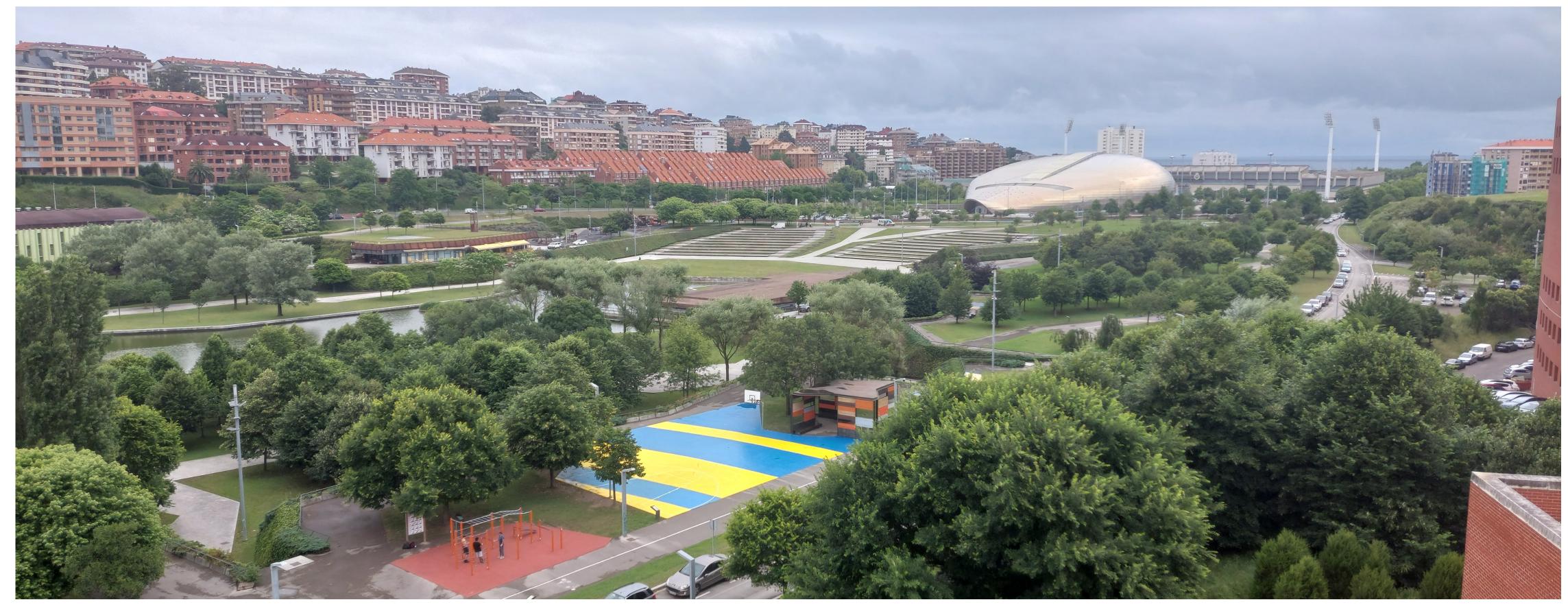# SANTANDER, SPAIN

Data driven implementation of hybrid nature based solutions **For** preventing and managing diffuse pollution from urban water **RUNOFF**

D4RUNOFF

CASE STUDY NAME: **LAS LLAMAS PARK**

LOCATION: **SANTANDER, SPAIN**

SCIENTIFIC PARTNER: **UNIVERSITY OF CANTABRIA & AQUALIA**

LOCAL STAKEHOLDERS: **SEO/BIRDLIFE, CIUDAD DE SANTANDER, IH CANTABRIA, MARE**

NATURE BASED SOLUTIONS: **WETLAND & PERMEABLE CARPARK**

WATER MANAGEMENT SOLUTION: **COMBINED DRAINAGE SYSTEM**

ABOUT LAS LLAMAS PARK

Parque Atlántico de Las Llamas or Las Llamas park is a previously degraded, recovered urban park, connecting neighbourhoods and promoting coherent urban development around large green spaces. It is an 11 ha urban park that is the main green lung of the city, and is now home to a large number of Cantabrian and Atlantic Ocean riparian tree species, as well as various bird species.

At the lowest level is the reedbed-wetland, with a surface area of 45 000 m², which receives rainwater from a nearby stream and runoff from the park. Among the main plant species are rushes, cattails and lilies. The park is also inhabited by 150 identified bird species, whose numbers have increased in recent years, and confirms the importance of conservation efforts. As a consequence, the park has a management plan to conserve and increase biodiversity, managed by SEO/Birdlife.

From the Palacio de Deportes (east side of the park), to the reedbed that runs through the centre of the valley, there is an artificial pond between 60 and 90 cm deep.

Before the urban park project, the area that is now Las Llamas Park was a marshy, lake area used for agricultural activity. From 2006 several projects, promoted by Santander Council, have contributed to the successful recovery of the area.

AIMS & CHALLENGES

The D4RUNOFF project's goal is to create a novel framework for preventing and managing diffuse pollution from urban water runoff. This will be achieved by designing hybrid nature-based solutions (NBS) and a data-driven AI-platform to support policy and decision making.

The case studies have been identified for the implementation and validation of this approach in varying environments. The replicability of these results will then be assessed at five replication sites.

The selected area in this case study is limited to the Las Llamas basin, an area that already has hybrid NBS systems in place. This includes a section of 7.3 km² with two NBS (**a wetland and a permeable car park**) and two conventional systems (**a pumping station and a treatment plant**).

The main challenges to currently overcome are:
- Possible collapse of treatment systems due to overflows (120 stormwater overflow events/year and a volume of 240 000 m³/year).
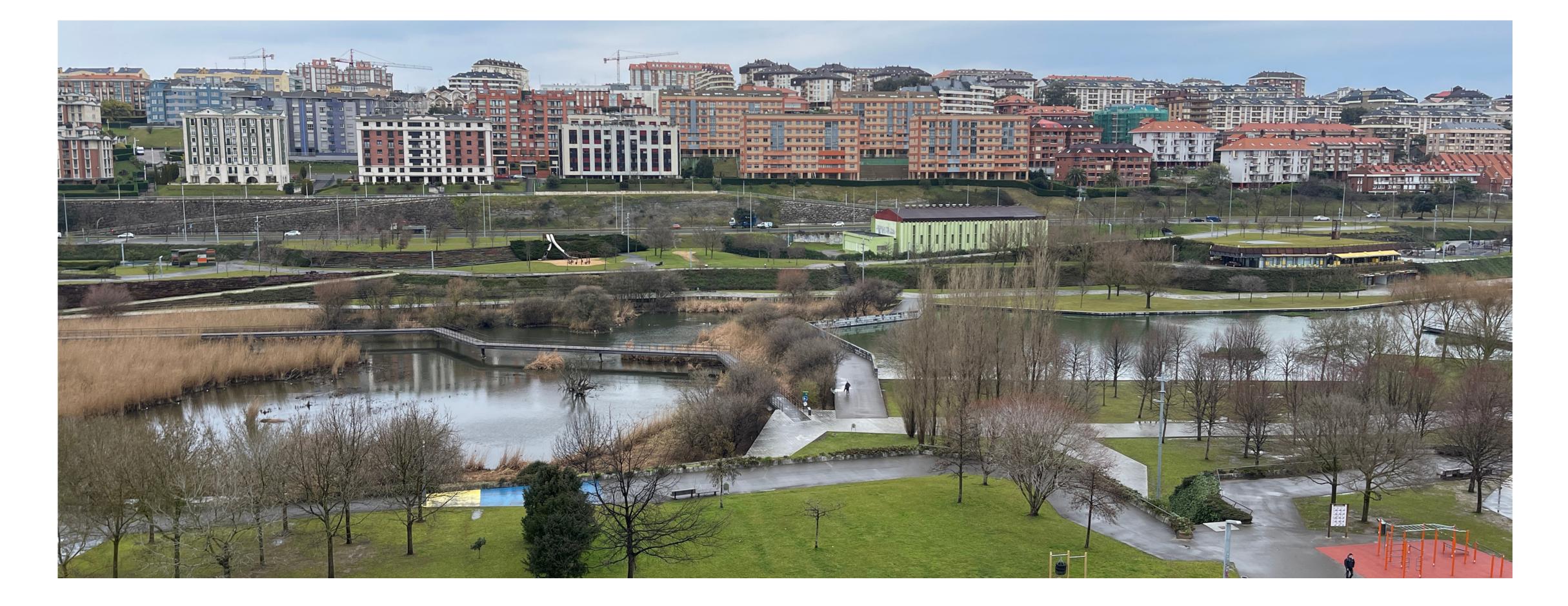- Gap in knowledge of contaminants of emerging concern (CECs).

SANTANDER, SPAIN

CASE STUDY FACTSHEET

D4RUNOFF

RESEARCH & OUTPUTS

- Assessment of the influence of NBS techniques in a traditional urban drainage system, not only for water management, but also for pollutants treatment:
  - Use of permeable pavements in car parks,
  - Increase the wetland's surface to maximise its potential benefits.

- Knowledge in urban CECs presence and concentration:
  - Water sampling in the inlet and outlet of the wetland (to control water quality and ecosystem well-being) and at the car park (to identify the presence of CECs),
  - Study of two traditional sites connected to the sewer system (pumping station and treatment plant),
  - IoT sensors and an AI platform for pollutants, allowing decision making in real time.
  - Characterisation of the whole urban drainage system (e.g. dilution and occurrence of combined sewer overflow (CSOs)) and modelling of positive consequences of the connection of new NBS.

- Validation of the projects results.

- Assessment of the replicability of the study's results.

ADDITIONAL INFORMATION

The methods and tools developed in the project (novel measurements methods, online sensors, risk mapping, etc,) will be implemented, tested and validated in three demonstration sites.

The three case study sites are located in Odense (Denmark), Santander (Spain) and Pontedera (Italy), covering different climate and urban areas.

Replicability will be assessed in five sites: Pisa Sud (Italy), Algeciras (Spain), Ostrava (Czech Republic), Gdansk (Poland) and El Cairo (Egypt).

Contact:
Nicolás Morales (Aqualia) ✉ nicolas.morales.pereira@fcc.es
Jorge Rodríguez (UniCan) ✉ jorge.rodriguez@unican.es

Close up view of the surface of the permeable carpark

The permeable carpark at Las Llamas Park