

## Pilot location: Kralingen, Rotterdam, NL

### Location and Environmental Setting

The district Kralingen-Crooswijk, is one of the 42 districts of Rotterdam City, and is located in the Eastern part of the city, at about 1 Km from the City Centre. It is a combined sewer system. It includes a residential zone (Central and Southern part) where approximately 50.000 people live, a small industrial area (Northern part) and a green area occupying the N-W part of the district, called Kralingse Bos. The Kralingse Plas is a 100 ha lake adjacent to the green area. The southern border of the district is formed by one of the Maas river meanders (see Figure 1).

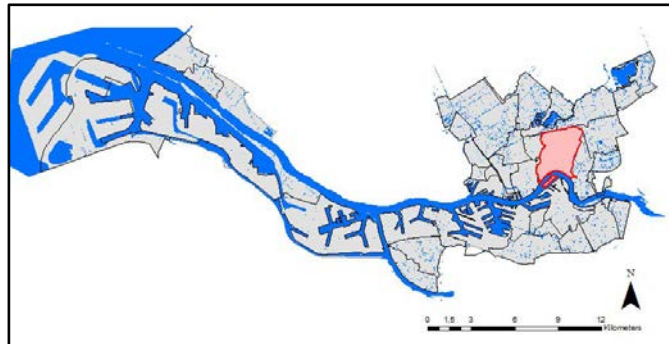


Figure 1: General location of the Kralingen catchment



Figure 2: Map of the sewer system of the Kralingen catchment

The district belongs to a polder area, i.e. below sea level. For this reason, during heavy rainfall, excess storm water needs to be pumped out in the river system (directly to Maas River or to surface water bodies connected to it) or temporarily stored.

The district area covers about 6,7 Km<sup>2</sup>, 40% of which consists of pervious areas (grasslands, gardens, lake and canals), 60% by impervious areas (linear infrastructures and buildings (10% industrial and 90% residential buildings)).



Figure 3: photos of the Kralingen catchment

### Urban pluvial flood risk problems and management objectives

#### Past flood problems:

**14<sup>th</sup> July 2011:** The estimated volume of rainfall that fell between 17:00 and 22:00 was 70 mm. This caused a sewer surcharge and, as a consequence, streets, basements and gardens in the North-Western part of the district flooded.

#### Flooding mechanisms:

The main flooding mechanism in this area is pluvial flooding. Pluvial flooding occurs because of the interaction of several factors:

- The district has a high percentage of imperviousness due to the dense urbanization. As a consequence, the hydrologic response to rainfall is very fast and high rainfall peaks translate almost immediately into high runoff peaks.
- There are no storage facilities in which the rainwater can be collected, so surface runoff drains directly into the sewer system, causing flooding when extreme rainfall occurs.
- Under dry weather conditions, water is transported to the waste water treatment plant by means of a pumping system. Under storm conditions, the excess of storm water is pumped out of the system towards the river Maas. However, the pump capacity is limited, and when the water volume exceeds it, water is drained out of the system to surface water bodies. A non-optimal management of the pumping system can exacerbate sewer surcharge.

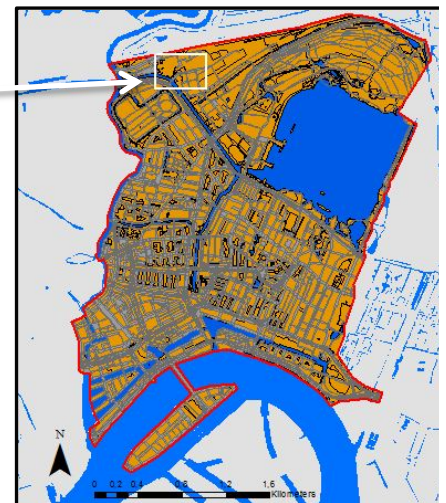


Figure 3: Areas affected by the flood in the past.

#### Urban pluvial flood risk mitigation options:

Options under consideration for this area, some of which are being explored in the RainGain project, include the following:

- Identify flood prone areas, by modelling the sewer flow in combination with the street flow, taking into account the interaction between the street and the sewer level.
- Find solution to mitigate, reduce or eliminate the risk of flooding, such as: create or optimise storage facilities, better pumping control, new pumping stations that divert water flow towards less vulnerable area.