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Evaluation of CSO's pollution impact of the Bologna sewer system on the basis of long-term simulation and mitigation effects obtained with storage tanks.

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The city of Bologna (located in the Northern part of Italy) has an urbanised area of more than 4700 ha, 47% of which contributing from impervious surfaces. Its combined sewer system has a total length of about 600 km and it has a daily load of about 350.000 equivalent inhabitants. Sewage flows into a wastewater treatment plant, which is correctly dimensioned for dry weather period but it can't cope with discharges exceeding two or three times the dry weather flow, so during rainfall events, stormwater is spilled to receiving streams by 79 Combined Sewer Overflows (CSO's).

This study concerns long term simulations (covering five year) of the whole sewer network of Bologna, using InfoWorks CS 4.5 model (developed by Wallingford Software), in order to assess CSO's impacts on the main receiving water bodies (Reno River, Savena River and Navile Channel).

Two different kind of simulations have been done using a complete rainfall series recorded in Bologna in the years from 1994 to 1998:

a)the first one considering the current sewer system;

b)the second one including the presence of first-flush tanks on the main overflows, in order to reduce the amount of pollutant discharged.

The calibration of the InfoWorks model has been done on the basis of the data collected during the INNOVATION DGXIII European Project (Artina et al., 1999). Hydraulic and water quality results from the first set show that during five year Combined

Sewer Overflows discharge about 5x10^6 m3 into receiving water bodies as well as 3.3x10^6 kg of Total Suspended Solids, which means a specific loads of more than 1500 Kg TSS/ha. In the second phase first-flush tanks have been inserted downstream the CSO's. They have been designed using two parameters:

- the specific volume (equal to 25, 50 and 70 m3/ha), used to determine the total storage volume required for the entire network;

- the discharged mass ratio (single CSO mass of TSS divided by total mass discharged), used to determine the single tank volume. The discharged mass ratio comes from the results of the first simulation set.

Improvements originated by the presence of tanks are quite clearly shown by results of "b)"simulation set. In fact, inserting tanks with a specific volume of 25 m3/ha, there is a 33% reduction of water discharged into receiving water bodies and 54% reduction of TSS. These value reaches up to 53% and 75% in terms of discharge and TSS respectively adopting a specific volume of 50 m3/ha.