



**Desafios à gestão da infraestrutura verde
urbana no sul da Europa: o caso de Lisboa**

**Southern Europe Challenges in green
infrastructure management: The Lisbon's case**

09.05.2017

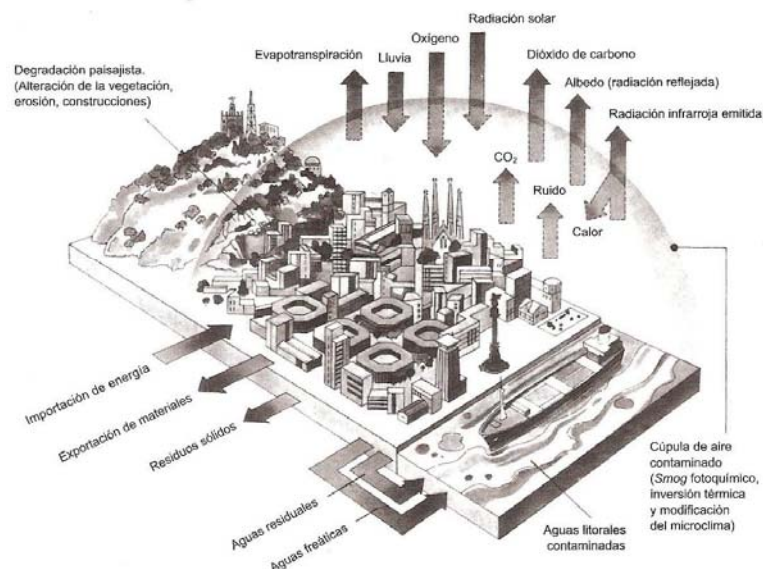
DUARTE D'ARAÚJO MATA
ARQUITECTO PAISAGISTA
LANDSCAPE ARCHITECT

GABINETE DO PELOURO DA ESTRUTURA VERDE E ENERGIA
GREEN INFRASTRUCTURE AND ENERGY DIRECTORATE
duarte.mata@cm-lisboa.pt



Câmara Municipal
lisboa

FIGURA 44. El metabolismo urbano de Barcelona en un esquema que relaciona la ciudad con su entorno.



Fuente: Parés, Pou y Terradas, 1985.

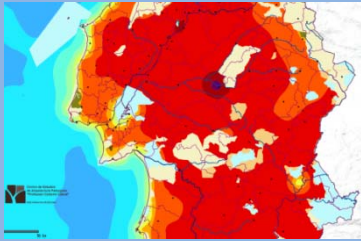
CLIMATE CHANGE AND THE CITY

Palomo, P.J. (2003); "La Planificación Verde en las Ciudades", Gustavo Gili, s.a.

Parámetro climático	Característica	Comparación con el entorno exterior (campo)
Contaminación del aire	Núcleos de condensación Contaminación gaseosa	10 veces más 5-25 veces más
Radiación	Durante las horas Directa solar Directa solar (invierno) Ultravioleta (invierno) Ultravioleta (verano) Albedo en la superficie del suelo Global Emitida en larga longitud de onda (mediodía-tarde) Emitida en larga longitud de onda (tarde-noche) Hacia la atmósfera (mediodía-tarde) Hacia la atmósfera (tarde-noche) Balance de radiación (mediodía-tarde) Balance de radiación (tarde-noche)	5-15 % más 20-25 % más Hasta 50 % menos 30 % menos 5 % menos Alrededor del 10 % menos 6-37 % menos 2 % más 5 % más 1 % más 12 % más 11 % más 47 % más
Temperatura	Media anual (Berlín) En días de sol (Berlín) En días radiantes (Berlín)	1-2 °C más 2-9 °C más 2-7 °C más
Humedad relativa	Invierno Verano En días radiantes (Berlín)	2 % menos 8-10 % menos 30 % menos
Velocidad del viento	Media anual Viento en calma	10-20 % menos 5-20 % menos
Precipitaciones	Media anual (Berlín) Tormentas Día con < 5 mm de lluvia Nieve	Hasta 20 % más 10-20 % más 10 % más 5 % menos
Nubosidad	Cielo cubierto Niebla (invierno) Niebla (verano)	5-10 % más 100 % más 30 % más

LISBON'S MOST IMPORTANT CLIMATE ADAPTATION OVERVIEW

WITH DIRECT GREEN INFRASTRUCTURE INFLUENCE



**HOT DAYS
&
URBAN HEAT
ISLAND EFFECT**

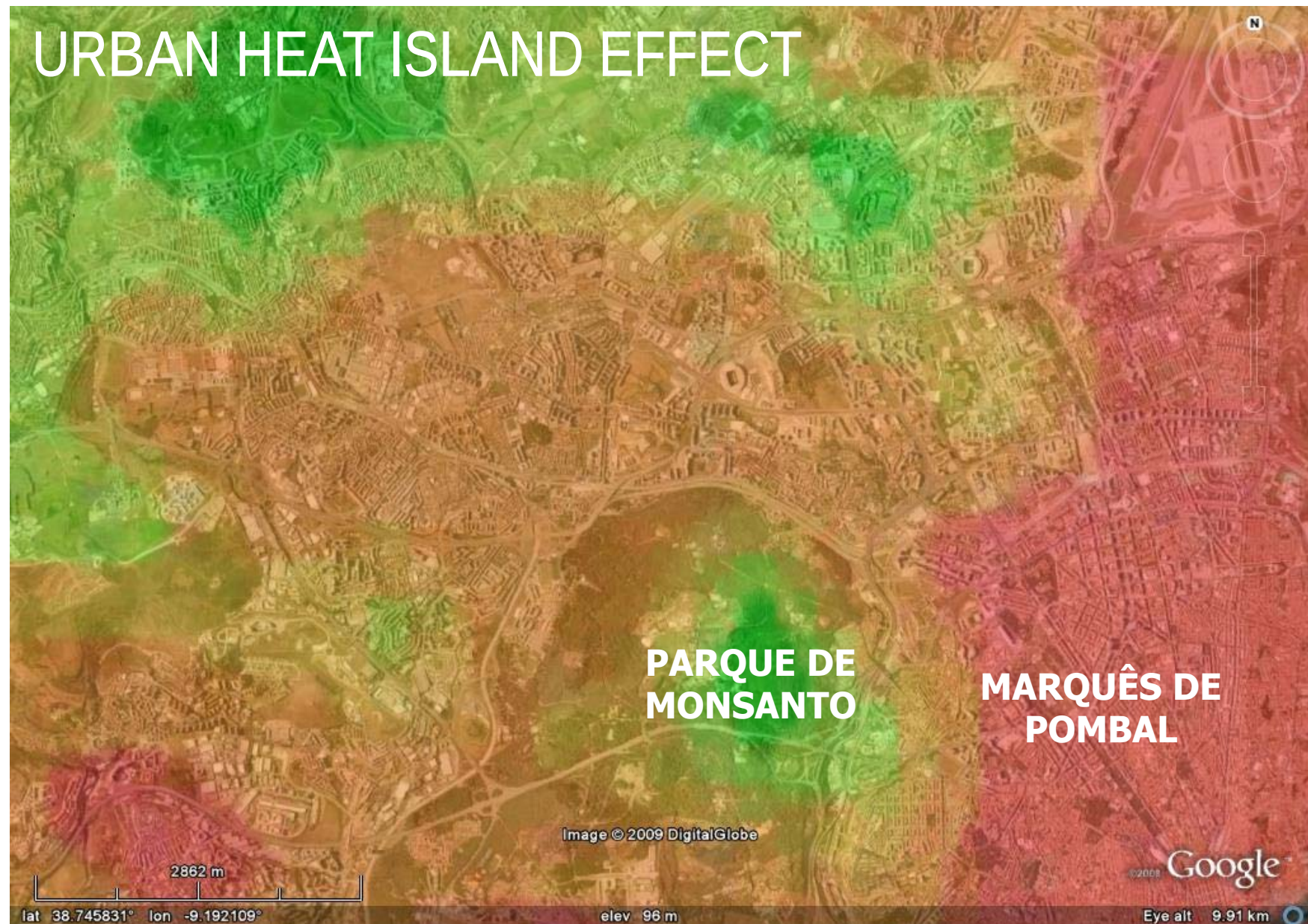


**URBAN
FLOODS**



**FREQUENT
DROUGHTS**

Temperatures 2003-08-01:00



Grupo de Previsão Numérica do Tempo, IST, 2009 em:
http://jddomingos.ist.utl.pt/Urbanismo/Factores_Cimaticos-Planeamento-Urbano_20090402.pdf

URBAN HEAT ISLAND EFFECT



Temperature (°C)

Atlanta, Georgia

Source: Heat Island Group in <http://eetd.lbl.gov/HeatIsland/HighTemps/>

Sketch of an Urban Heat-Island Profile

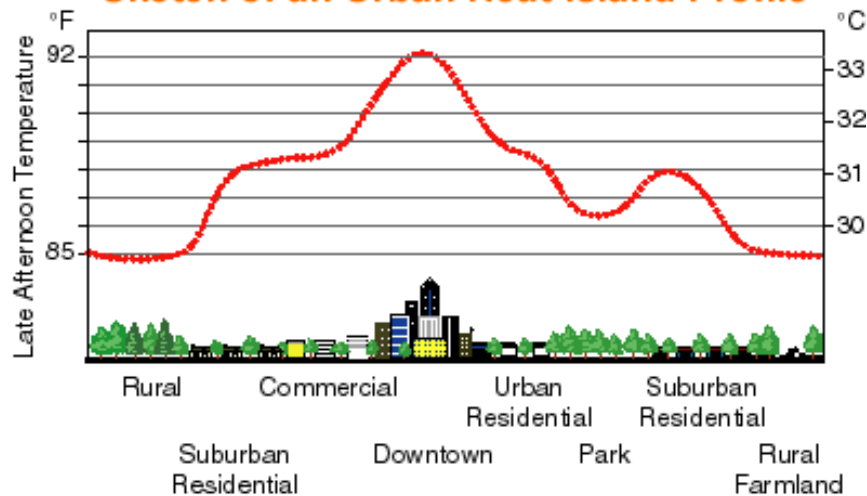
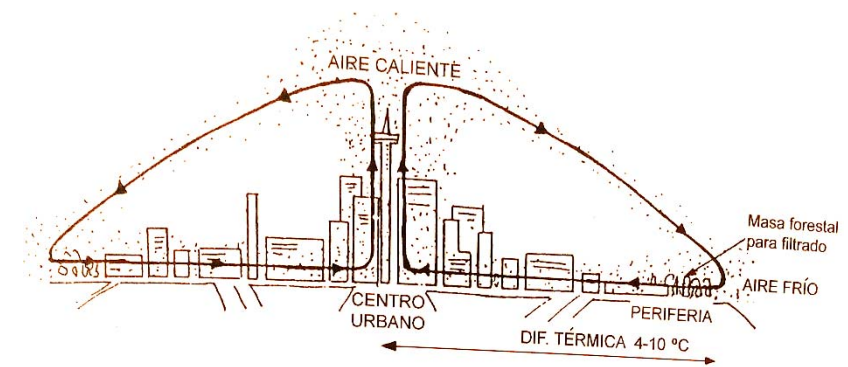


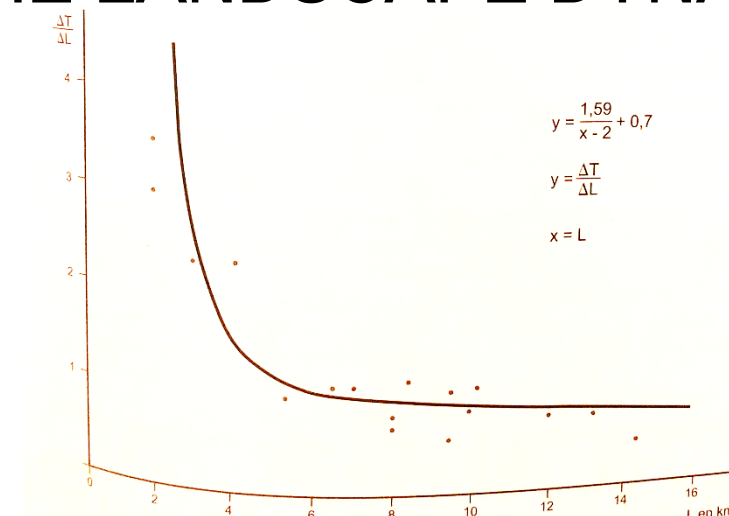
FIGURA 26. Representación de la "isla de calor urbano".



Fuente: Harris y Dines, 1988.

FIGURA 27. Relación entre la distancia al centro urbano y el gradiente térmico.

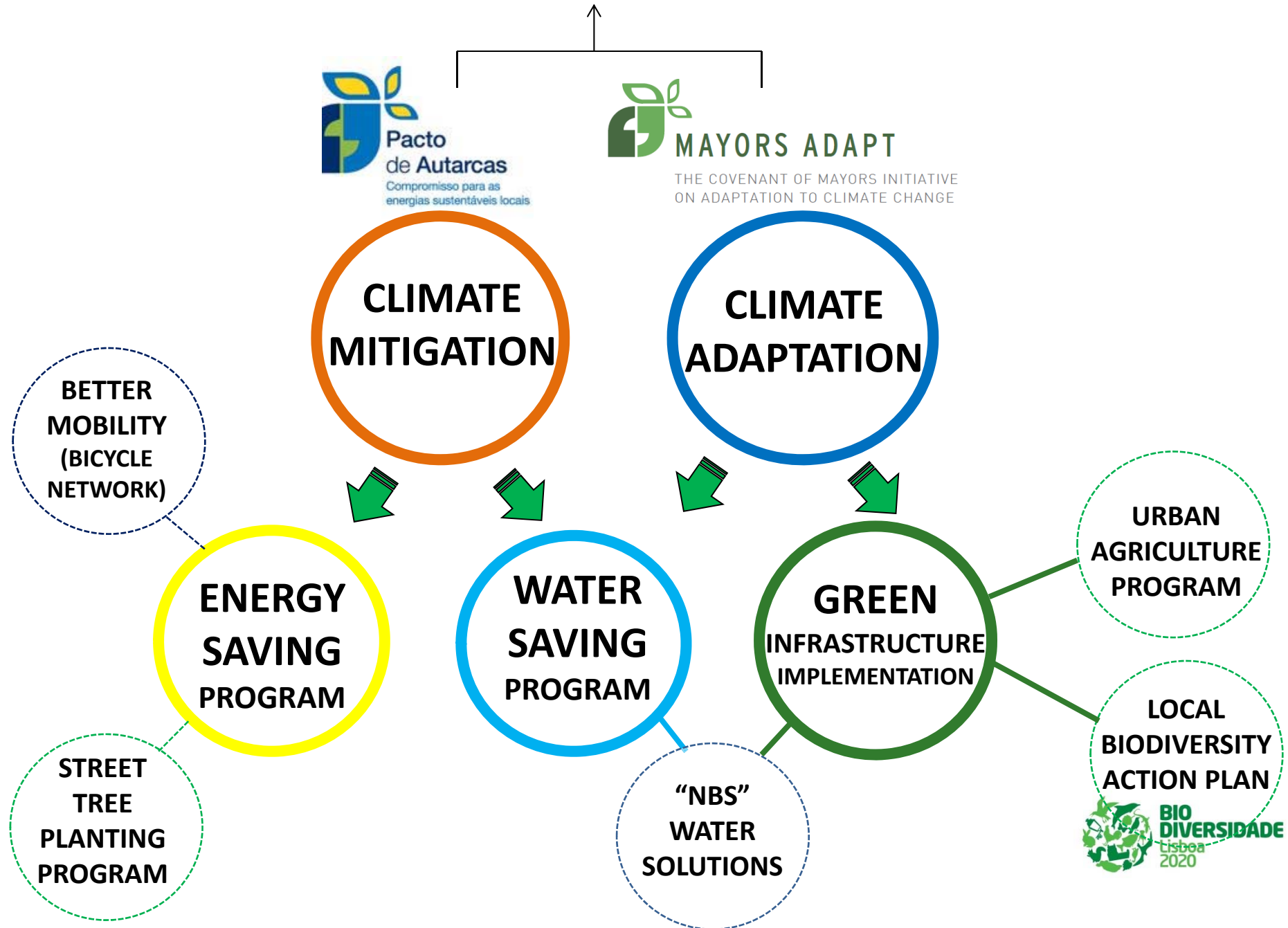
THE LANDSCAPE DYNAMIC



Fuente: Kwi-Gon Kim, 1989.

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

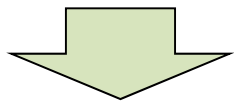
SINCE 2016: NEW COVENANT OF MAYOR'S FOR CLIMATE AND ENERGY



LISBON'S IS IN THE CORE GROUP OF THE URBAN WATER AGENDA TO 2030

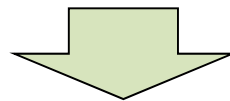
CLOSING THE URBAN WATER CYCLE
WATER SCARCITY, WATER POLLUTION, FLOODS

+ 20%
CONSUMPTION
EFFICIENCY
COMPARED
WITH
2015 DATA



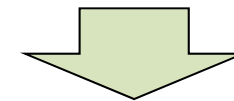
REDUCE LEAKAGE
REDUCE CONSUMPTION
DRYLAND LANDSCAPES

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



FLOOD PREVENTION
AND
"NBS" WATER LANDSCAPES

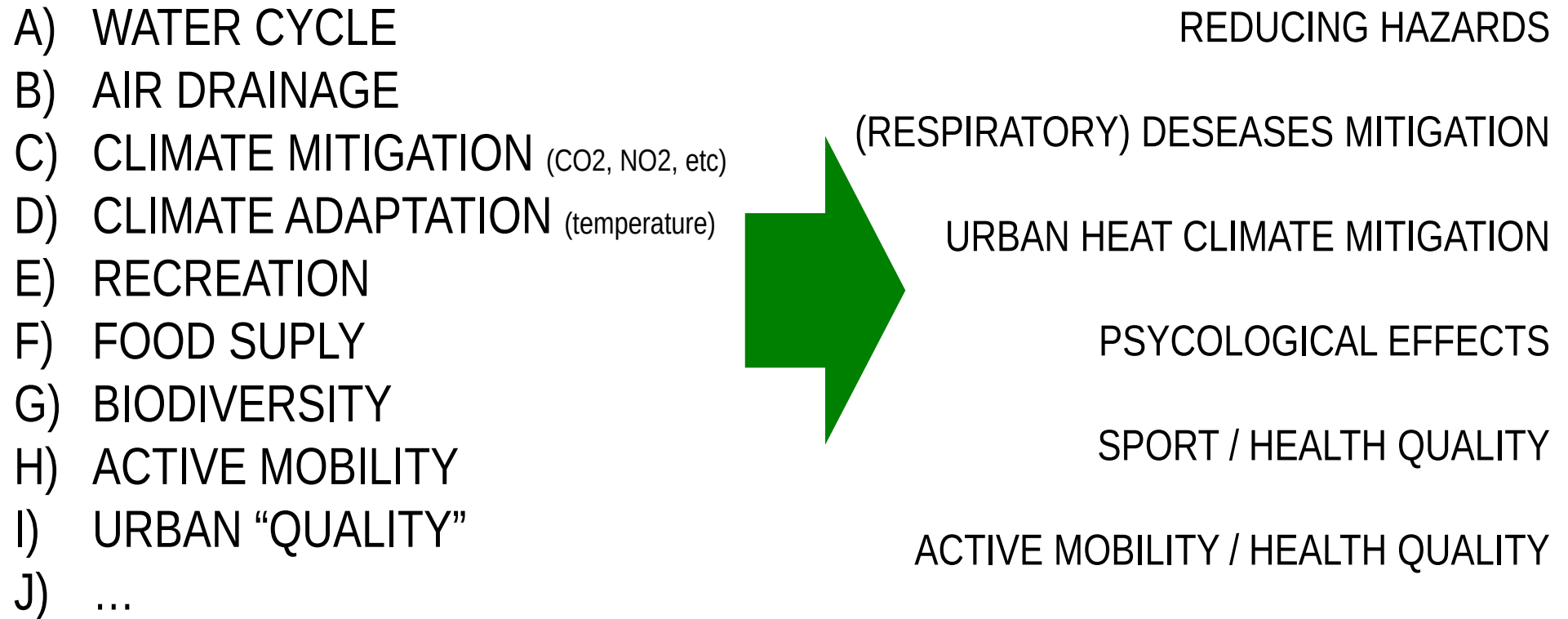
50%
OF NON-DRINKING
WATER COMING
FROM
REUSED
WATER



CIRCULAR
ECONOMY
CONCEPT

GREEN INFRASTRUCTURE

IT CAN RESPONDE TO IT from a coordinated perspective:



FIRST BICYCLE NETWORK “GREEN & CYCLE”

TARGET: RAISE THE NUMBER OF BICYCLES COMMUTING



FIRST CYCLE NETWORK 2008-2014

FINANCING

GREEN €

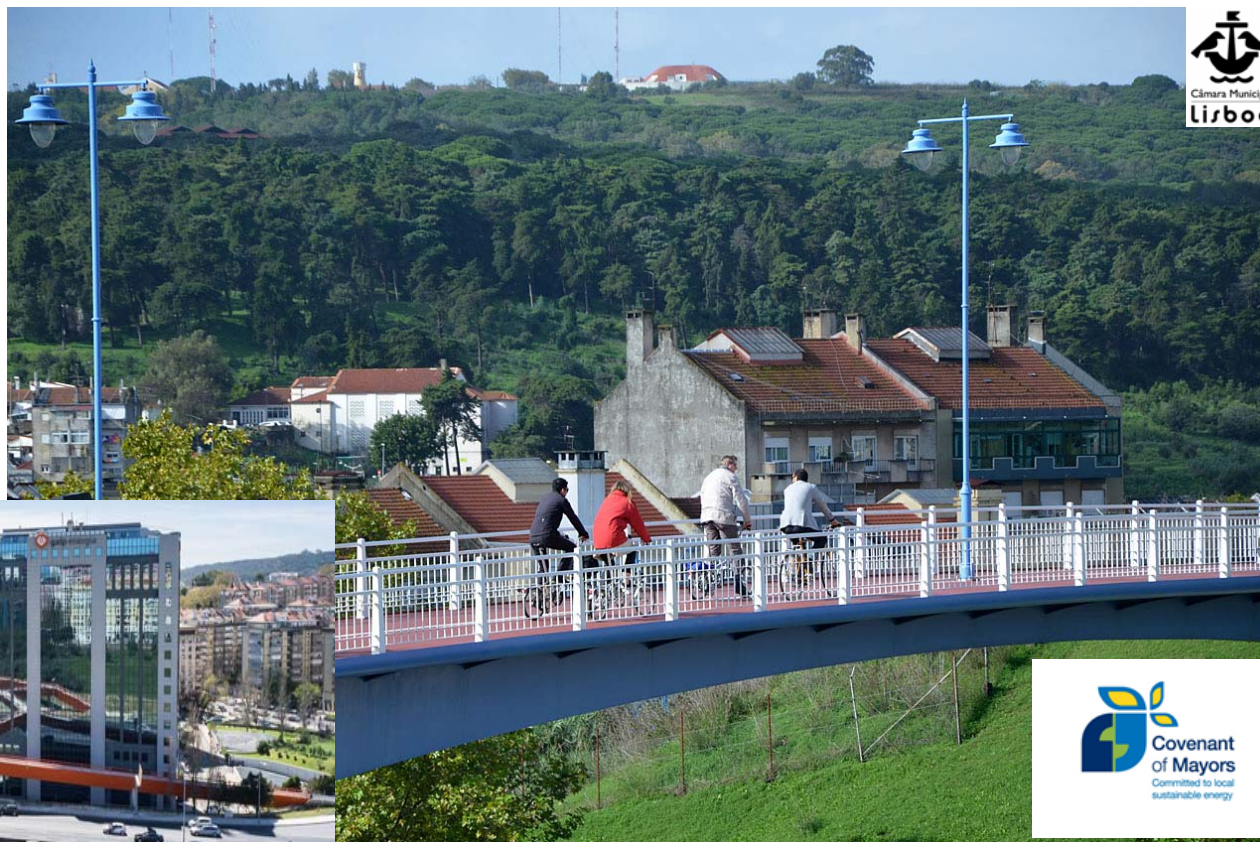
GREEN

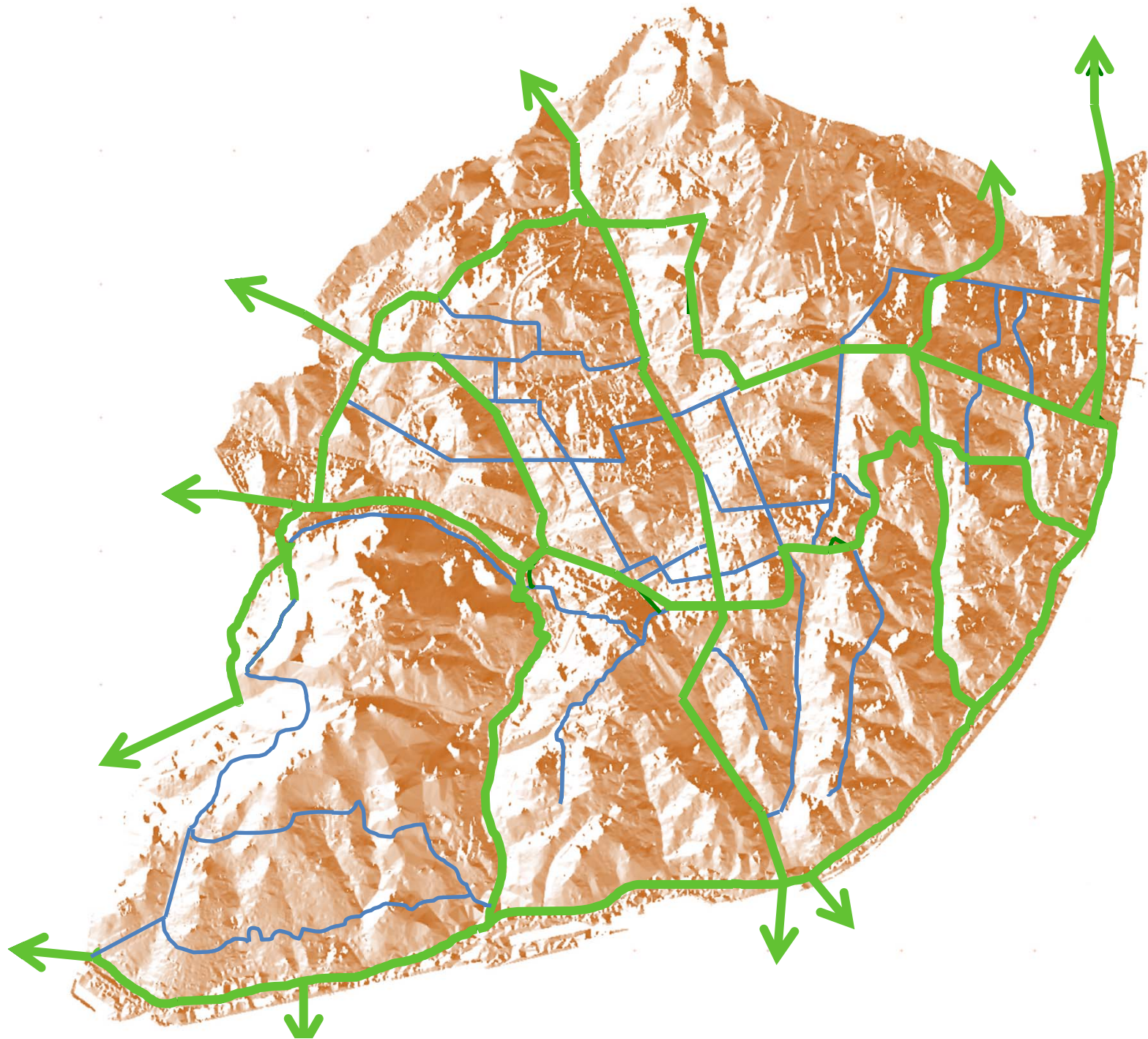
CYCLE

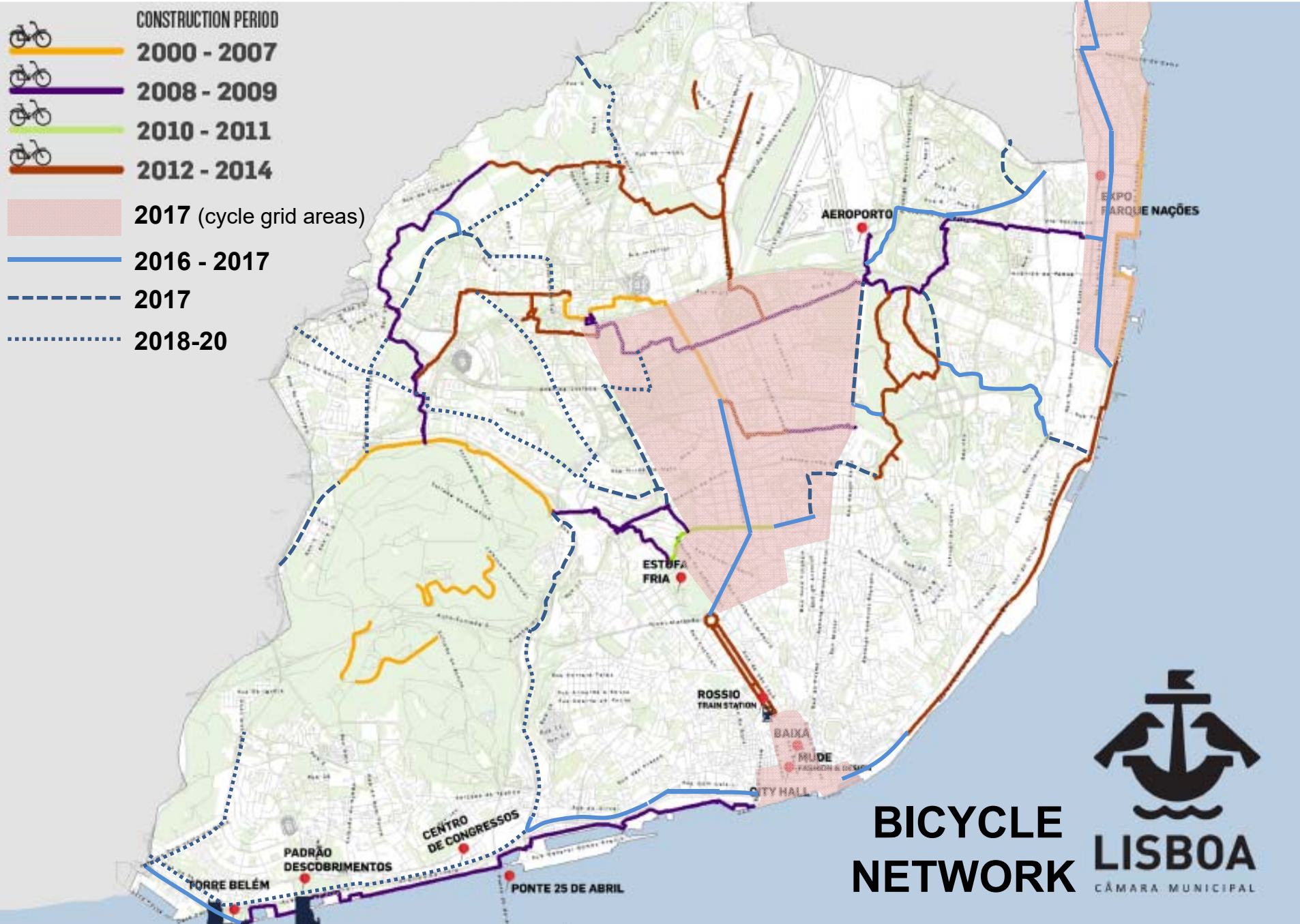
CYCLE €



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







SECOND BICYCLE NETWORK UNDERWAY (2017)





**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**

HOW TO
MAKE IT
USEFULL
(TO PEOPLE)?

HOW
TO
CREATE
MORE?



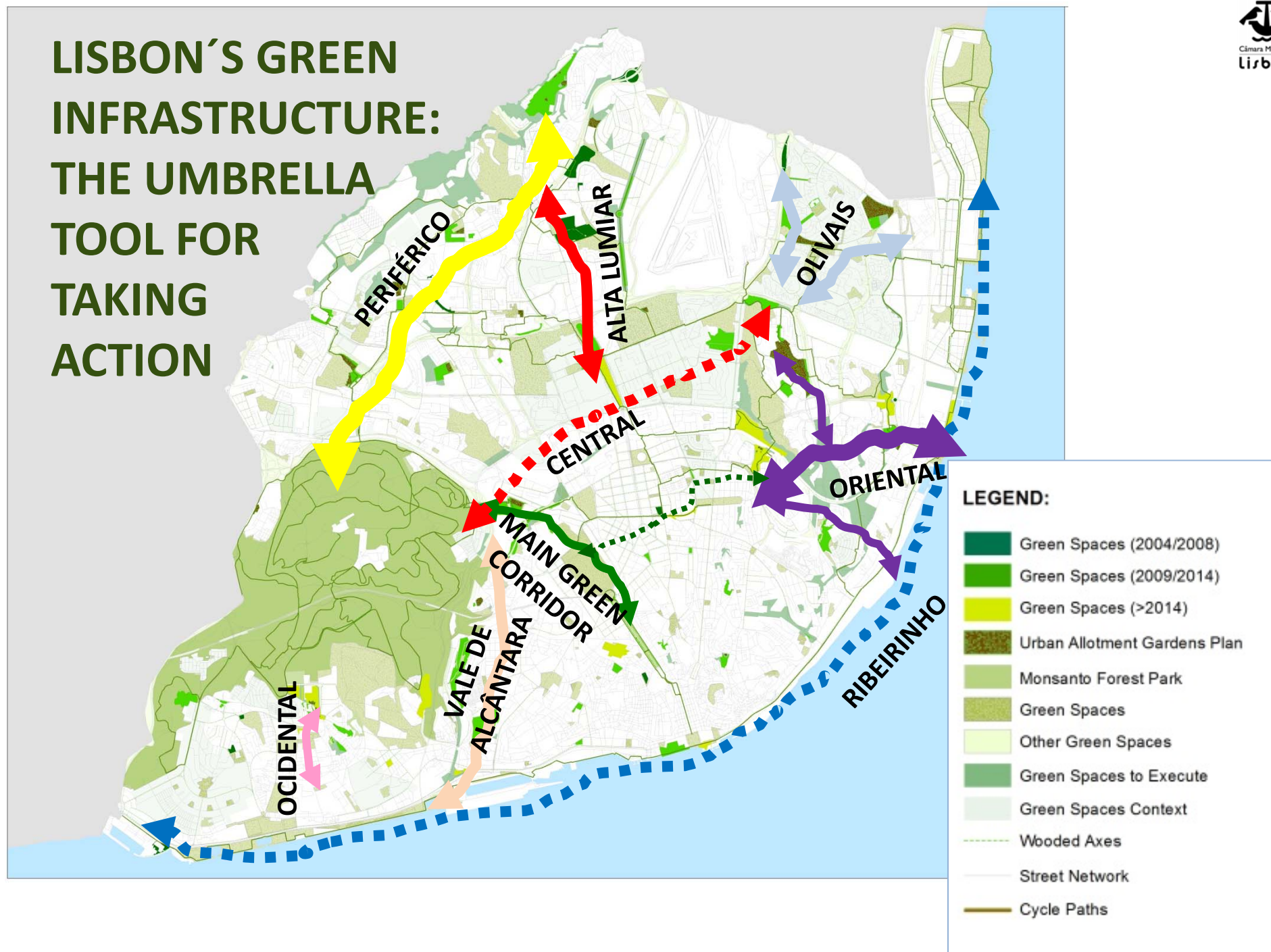
GREEN INFRASTRUCTURE

CHOOSING STRATEGIC

HOW TO
MAINTAIN IT
COSTLESS?

HOW TO
KEEP IT
RESILIENT?

LISBON'S GREEN INFRASTRUCTURE: THE UMBRELLA TOOL FOR TAKING ACTION



Dresden (Germany) Master Plan

Green Corridors link the outskirts of the city
with the city center



Costa, C. Et all (2008): Greenkeys@Your City. A Guide for Urban
Green Quality, Ed. Greenkeys Project Team

GREEN INFRASTRUCTURE



HOW TO CREATE (MORE)?

NEW GREEN INFRASTRUCTURE

GREEN AREAS IMPLEMENTATION COSTS

10,00 €/m²

75,00 € / m²

EXTENSIVITY

INTENSITY

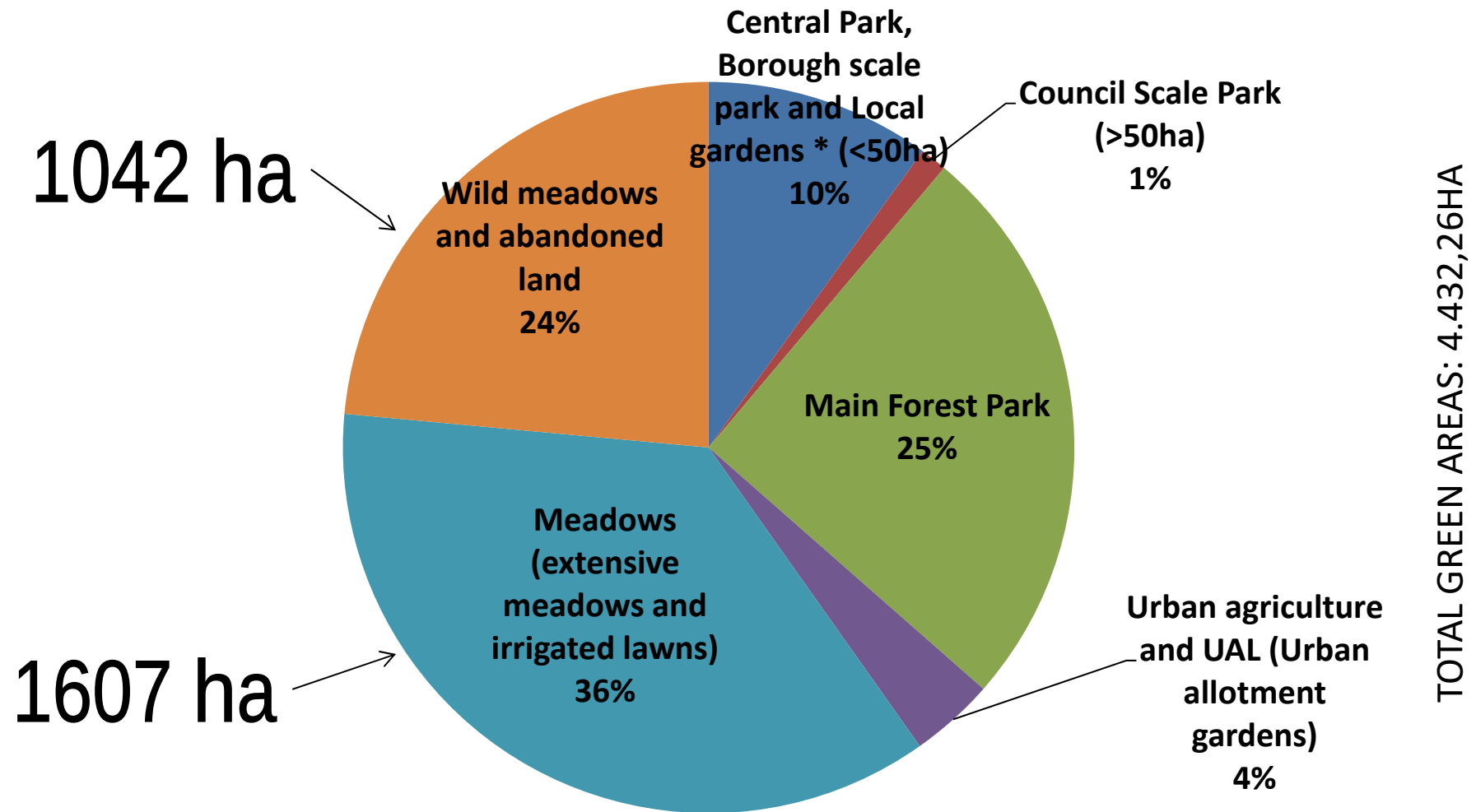


TRANSITION TO GREEN CORRIDORS

TRANSITION TO NBS

data from Lisbon Municipality

NEW GREEN INFRASTRUCTURE LISBON MUNICIPALITY



Source: Lisbon Municipality 2015

GREEN INFRASTRUCTURE MANAGEMENT

GREEN AREAS = MAINTENANCE COSTS

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

> INTENSIVE

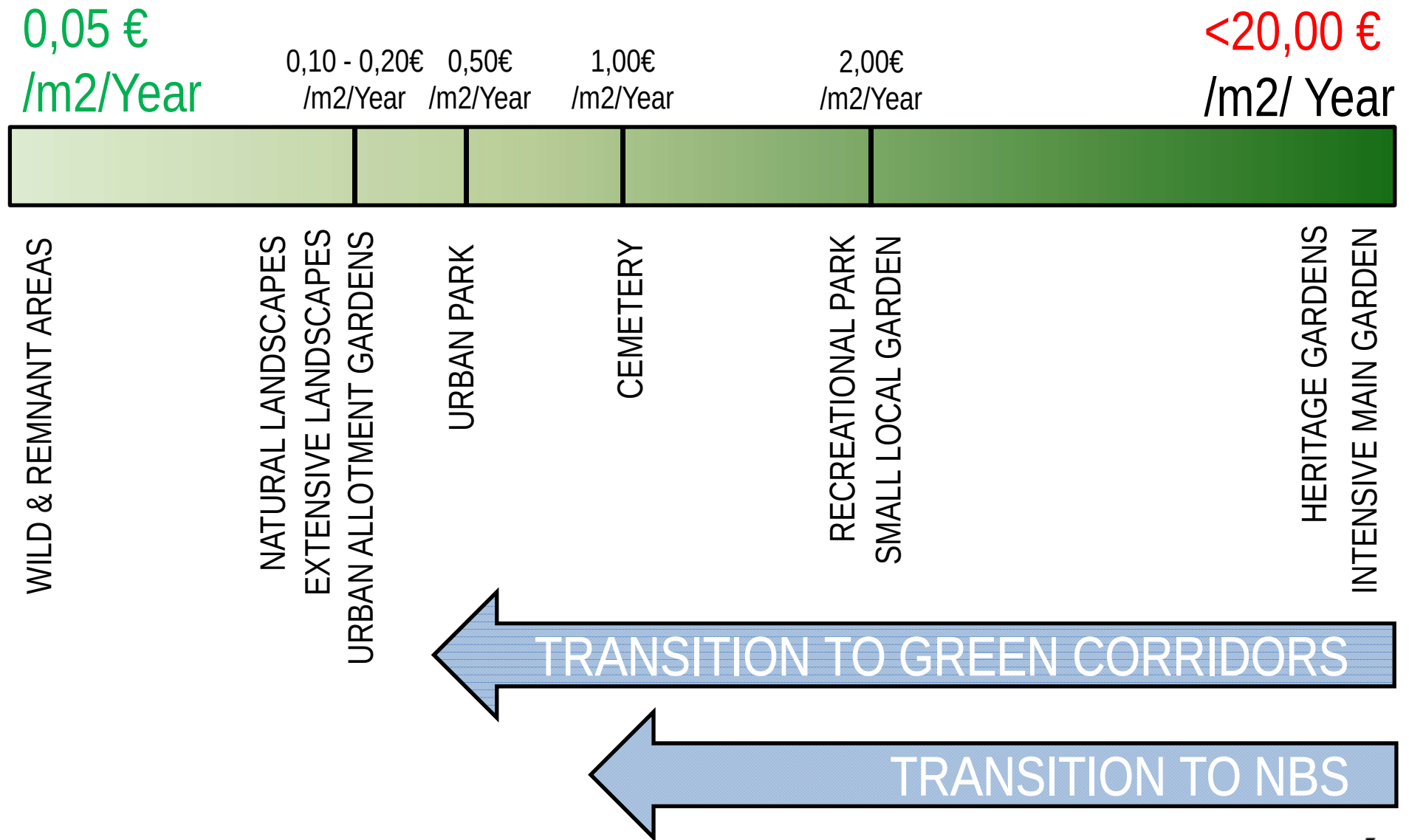
	€ / m ² / Year	
	Min	Max
MAIN GARDEN	1,47000	3,30000
MONUMENT LANDSCAPING	1,47000	3,30000
RECREATIONAL PARK	0,98004	2,19996
SMALL GARDEN	0,98004	2,19996
GARDEN SCHOOL	0,98004	2,19996
CEMETERY	0,48996	1,10004
HOUSING LANDSCAPING	0,48996	1,10004
URBAN PARK	0,36804	0,82500
HERITAGE AND CENTRAL GARDEN	9,80004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

< INTENSIVE

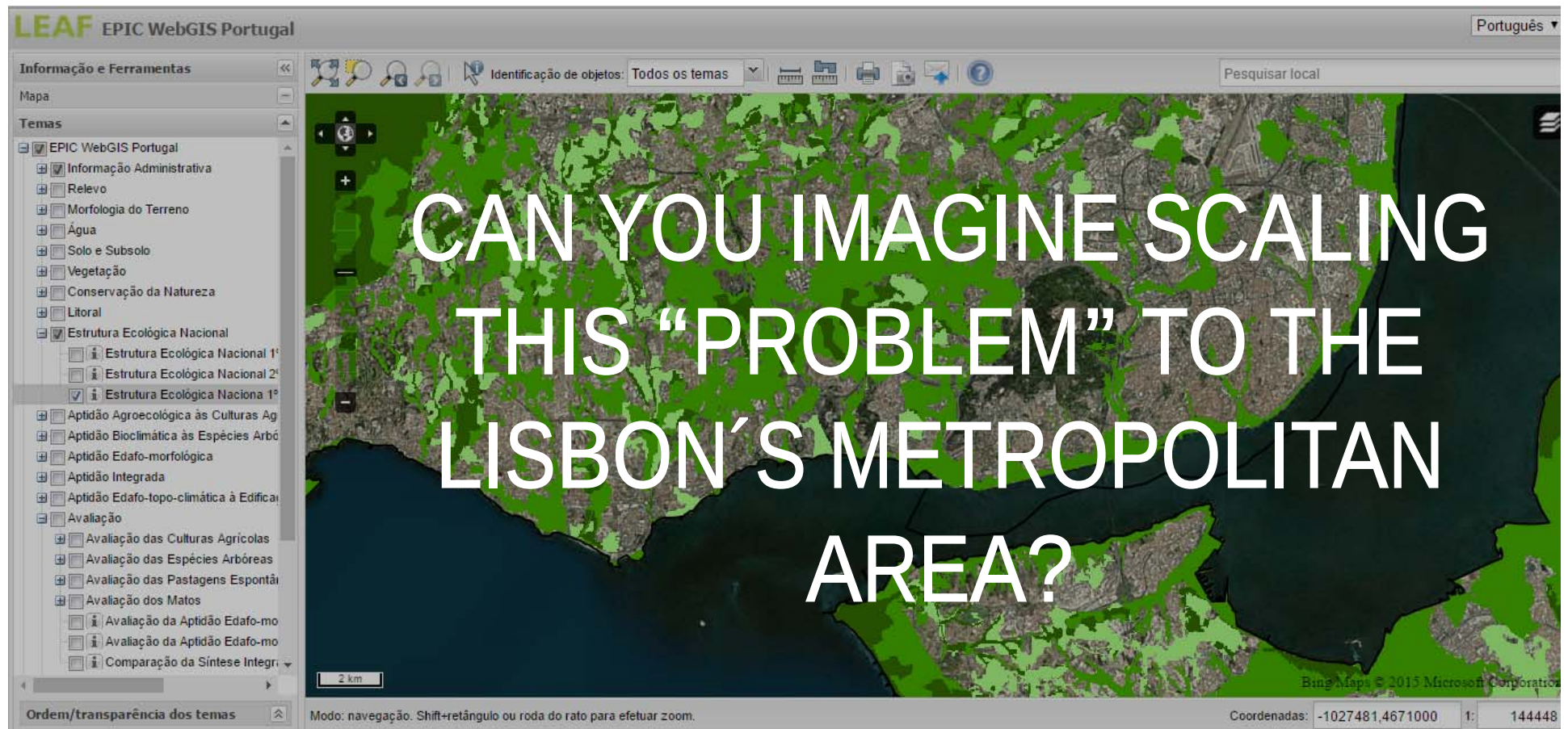
	€ / m ² / Year	
	Min	Max
MAIN AVENUE OR ROAD LANDSCAPING	0,36804	0,82500
EXTENSIVE LANDSCAPES AND URBAN ALLOTMENT GARDENS	0,09804	0,21996
NATURAL AND CONSERVATIVE AREAS	0,09804	0,21996
WILD AND REMNANT AREAS	0,02496	0,05496

data from Lisbon Municipality 2015

GREEN INFRASTRUCTURE MANAGEMENT



data from Lisbon Municipality 2015



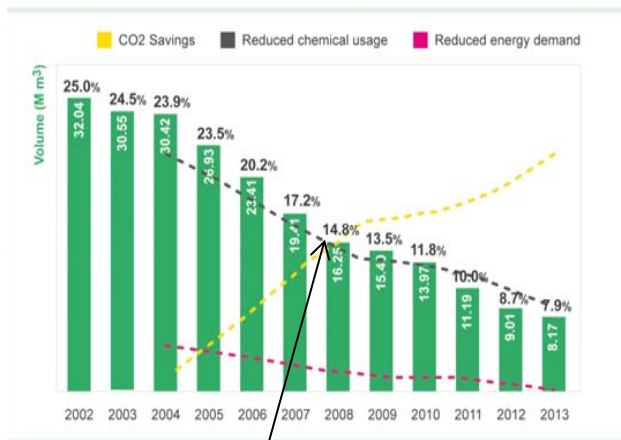
...AND TO THE
SOUTHERN EUROPEAN SCALE?

PROXIMITY GREEN SPACES = INTENSIVE

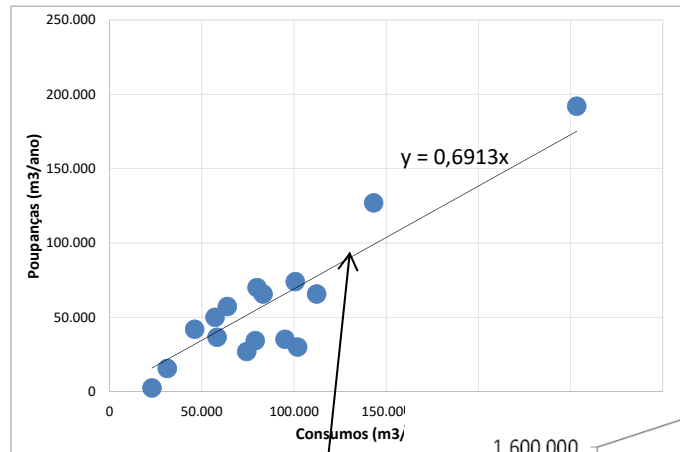


MAIN GREENWAYS = SHIFT TO EXTENSIVITY





**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)**

■ Consumption 2014 ■ Saving goals ■ Achieved savings ■ Consumption goals

RECYCLED WATER

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



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)

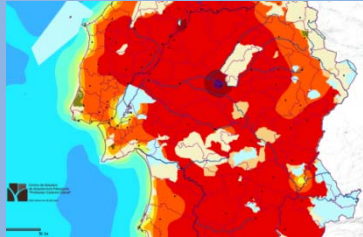
GREEN INFRASTRUCTURE

GREENWAYS IMPLEMENTATION (MULTI-TASK URBAN GREEN SPACES SYSTEM)

BICYCLE NETWORK

EXISTING GREEN AREAS REFURBISHMENTS

LISBON'S CLIMATE ACTION: SOLUTIONS TO SOUTHERN EUROPEAN CITIES



HOT DAYS
&
URBAN HEAT
ISLAND EFFECT



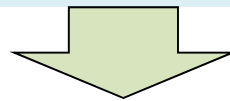
URBAN
FLOODS



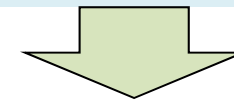
FREQUENT
DROUGHTS



+ GREEN
INFRASTRUCTURE
+ TREE PLANTING
+ AIR HUMIDITY



"ECO PLANNING"
FLOOD PREVENTION
"NBS" &
WATER LANDSCAPES



+WATER SAVING
+RECYCLED WATER
+ DRYLAND LANDSCAPES



**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

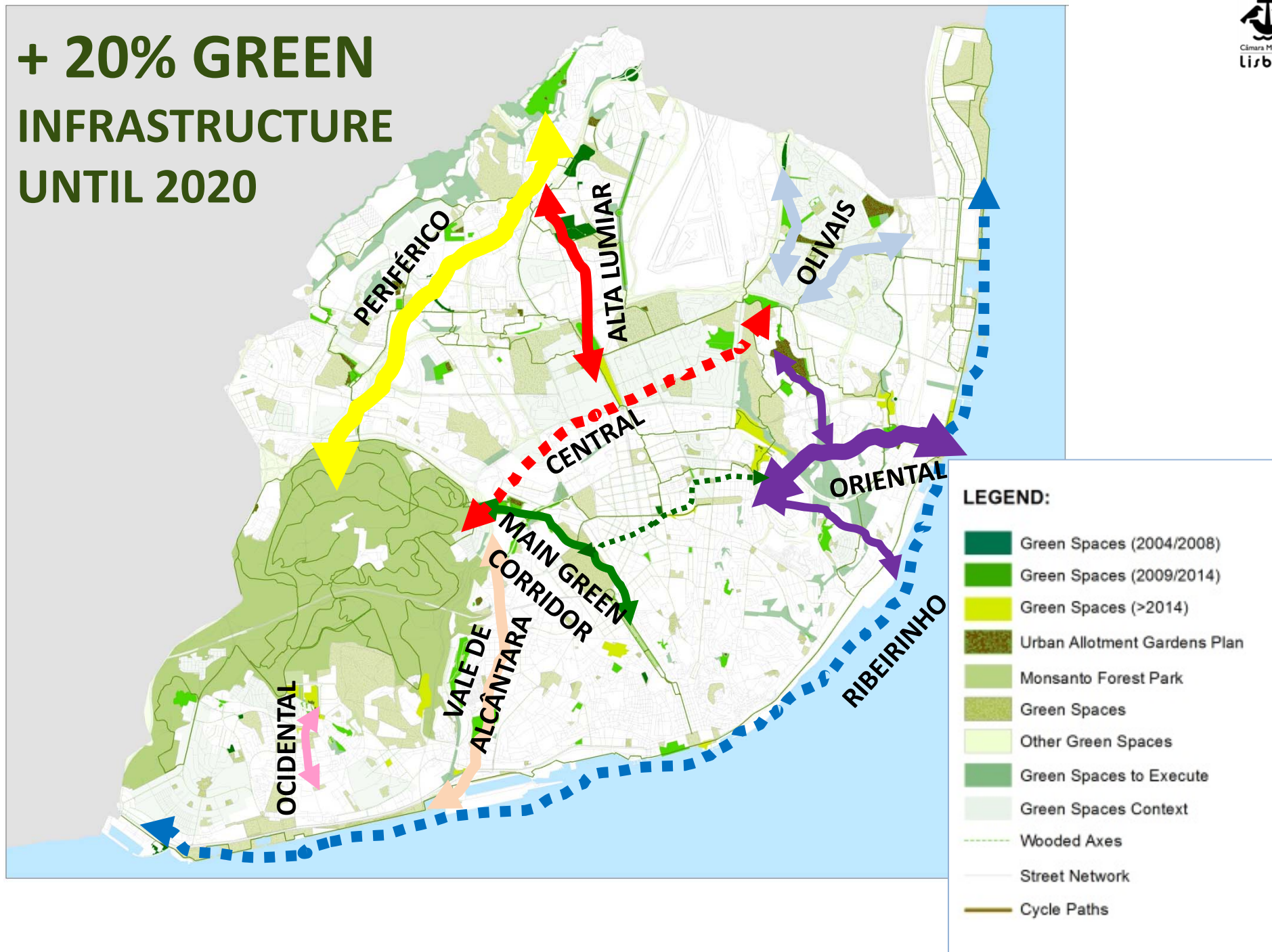
GREEN STRUCTURE
RE-NATURALIZATION

RUGLEMENTS TO GREEN
AREAS DESIGN

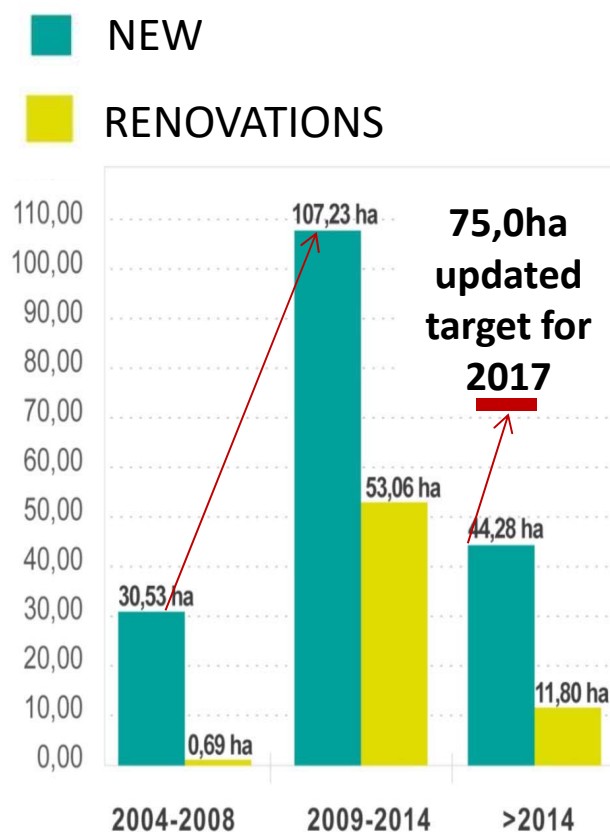
RUGLEMENTS TO GREEN
AREAS MANAGEMENT

BIODIVERSITY HAZARDS

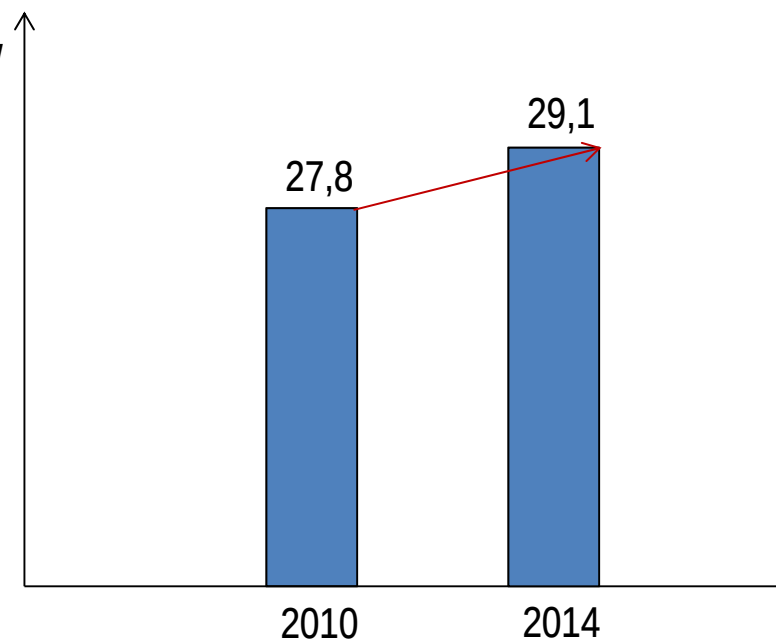
+ 20% GREEN INFRASTRUCTURE UNTIL 2020



ECOSYSTEM SERVICES & NATURE BASED SOLUTIONS (NBS)



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



GREEN AREAS EVOLUTION (2004-2014)

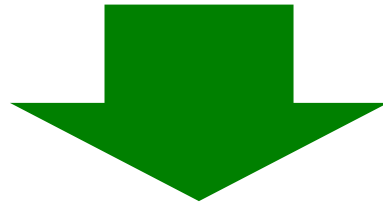
FROM 1.000 HA FOREST PARK TO “EDUARDO VII” CENTRAL PARK



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

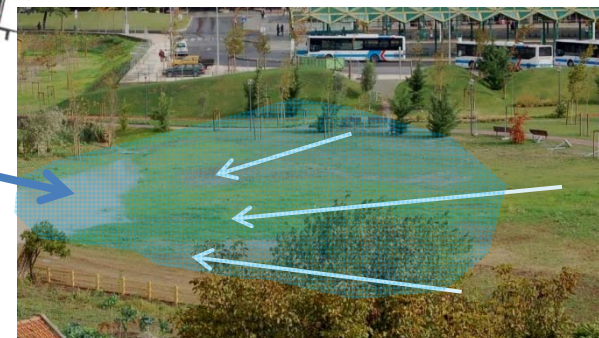
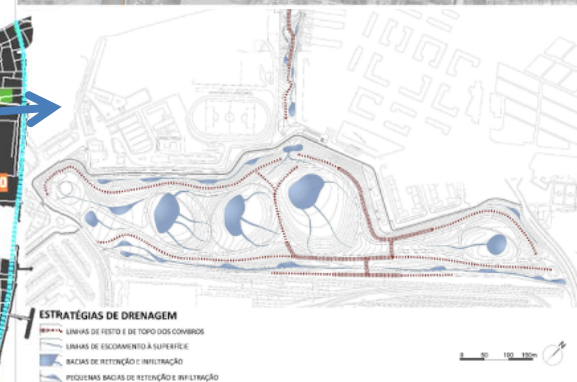


GREEN INFRASTRUCTURE



HOW TO CREATE IT
(MORE) USEFULL?

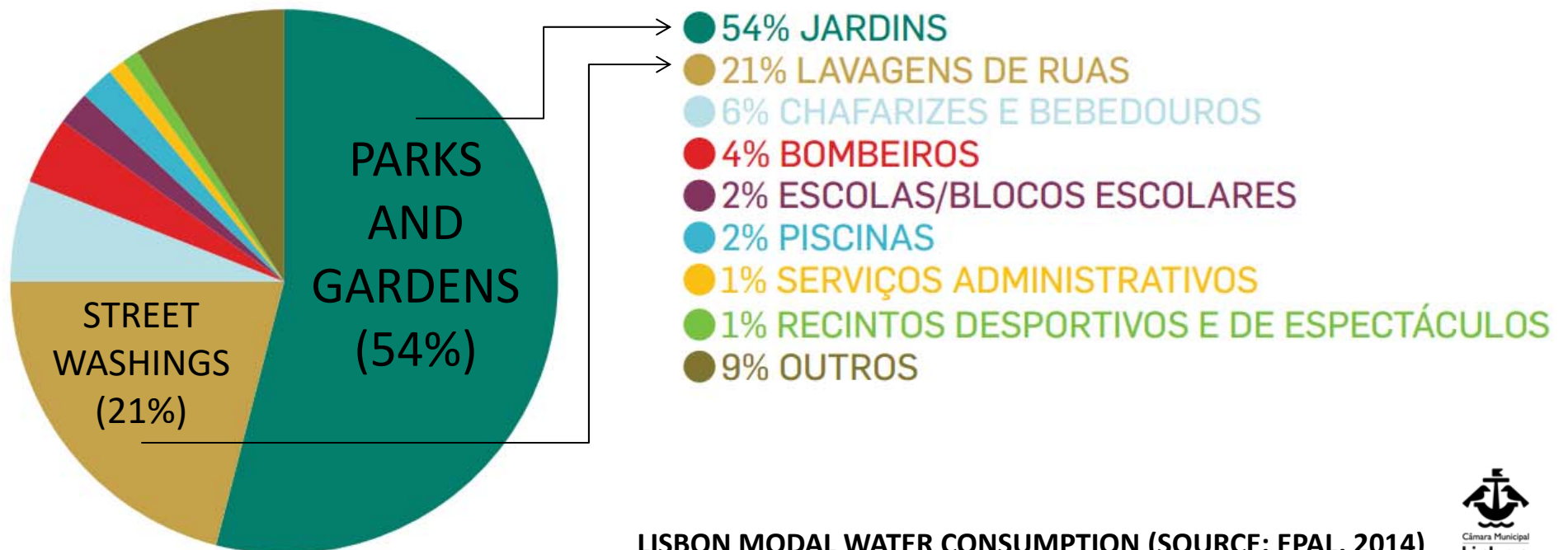
CLIMATE ADAPTATION TO URBAN FLOODS





RAINWATER
MANAGEMENT
“NBS”
SOLUTIONS

CLIMATE ADAPTATION TO WATER SCARCITY



LISBON MODAL WATER CONSUMPTION (SOURCE: EPAL, 2014)

+RESILIENCE / SAVING WATER



SAVING ENERGY IN
MAINTENANCE



FERTILIZERS



CO2 SINK



NO2 SINK



URBAN BIODIVERSITY

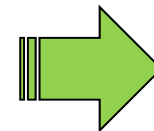
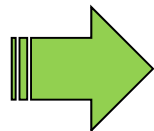


CLOSING THE CYCLE

ADAPTATION + BIODIVERSITY + ECONOMY

URBAN GRAZING IN PARKS MANAGEMENT:

WHY NOT?





URBAN ALLOTMENT GARDENS

● OPENED (14)

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

● OPENING SOON (05)

VALE DA AMEIXOEIRA
NUCLEO DE CARNIDE / CARMELITAS
BELAVISTA NORTE
MURTAS / LNEC
PARQUE PERIFÉRICO / Bº PADRE CRUZ
VALE FUNDÃO

● IN STUDY / PROJECT (01)

CASAL VISTOSO

URBAN ALLOTMENT GARDEN MODEL SCHEME

PUBLIC
PATH

COLLECTIVE
WAREHOUSE

GATE

A REGULAR 4
PLOTS
WITH FENCE

1

2

3

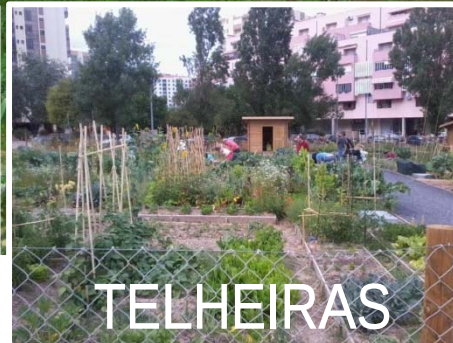
4



GRAÇA



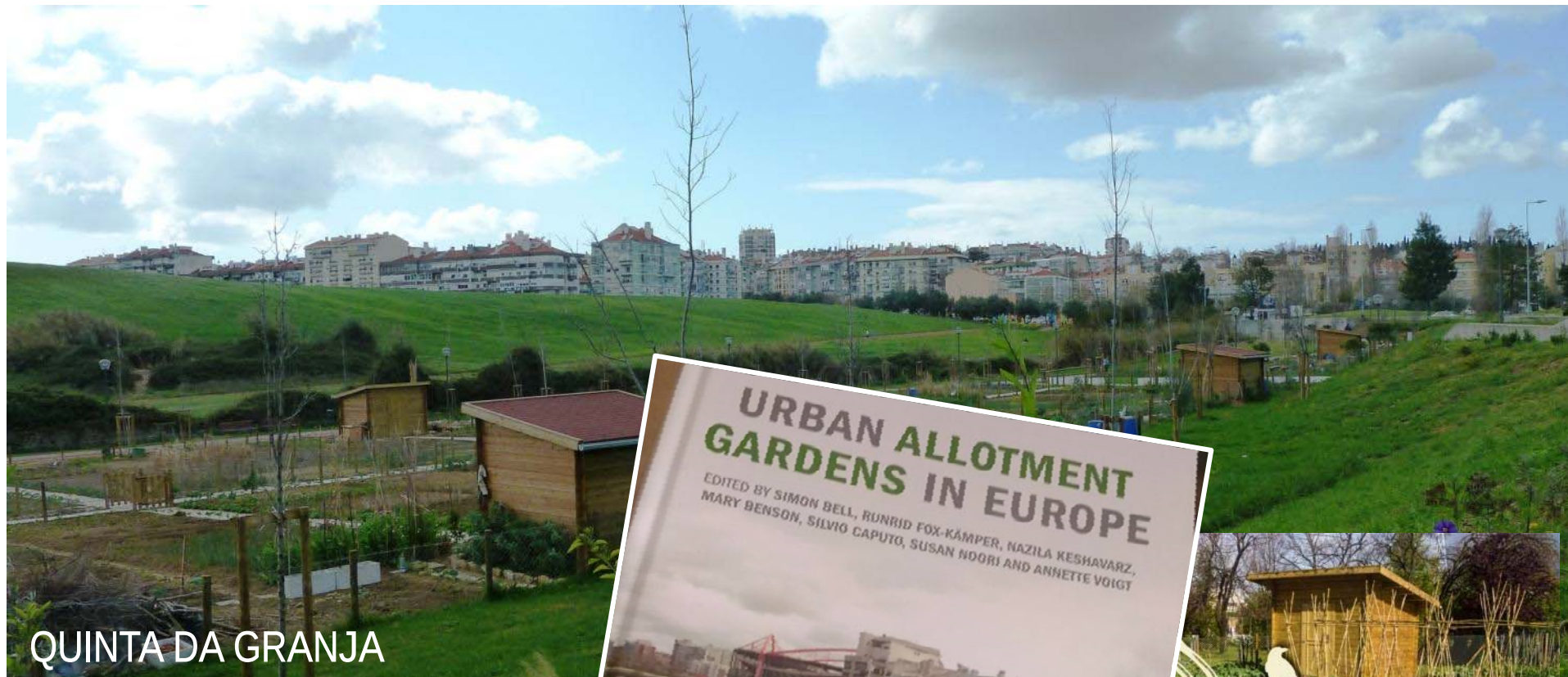
CAMPOLIDE



TELHEIRAS



N.S. PAZ



QUINTA DA GRANJA



HORTAS URBANAS

CANDIDATURAS A 28 DE JUNHO

OS INTERESSADOS PODERÃO CONSULTAR AS REGRAS DE ACESSO E UTILIZAÇÃO DO PARQUE HORTÍCOLA EM WWW.CM-LISBOA.PT OU NOS SERVIÇOS BALÇÃO ÚNICO DA CML:

- Balcão Único Municipal Centro**
Edifício Central do Município
Campo Grande, 25
- Balcão Único Municipal Centro Histórico**
Rua Nova do Almada, 2 - 3º
- Balcão Único Municipal Oriental**
(Loja do Codazzo de Marvila)
Avenida do Santo Condestável, 11 B - Loja 34
- Balcão Único Municipal Oriental**
(Parque das Nações)
Rua Professor Picard | Antigo Edifício do IMTT
- Balcão Único Municipal Ocidental**
Rua da Cozinha Económica, 36 A, loja E
- Balcão Único Municipal Norte**
Rua Manuel Marques, 6 H
Edifício Odebre

AS CANDIDATURAS PODERÃO SER APRESENTADAS NOS SERVIÇOS BALÇÃO ÚNICO DA CML, ATÉ ÀS 17H DO DIA 28 DE JUNHO DE 2013, ATÍVEIS DA ENTREGA DA SEGUINTE DOCUMENTAÇÃO:

- FOTOCOPIAS DE BILHETE DE IDENTIDADE E CARTÃO DE CONTRIBUINTE OU CARTÃO DE CIDADÃO.
- FOTOCOPIA DE DOCUMENTO COMPROVATIVO DE RESIDÊNCIA.

TIPOLOGIAS SOCIAIS
PARQUE HORTÍCOLA DA PRAIA DE CHELAS
 ALÔJES COM 150 m²

ÁREAS DE RECREIO
PARQUE HORTÍCOLA DOS OLIVAIS
 ALÔJES ENTRE OS 80 E OS 140 m²

cost
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

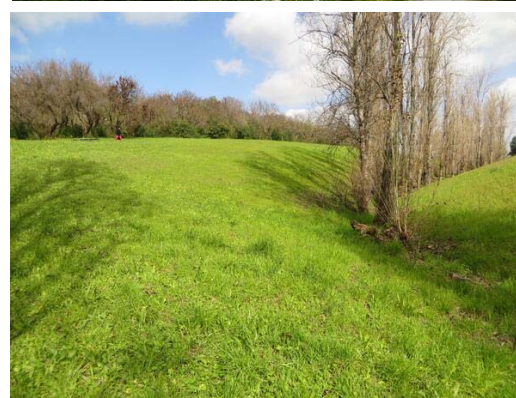
editions from Rou

LISBOA

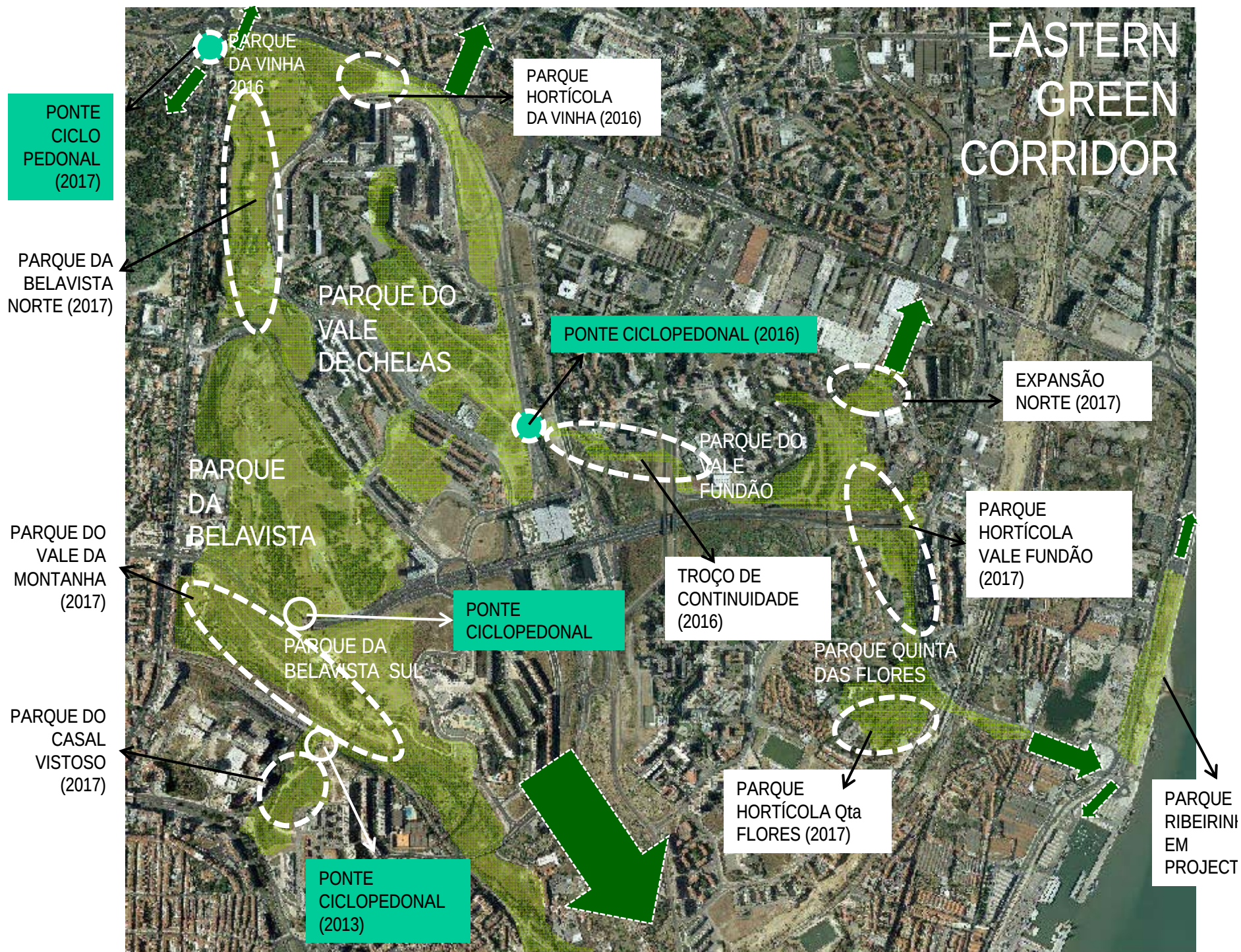
NORTH PERIPHERAL GREEN CORRIDOR

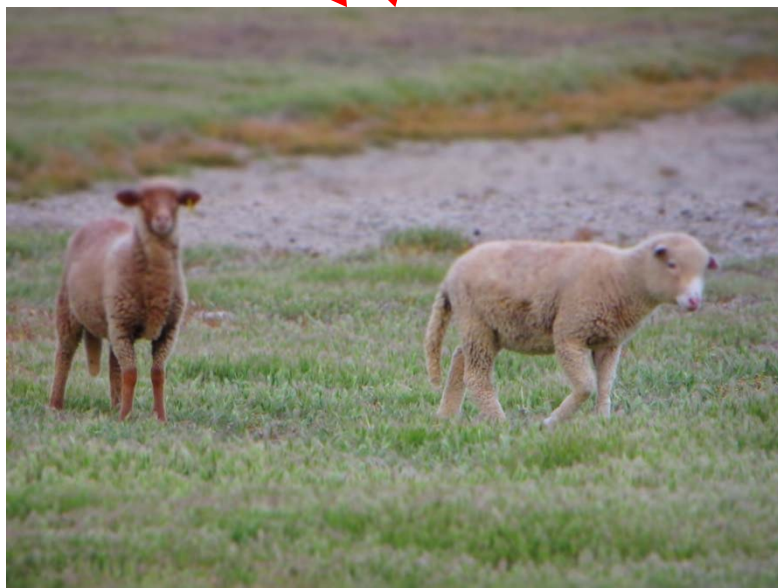
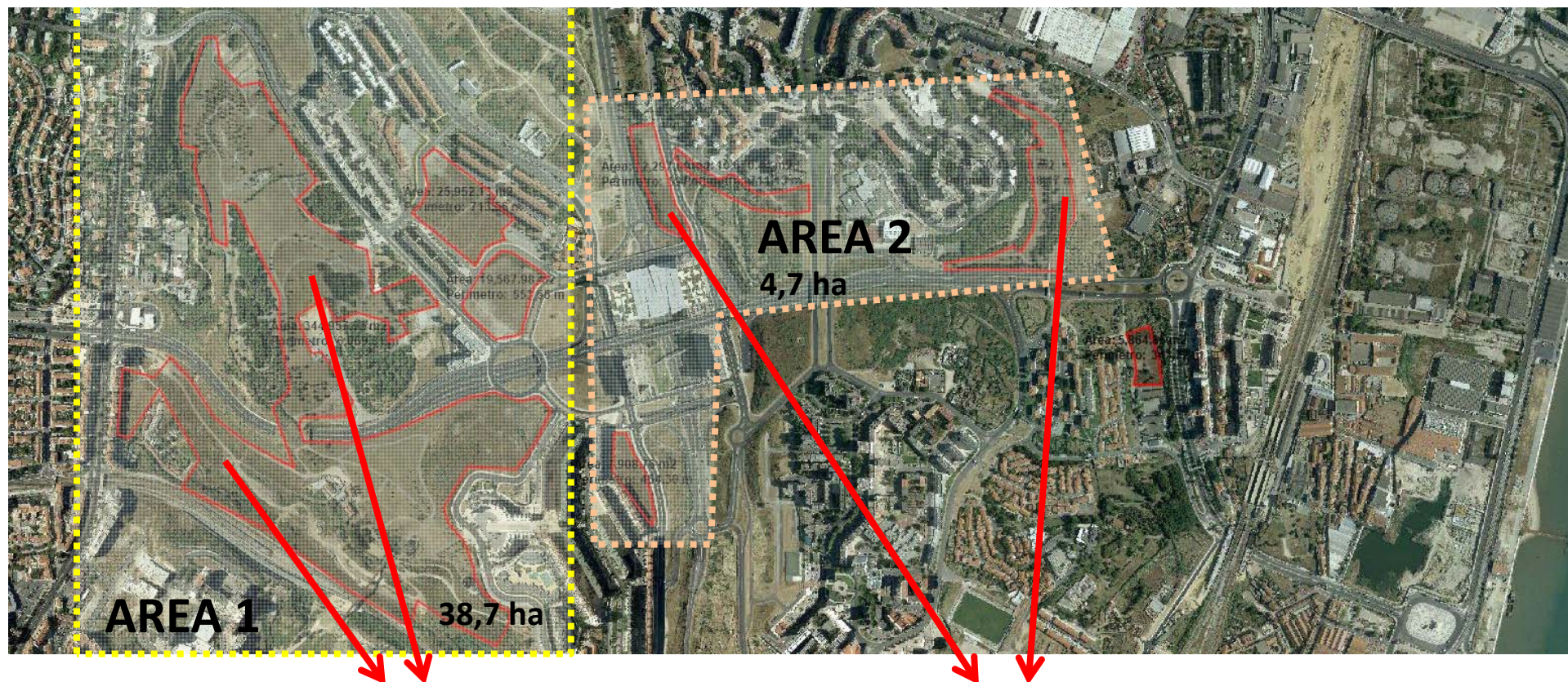


EASTERN GREEN CORRIDOR



EASTERN GREEN CORRIDOR





ALCÂNTARA VALLEY GREEN CORRIDOR



**Desafios à gestão da infraestrutura verde
urbana no sul da Europa: o caso de Lisboa**

**Southern Europe Challenges in green
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