

# Guidelines on NbS for Adaptation to Climate Change in Different Coastal Typologies of the Mediterranean

---

Igor Belamaric, PAP/RAC

---



Mediterranean  
Action Plan  
Barcelona  
Convention



## CONTRIBUTORS:

**Coastal Typology** – Gonzalo Malvarez

**Wetlands** – Alessio Satta

**Dunes** – Javier Loidi

**Forests and Woodlands** – Ali Kavgaci

**Coastal Aquifers** – Jose Luis Bordes

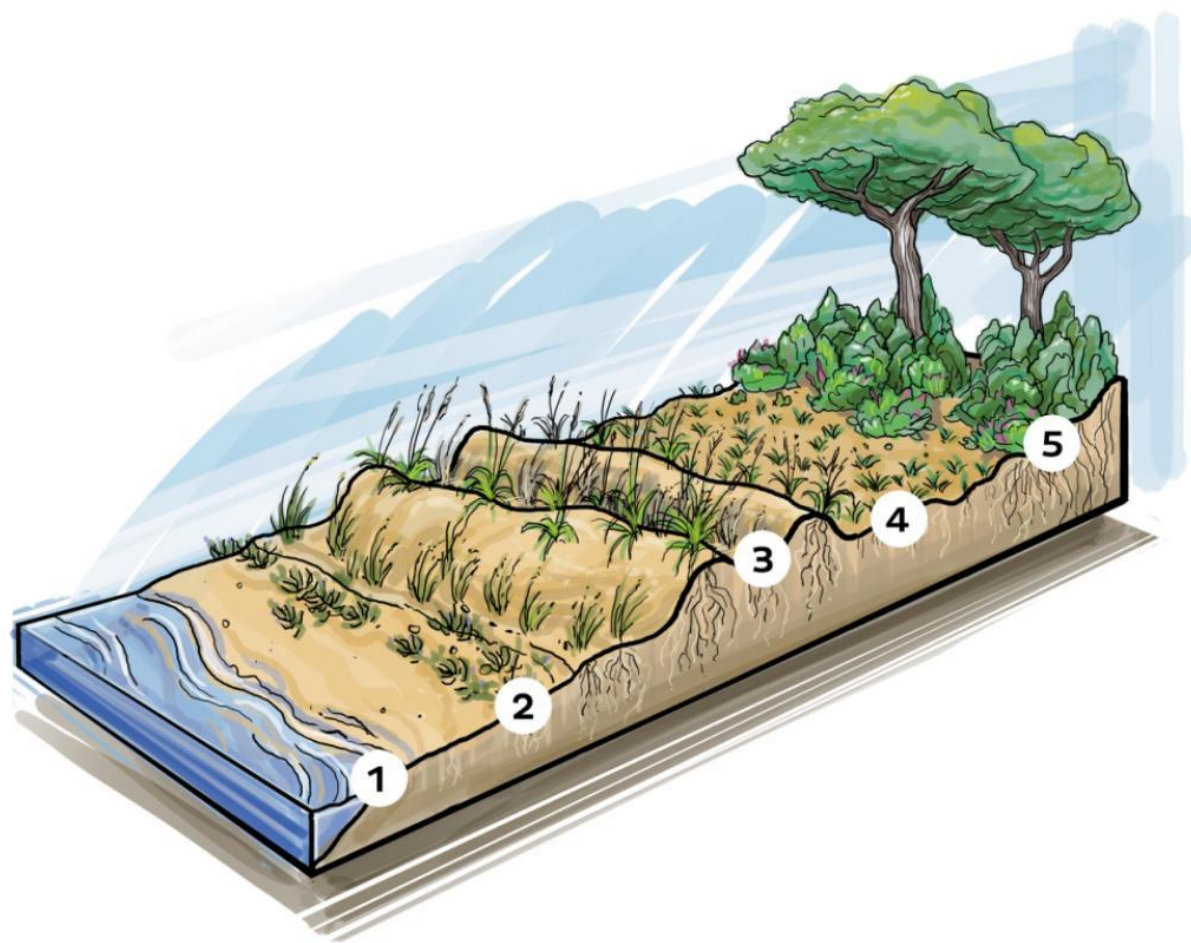
**Urban heat islands, marine heat waves** – Ivan Sekovski

**Invasive species** – Alicia Acosta

**Wildfires** – Erwin Bergmeier

**Old trees protection** – Fran Postenjak

**Illustrations** – Luka Duplancic



## CHALLENGES:

LOSS OF BIODIVERSITY

LAND-USE CHANGE

COMPOUND FLOODING

SEA-LEVEL RISE

COASTAL EROSION

INVASIVE ALIEN SPECIES

URBAN HEAT ISLANDS

MARINE HEAT WAVES

WILDFIRES



## CONTENTS:

### SUMMARY / KEYWORDS

#### 1 NBS FOR THE MEDITERRANEAN COASTS

##### 1.1 THE COASTAL ZONE OF THE MEDITERRANEAN SEA

##### 1.2 INTRODUCING NBS

##### 1.3 CLIMATE CHANGE

##### 1.4 SEA-LEVEL RISE

##### 1.5 SUSTAINABLE DEVELOPMENT GOALS AND NBS

#### 2 COASTAL TYPOLOGY

##### 2.1 ENTIRELY ARTIFICIAL COASTS

##### 2.2 MODERATELY ARTIFICIAL COASTS

##### 2.3 LOW DENSITY URBANISED COASTS

##### 2.4 TRANSITIONAL COASTS

#### 3 SPECIFIC COASTAL ECOSYSTEMS

##### 3.1 COASTAL MARINE HABITATS

##### 3.2 WETLANDS AND ESTUARIES

###### 3.2.1 SALT MARSHES

###### 3.2.2 COASTAL FRESHWATER PONDS

##### 3.3 COASTAL FORESTS AND WOODLANDS

##### 3.4 COASTAL DUNES

##### 3.5 COASTAL CLIFFS

##### 3.6 COASTAL AQUIFERS

#### 4. WIDE-SCALE NBS

##### 4.1 PROTECTION AND RESTAURATION OF SPECIFIC COASTAL ECOSYSTEMS

##### 4.2 LOSS OF BIODIVERSITY

##### 4.3 WILDFIRES

##### 4.4 COASTAL EROSION

##### 4.5 LAND-USE CHANGE

##### 4.6 COASTAL PLANS

##### 4.7 AGRICULTURE

#### 5. LOCAL-SCALE NBS

##### 5.1 COMPOUND FLOODING

##### 5.2 INVASIVE ALIEN SPECIES

##### 5.3 REWILDING

##### 5.4 NBS INFRASTRUCTURE FOR CITIES

##### 5.5 INTENTIONALLY UNMANAGED AREAS

##### 5.6 OLD TREES PROTECTION

##### 5.7 GREEN, BROWN AND BIODIVERSE ROOFS

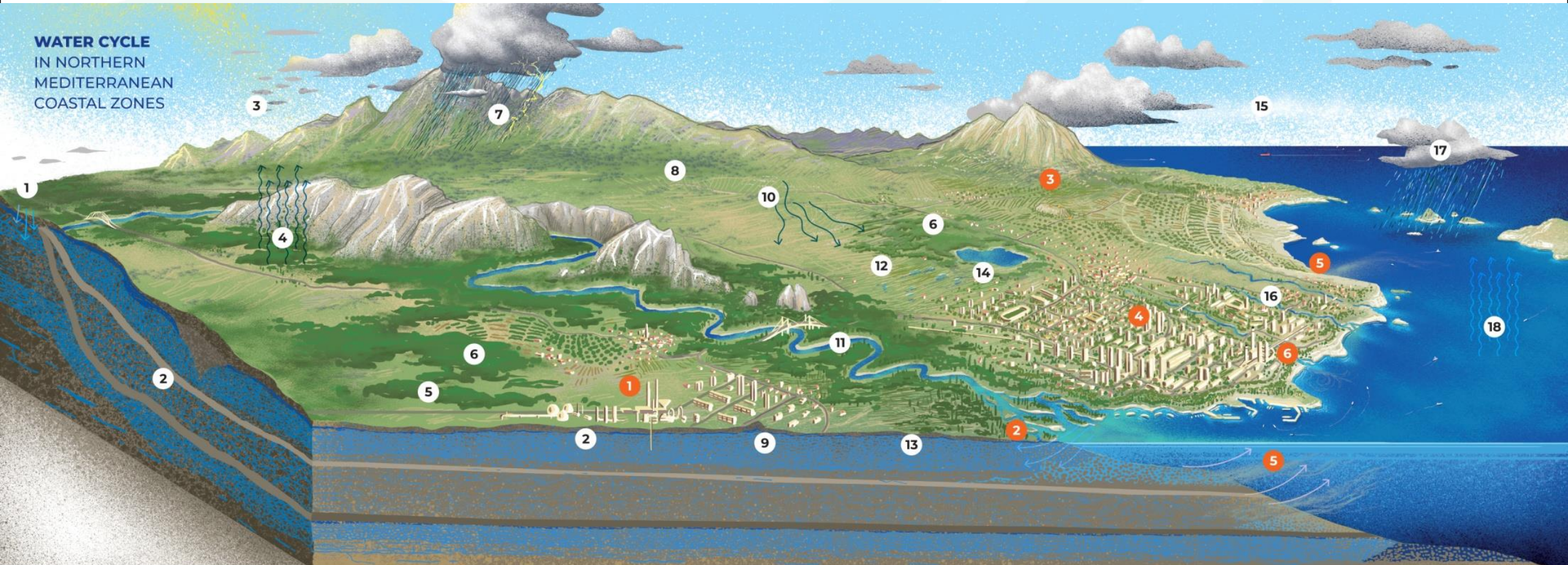
##### 5.8 CITIZEN SCIENCE and NbS

#### MAP OF CHOSEN EXAMPLES

#### 6. KEY REFERENCES

#### ACRONYMS

# WATER CYCLE IN NORTHERN MEDITERRANEAN COASTAL ZONES



- 1 Groundwater recharge
- 2 Groundwater
- 3 Atmospheric moisture over land

- 4 Evapotranspiration
- 5 Support for vegetation and ecological balance
- 6 Vegetation cover as a filter

- 7 Precipitation over land
- 8 Soil moisture
- 9 Adaptation to climate change: Natural storage for freshwater, Storing excess rainfall

- 10 Runoff
- 11 River
- 12 Grazing water use

- 13 Support for unique and diverse ecosystems including wetlands, estuaries, lagoons
- 14 Drinking water
- 15 Atmospheric moisture over sea

- 16 Streamflows
- 17 Precipitation over sea
- 18 Sea evaporation

- PRESSURES ON GROUNDWATER AGGRAVATED BY ANTHROPOGENIC ACTIVITIES**
- 1 OVEREXTRACTION
  - 2 SALTWATER INTRUSION
  - 3 LANDFILLS
  - 4 URBAN IMPACTS
  - 5 SUBMARINE GROUNDWATER DISCHARGES
  - 6 INDUSTRIAL DISCHARGE

COASTAL TYPOLOGY:



## NATURE-BASED SOLUTIONS:

**Actions aimed at protecting, sustainably managing, and restoring ecosystems in ways that effectively address societal challenges and deliver both human well-being and biodiversity benefits.**

COASTAL TYPE / ELEMENT










NATURE-BASED SOLUTION

TARGETED CHALLENGE

-  DUNE
-  AQUIFER
-  ENTIRELY ARTIFICIAL
-  MODERATELY ARTIFICIAL
-  WETLAND
-  FOREST - WOODLAND
-  TRANSITIONAL
-  LOW DENSITY URBANISED
-  CLIFF
-  MARINE

-  **1 RECOGNITION - AREA PROTECTION**
-  **2 ECOSYSTEM RESTAURATION**
-  **3 ESTABLISHMENT OF A NEW ECOSYSTEM**
-  **4 ANCIENT TREE PROTECTION**
-  **5 INTENTIONALLY UNMANAGED AREAS**
-  **6 SOLUTIONS FOR RAINWATER**
-  **7 PLANTATION OF AUTOCHTONOUS VEGETATION**
-  **8 INNOVATIVE SOLUTIONS IN AGRICULTURE**
-  **9 MONITORING (SOCIETAL)**
-  **10 ADVOCATING - EDUCATING (SOCIETAL)**
-  **11 LAND-USE CHANGE CONTROL (SOCIETAL)**

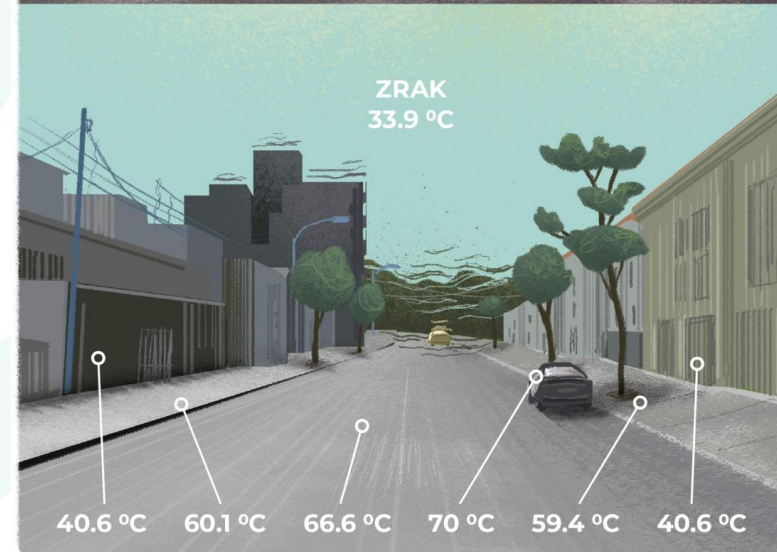
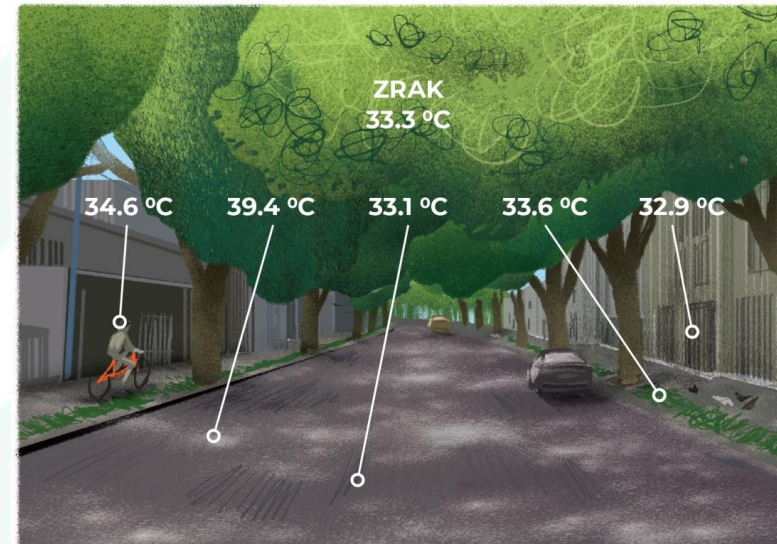
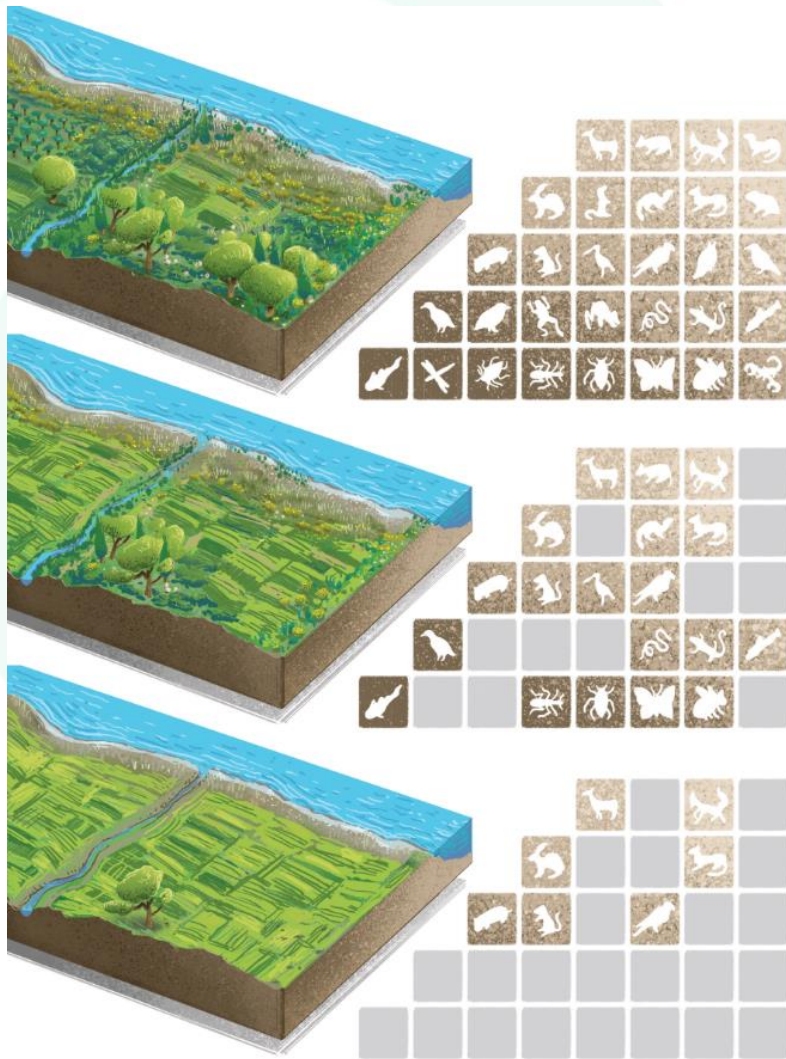


- biodiversity loss 
- torrential flooding 
- brownfields 
- erosion 
- sea-level rise 
- protection of specific ecosystems 
- pollinator crisis 
- healthy food 
- heat islands 

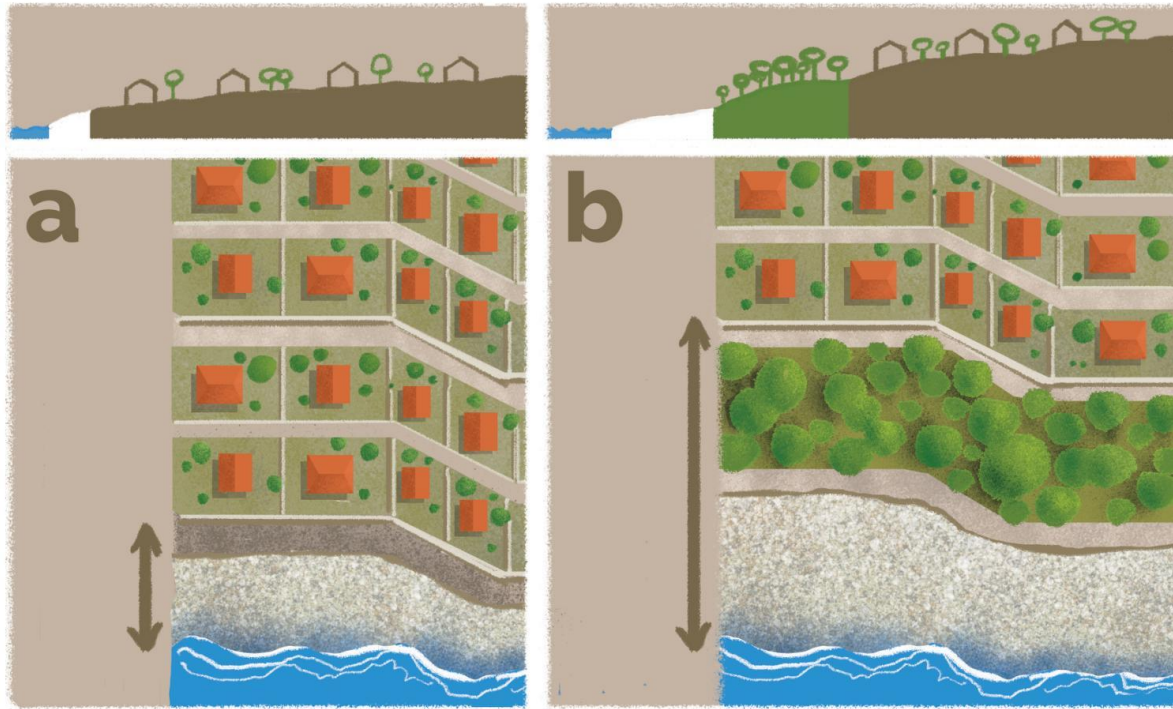




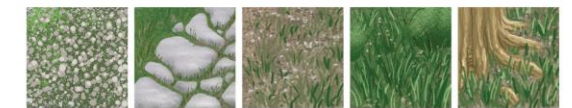
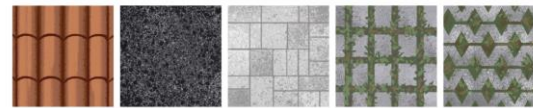
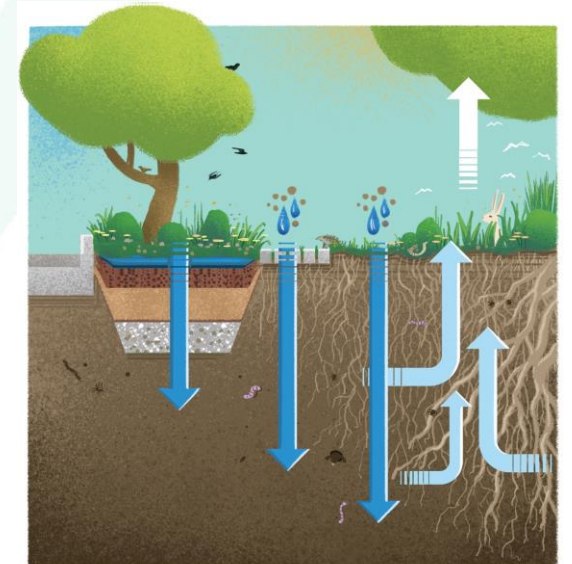
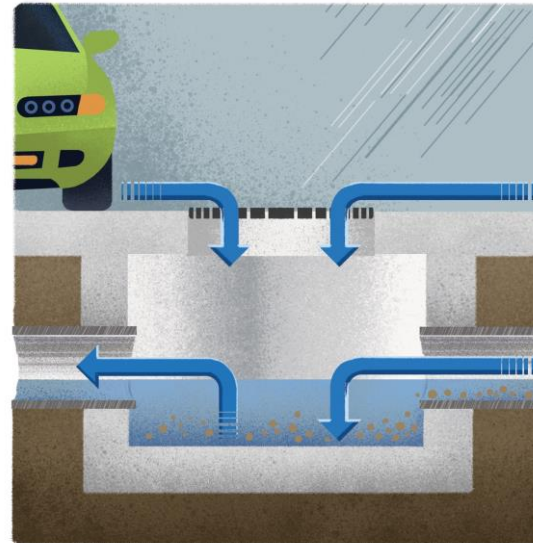
# BIODIVERSITY LOSS / LOSS OF STRUCTURES



# HEAT ISLANDS



COASTAL SETBACK



RAIN GARDENS / DEPAVEMENT



# Observations



Species

Location

Go

Filters <sup>2</sup>

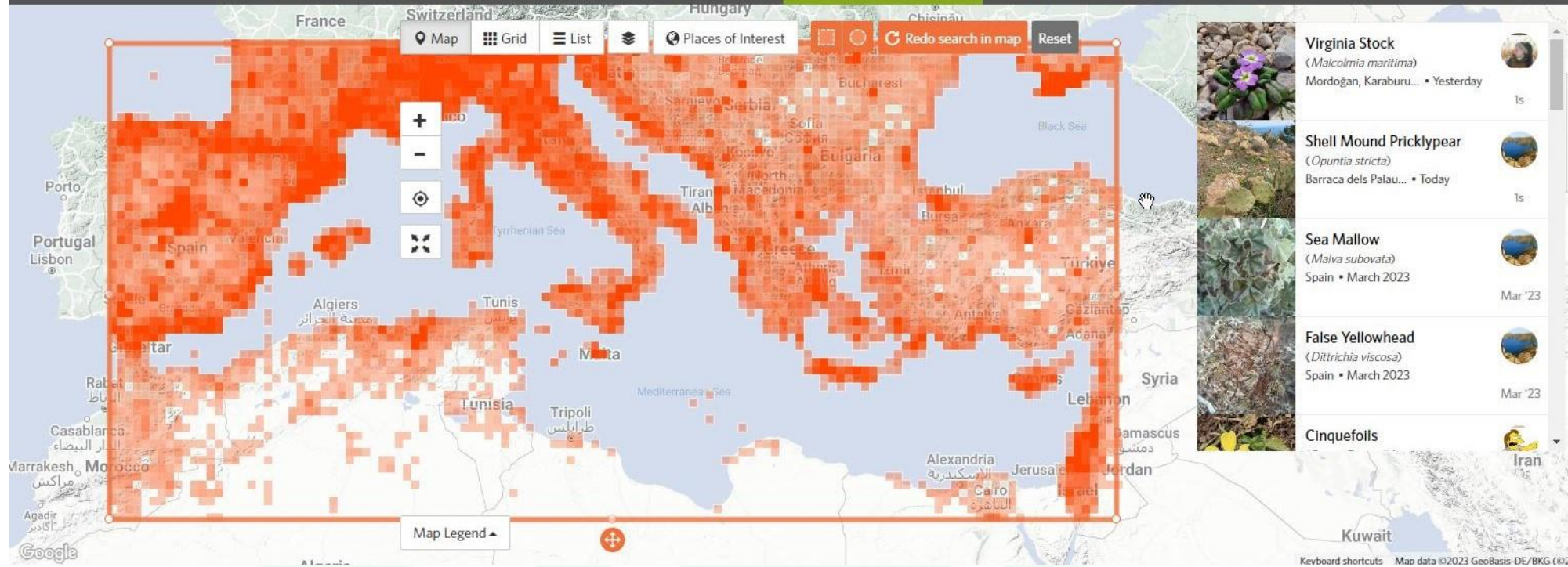
Custom Boundary

2,617,164  
OBSERVATIONS

19,617  
SPECIES

16,939  
IDENTIFIERS

114,167  
OBSERVERS



CITIZEN SCIENCE

## SDGs:



Coastal NbS help combat climate change by sequestering carbon, protecting communities from sea-level rise and storms, and reducing greenhouse gas emissions.



Coastal NbS contribute to the conservation and sustainable use of marine and coastal ecosystems, supporting biodiversity, fisheries, and tourism.



These solutions support terrestrial ecosystems, combat land degradation, halt biodiversity loss, and restore habitats on land.



Coastal NbS improve water quality, reduce runoff pollution, and enhance access to clean water for both human and ecological needs.



NbS in urban coastal areas enhance resilience to climate change, promote green infrastructure, and create sustainable and livable cities along the Mediterranean coast.



Coastal NbS provide employment opportunities and support local livelihoods, especially in sectors like sustainable fisheries, eco-tourism, and restoration projects.



Sustainable coastal fisheries, backed by NbS, can reduce hunger and enhance food security in coastal communities.



Sustainable coastal development with NbS can promote energy efficiency and reduce the carbon footprint of coastal communities.



Coastal NbS address environmental and social inequalities by benefiting vulnerable communities and marginalized groups along the coast.



# THANK YOU

<https://pandoteira.cy>

ΤΜΗΜΑ ΠΕΡΙΒΑΛΛΟΝΤΟΣ. ΥΠΟΥΡΓΕΙΟ ΓΕΩΡΓΙΑΣ, ΑΓΡΟΤΙΚΗΣ ΑΝΑΠΤΥΞΗΣ ΚΑΙ ΠΕΡΙΒΑΛΛΟΝΤΟΣ



Με τη συγχρηματοδότηση του προγράμματος  
LIFE της Ευρωπαϊκής Ένωσης