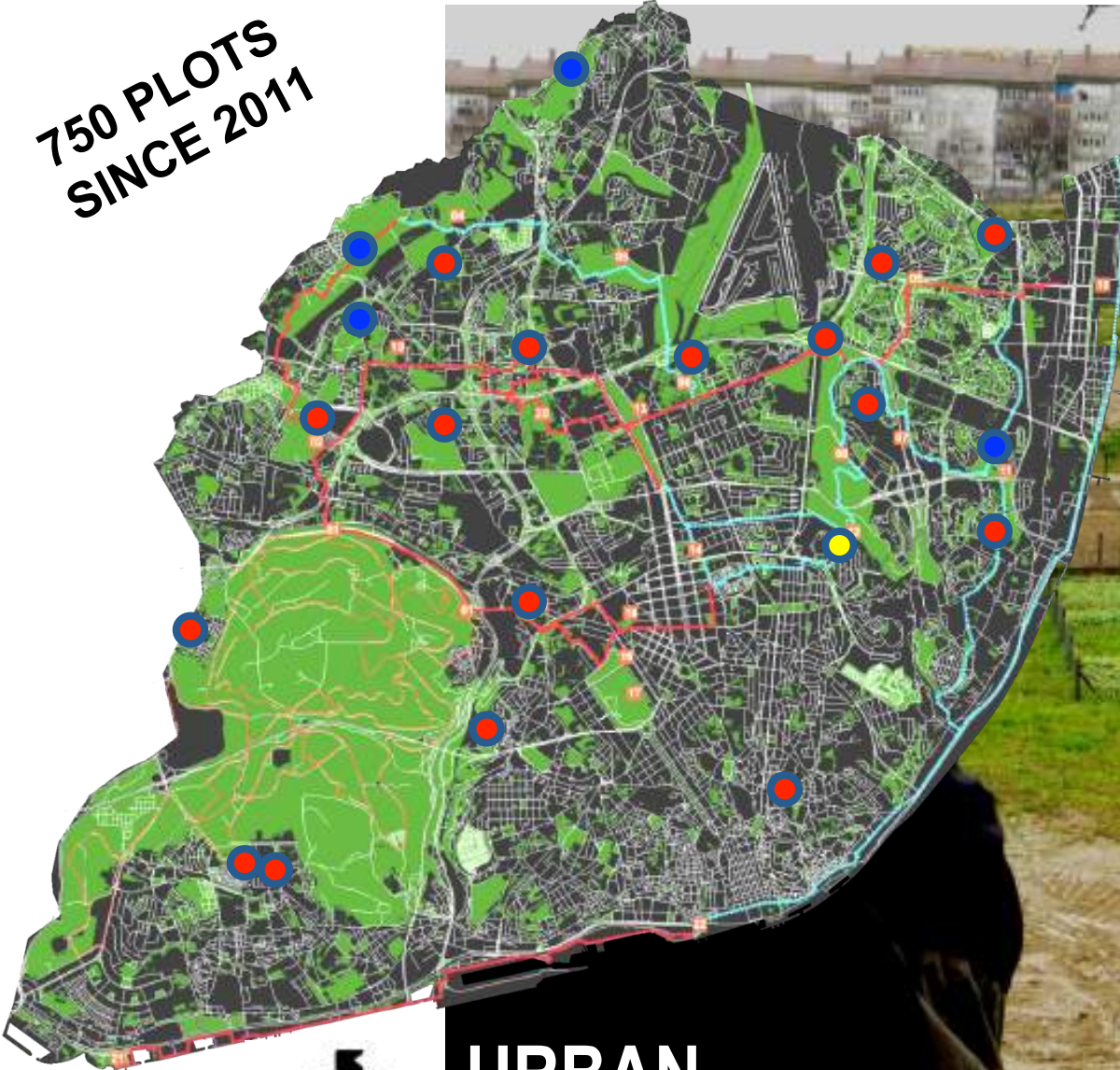
# CLIMATE ADAPTATION TO WATER URCITY



LISBON MODAL WATER CONSUMPTION (SOURCE: EPAL, 2014)



750 PLOTS  
SINCE 2011



## URBAN ALLOTMENT GARDENS

### ● OPENED (16)

PARQUE DA QUINTA DA GRANJA  
HORTAS DOS JARDINS DE CAMP  
TELHEIRAS NASCENTE  
OLIVAIS POENTE  
QUINTA N.S. DA PAZ  
HORTAS NO PARQUE BENSÁUDE  
PARQUE HORTÍCOLA DO VALE D  
HORTAS DA CERCA DA GRAÇA  
BOAVISTA  
CASALINHO DA AJUDA  
BELA-FLOR / CAMPOLIDE  
QUINTA DO CONDE DE ARCOS  
QUINTA DAS FLORES  
RIO SECO IV  
BELAVISTA NORTE /  
VNECA

### ● OPENING SOON

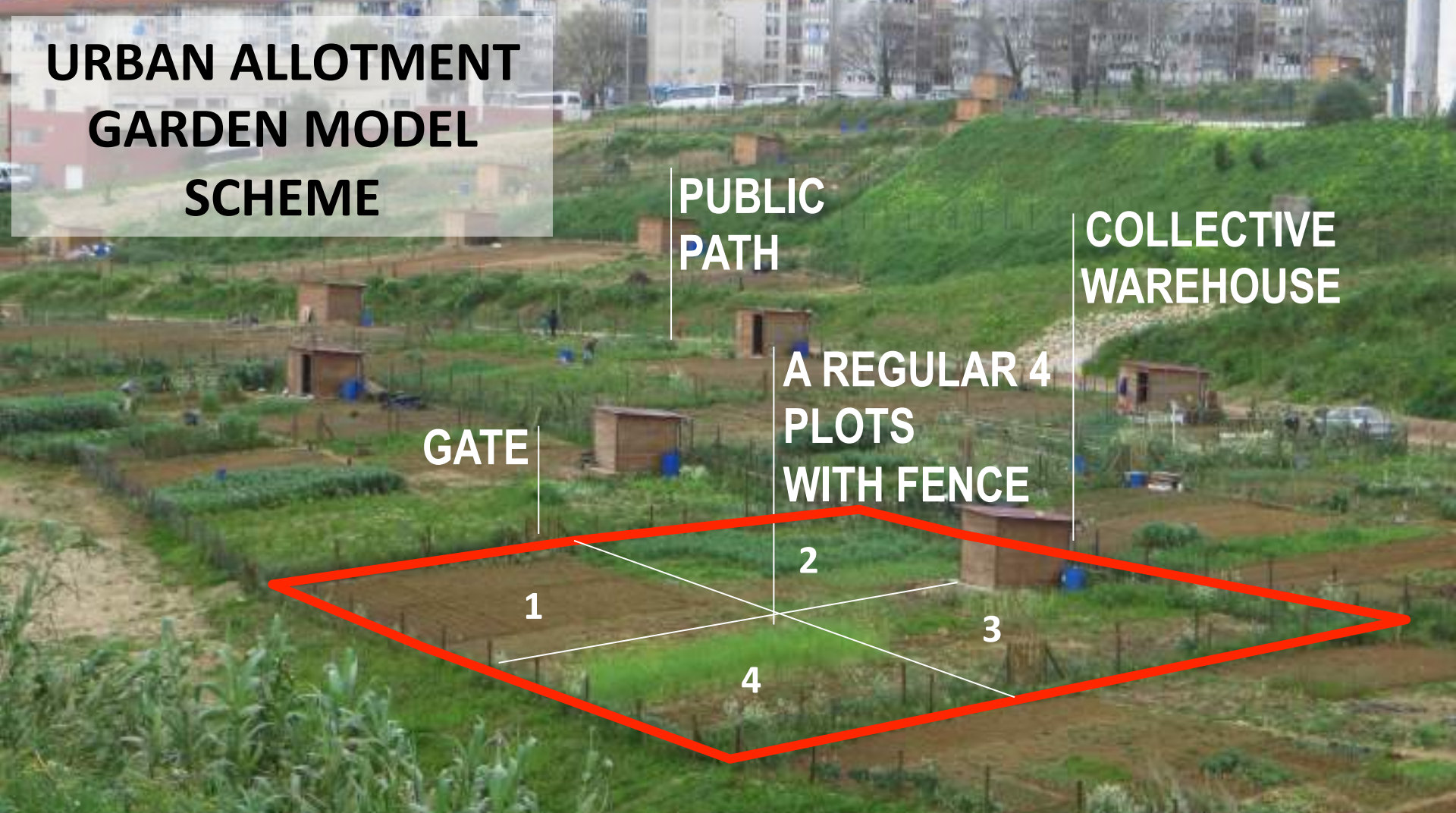
VAL (04)  
MEIXOEIRA  
NUCLEO DE CARNIDE / CARMEL  
PARQUE PERIFÉRICO / Bº PADRE  
VALE FUNDÃO

### ● UNDERWAY (01)

CASAL VISTOSO



# URBAN ALLOTMENT GARDEN MODEL SCHEME



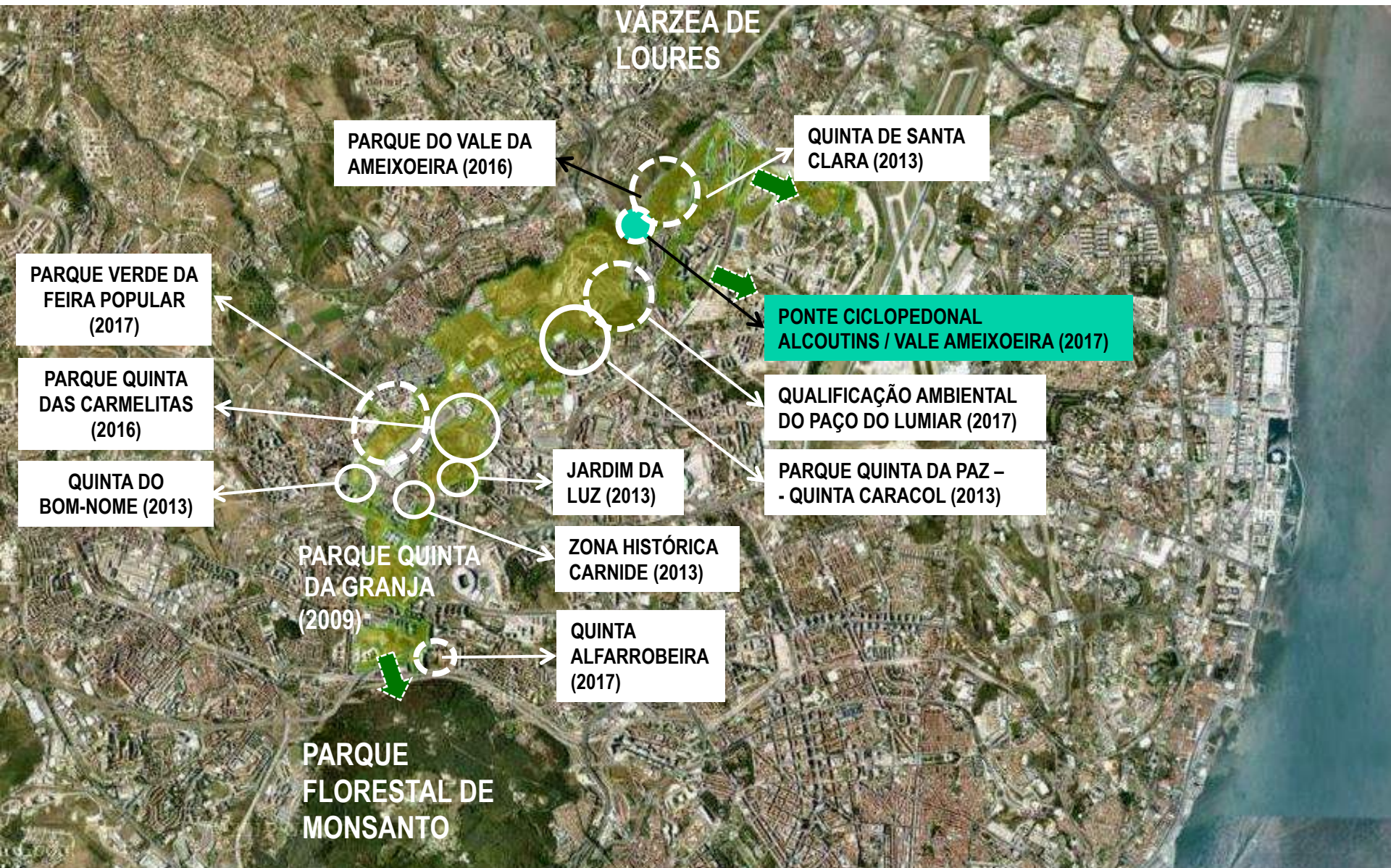




## QUINTA DA GRANJA

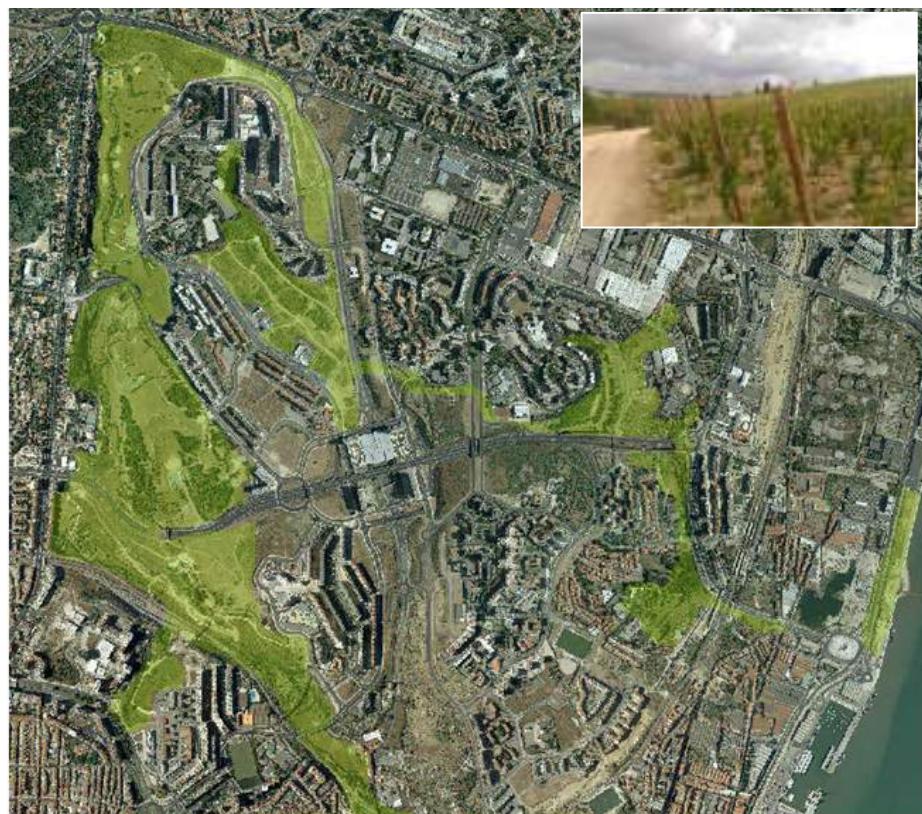


# NORTH PERIPHERAL GREEN CORRIDOR



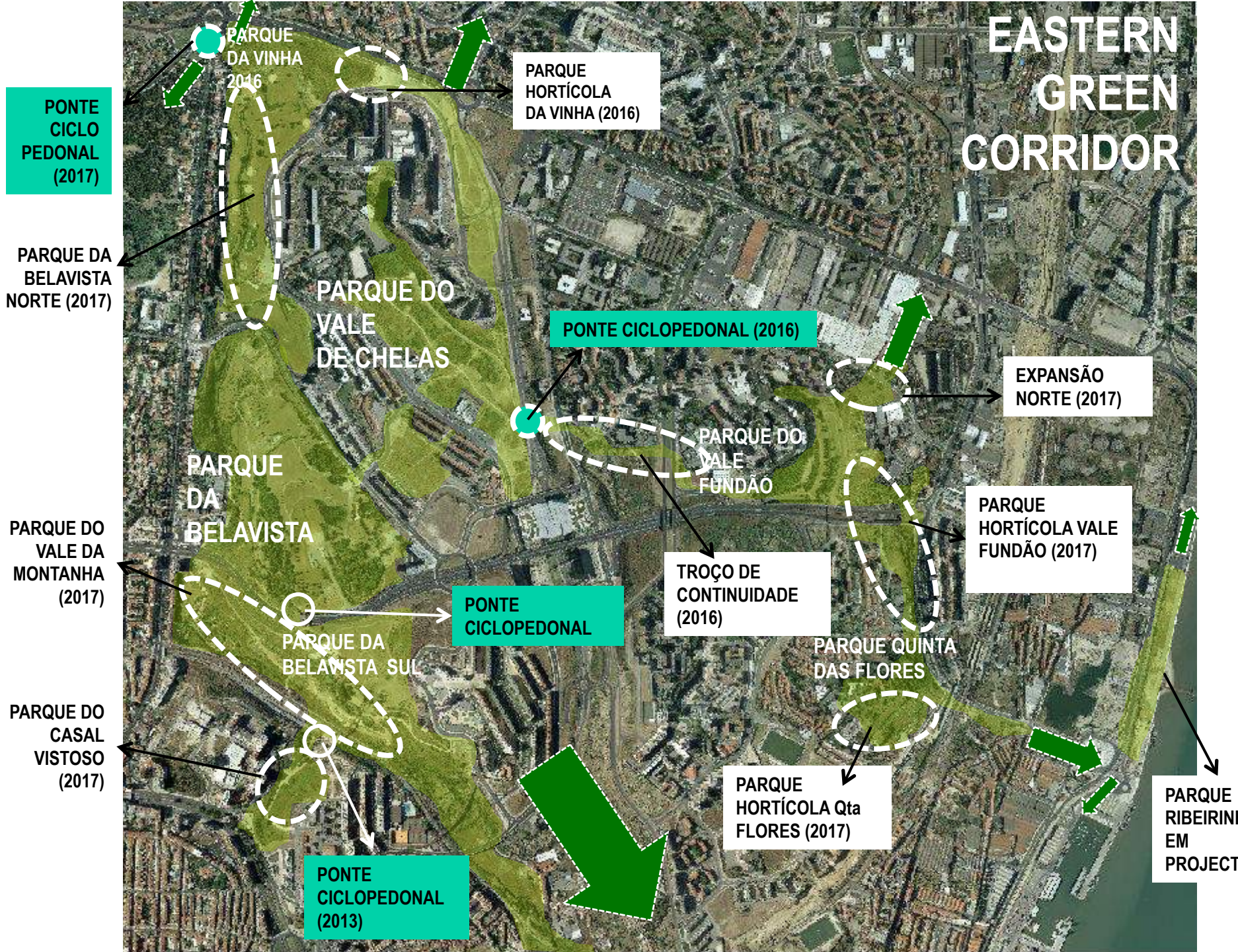


# EASTERN GREEN CORRIDOR





# EASTERN GREEN CORRIDOR









# ALCÂNTARA VALLEY GREEN CORRIDOR

## A GREEN CORRIDOR TO CLOSE THE WATER CYCLE





# THE BICYCLE MOBILITY OTHER GREEN INFRASTRUCTURE SERVICES





# FIRST BICYCLE NETWORK “GREEN & CYCLE”

TARGET: RAISE THE NUMBER OF BICYCLES COMMUTING





**“GREEN & CYCLE”  
1ST BICYCLE  
NETWORK  
TARGET ALREADY  
ACHIEVED**





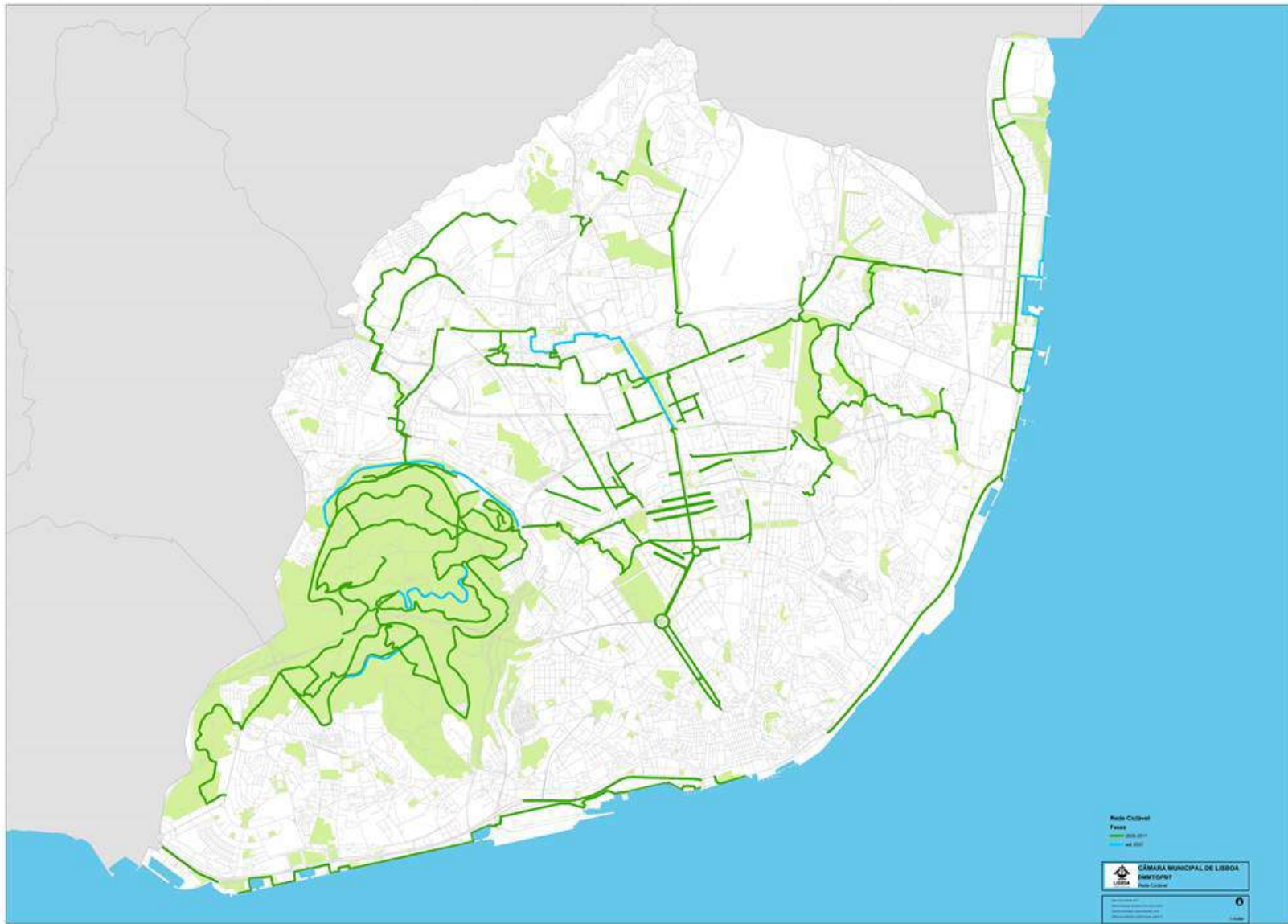
# SECOND BICYCLE NETWORK UNDERWAY (2017)



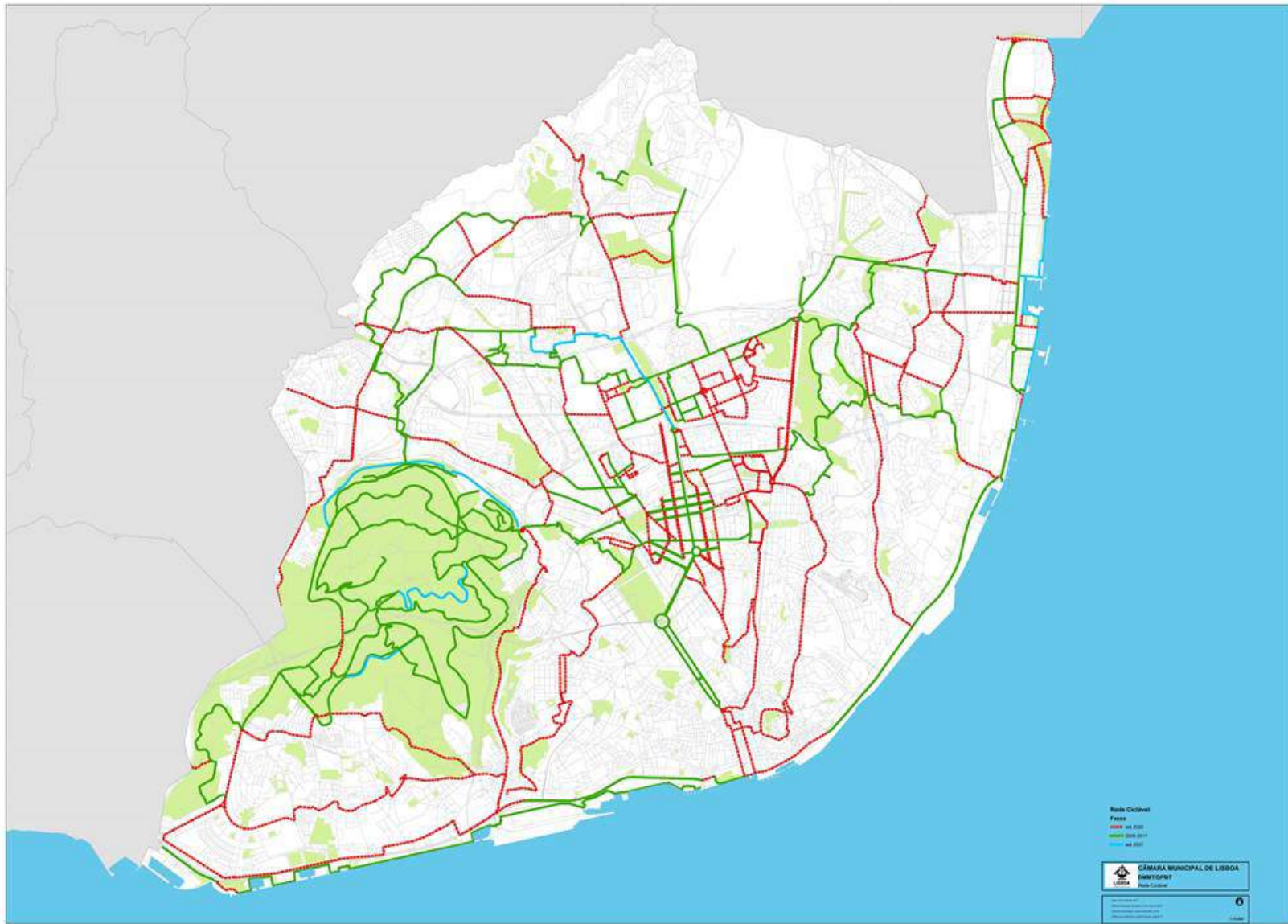


# LISBON BICYCLE INFRASTRUCTURE < 2007





# LISBON BICYCLE INFRASTRUCTURE 2008 - 2017



# LISBON BICYCLE INFRASTRUCTURE 2020





# A INFRAESTRUTURA VERDE DE LISBOA

22.06.2017

**DUARTE D'ARAÚJO MATA**  
ARQUITECTO PAISAGISTA | LANDSCAPE ARCHITECT

PELOURO DA ESTRUTURA VERDE E ENERGIA  
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