

Autonomous Control of Sewer Networks **Stream**

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1. BACKGROUND



Urbanisation, rapid population growth and more intense rainfall events are placing **urban drainage networks** under significant operational pressure.

CENTAUR™¹ is a real-time control system that utilizes the in-sewer storage of a sewer network to minimize **flood volumes** and **CSO spills**. The system commands Flow Control Devices (FCDs) to maximise the use of **storage capacity** during rainfall events.

CENTAUR™ has been successfully implemented in the Coimbra sewer network (Portugal), with a FCD capable to influence water level at a **single target location** (flooding manhole).



2. PROJECT AIM



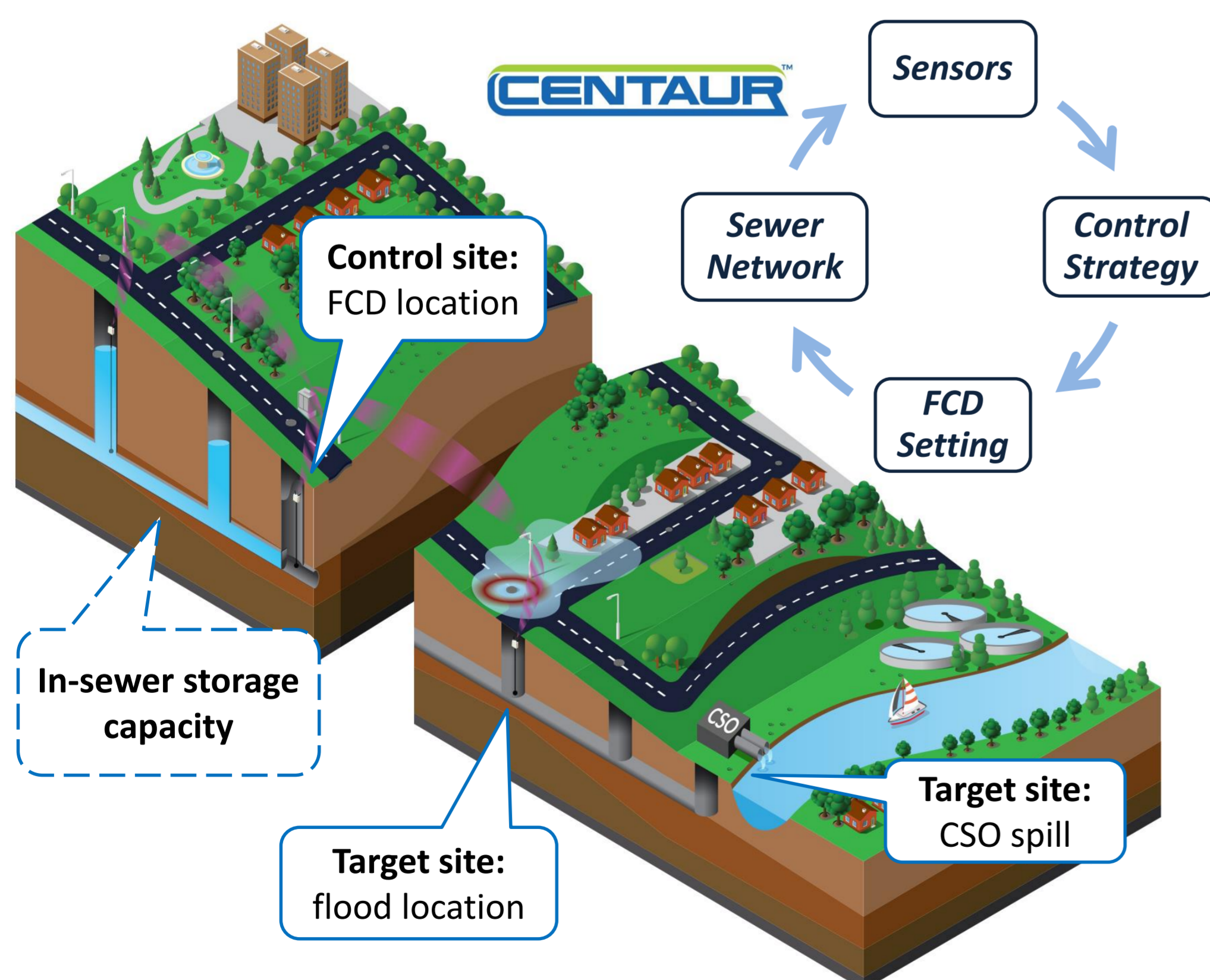
The aim of this research is to develop a decision support system to determine the **optimal location** and **control strategy** of FCDs implemented at multiple sites within a sewer network.

3. CHALLENGES



Assessing the effects of FCDs on the hydraulic behaviour of sewer networks is a **complex** and **time consuming** process. It is mainly due to:

- Number of **possible configurations** (number and location of FCDs within the network), especially with extended drainage systems;
- **Computational effort** demanded to assess the system performance through hydraulic analysis.



1: The CENTAUR project was funded by the European Union's Horizon 2020 research and innovation programme (grant agreement No 641931). Details available at <http://sheffield.ac.uk/centaur>.

www.stream-idc.net

4. METHODOLOGY

Identify optimal locations to install single FCD within sewer network

- Identify **potential FCD locations** (i.e. manholes);
- Automatically **implement** and **test** single FCD at different locations to assess the system performance.

Implement and test CENTAUR™ with multiple FCDs deployed at different locations within sewer network

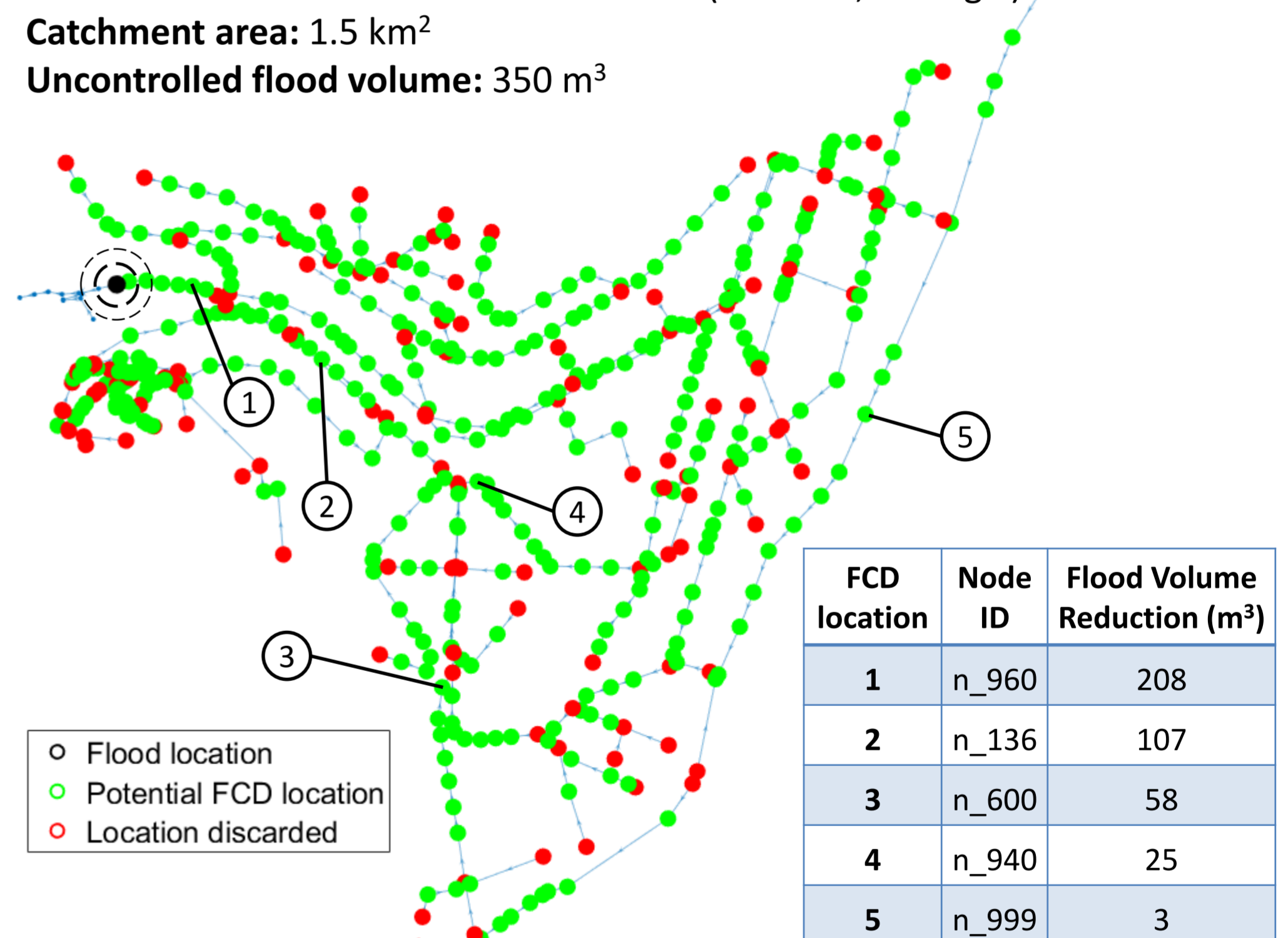
- Develop a **single objective** optimisation tool (e.g. minimize flood volume);
- Develop a **multi-objective** optimisation tool (e.g. minimize flood volume, minimize flooding damage);
- Develop a **decision support system** to consider sewer flooding and CSO spills simultaneously.

Demonstrate operational benefits

- Hydraulic simulation of **long-term** continuous **rainfall events**;
- **Investigate risks** associated to stormwater management with sewer flooding and CSO spills occurring simultaneously.

5. INITIAL RESULTS

Sewer network: Zona Central Catchment (Coimbra, Portugal)
Catchment area: 1.5 km²
Uncontrolled flood volume: 350 m³



The analysis performed indicates that **flood reduction** is influenced by the **hydrological characteristics** of the network and the **position** of the FCD relative to the flood location.

6. OUTCOMES

- Extend the **range of applications of FCDs** in stormwater network management;
- Deliver **new solutions** to mitigate urban flooding and CSO spills, through efficient control of flows and water levels within sewer networks.



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