Risk management of urban rain events in a coastal city

The case of Marseille

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5th International Conference on Sustainable Techniques and Strategies in Urban Water Management

5e Conférence Internationale sur les Techniques et Stratégies Durables pour la Gestion des Eaux Urbaines par temps de pluie
North

Marseille: 1 million inhabitants
Shape of a basin of 250 km²
Surrounded by mountains

North
Beaches
Torrential rain in autumn
Rain water network
500 km of storm drains
50 km of Rivers
Operated by SERAM
Two main problems:
Beach pollution
Flooding
Main Actions

- New developments
- Rainwater network maintenance
- Surface sealing regulation
- Public information
- Real time risk management
Urban flooding

River overflows
Street runoff
Maps of flooding risk in Marseilles

Rivers flooding areas

Dangerous street runoff
Urban watersheds have a rapid reaction time → Flash floods

Time to act is very short, for the crisis management it is necessary to make a decision before it rains on the city

We have to anticipate by assessing the « potential risk » of rainstorms coming towards the city
Rain forecast and monitoring

- Lightning monitoring
- Satellite images
- Rain monitoring radar
- 24 Rain gauges
- 24h SERAM Operator
  Sewer system supervising
- Monitoring Center
Transformation of the rain predicted into risk level

Total Rainfall - Intensity - Danger

Maximum rainfall Intensity in mm/h

Total rainfall in mm

Light rain

Medium to heavy rain

Very heavy rain

M.A.P. 1

M.A.P. 2
Curves Total Rainfall - Intensity - Danger

Rain drainage network management

Right organisation for assistance and rescue
Dry weather and Light rain $\leq$ level A

Risk = Beach pollution

Objective : Treatment of waste water and first runoff
Actions : Sewer network monitoring, remote control of gates
In case of discharge : Informing of municipal authorities
Bathing prohibition - Samples and bacteriological analyses
Medium to Heavy rain: Levels B, C, D

Risk = « flooding points »

Objective: To reduce flooding and their effects

Actions: Retention basin regulation, Opening of discharge pipes

Setting up of a telephone system for public calls reception,

3 levels crisis management with SERAM staff in the field,

Informing municipal authorities and raising of the M.A.P. by the DEA

Security services, fire brigade and police
Heavy and Very Heavy rain: Level > D
Risk = Dangerous flows in the streets

Objective: Public safety
Actions: Retention basin regulation, Opening of discharge pipes
Telephone system for public calls reception, SERAM staff in the field,
Informing municipal authorities and raising of the M.A.P. by the DEA
Security services, Fire Brigade, Police,
Schools information, Public information by the security councillor
An example: September, 19th 2000

9h00 Meteo-France Forecast:
Stormy weather for the afternoon
Total rainfall predicted: 40 à 60 mm
Intensity predicted: 50 à 70 mm/h
Total Rainfall - Intensity - Danger

Total rainfall in mm

Maximum rainfall Intensity in mm/h

A B C D
10h00

Raising of a risk level D

Putting on call of 120 SERAM workers

Informing of local authorities,

Raising of Municipal Assistance Plan

Mobilisation of Fire brigade and Police
Rain monitoring by Radar

15h00

Marseilles

Storm cells
Risk level C to D

Predicted path
Raising of alarm level D and MAP
Spreading of intervention staff in the city
End of alarm
It is now possible to do early warning:

- to make preventive management
- to inform the municipal authorities when necessary
A useful decision making system for Municipal Authorities

- Allows anticipation of a crisis and organisation of an assistance plan

- Allows the population to be informed when necessary
Outcome concerning beach pollution risk:

- Discharge reduction by remote control of gates
- Bathing is forbidden if pollution is suspected
- Bathing is allowed when the conditions are good
Outcome concerning the flooding risk:

- Flooding reduction by remote control of gates
- Management of intervention teams
- Security of children in the schools
- Giving caution advices to the population
- Closing of dangerous streets and underground spaces
- Evacuation of dangerous zones
Helps the mayor in his information, rescue and assistance role

Develops a risk awareness approach

An example of Public / Private partnership
Progress axes:

Construction of 90,000 m$^3$ of retention basin in the town center in order to prevent beach pollution and flooding,

Automatic calls for public warning in dangerous zones.

Thank you for your attention!