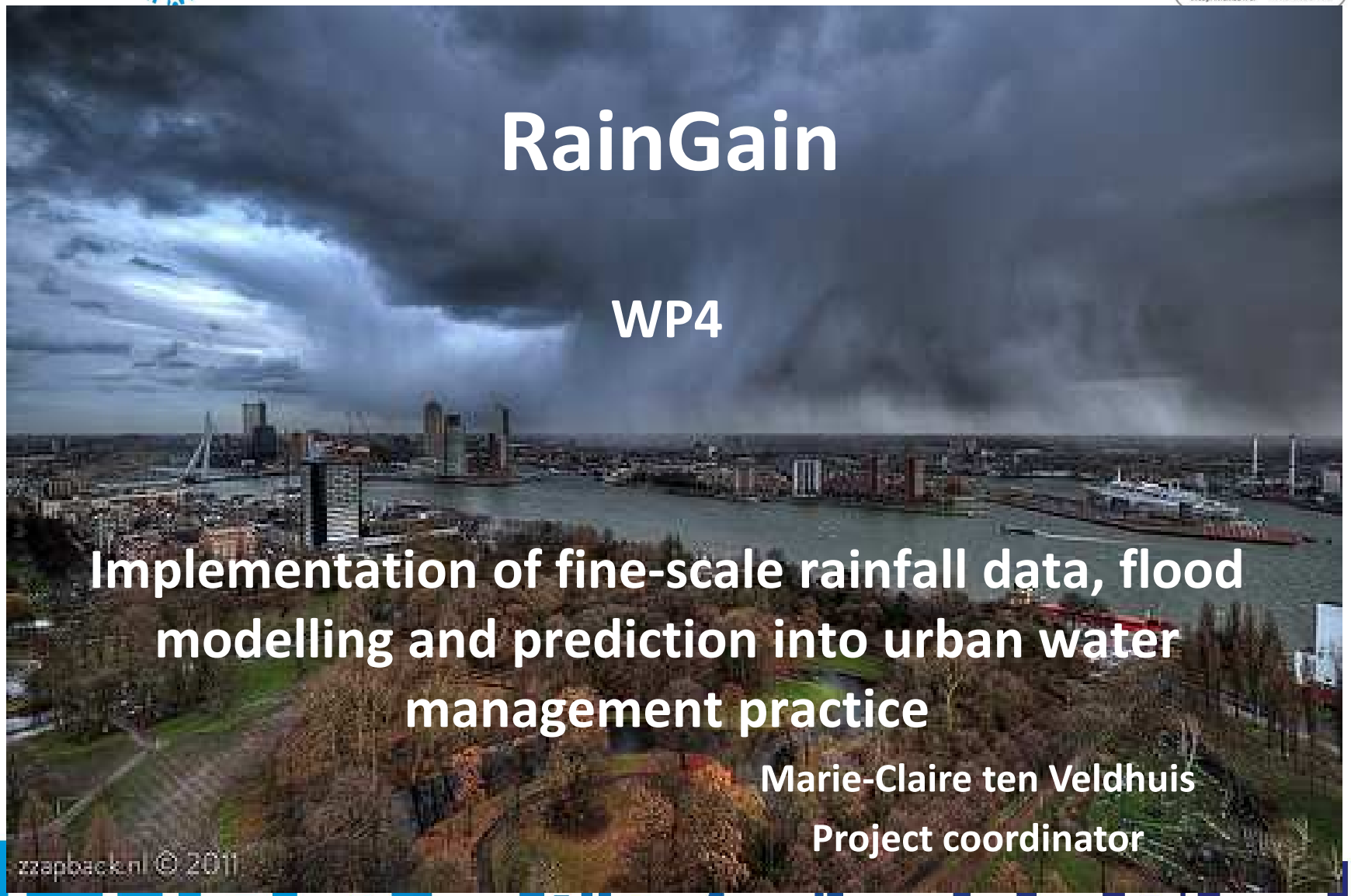


RainGain

WP4

Implementation of fine-scale rainfall data, flood modelling and prediction into urban water management practice

Marie-Claire ten Veldhuis

Project coordinator

Coping with extreme rainfall impacts: urban floods and damage

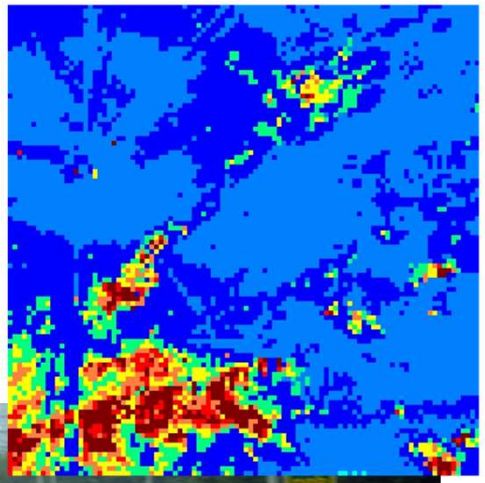
Rotterdam, July 2012

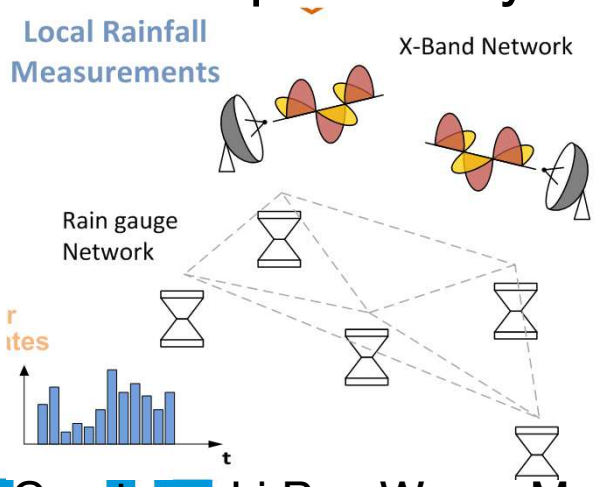
Extreme Rainfall in the City – towards Flood Resilience

What we want:

High resolution weather information

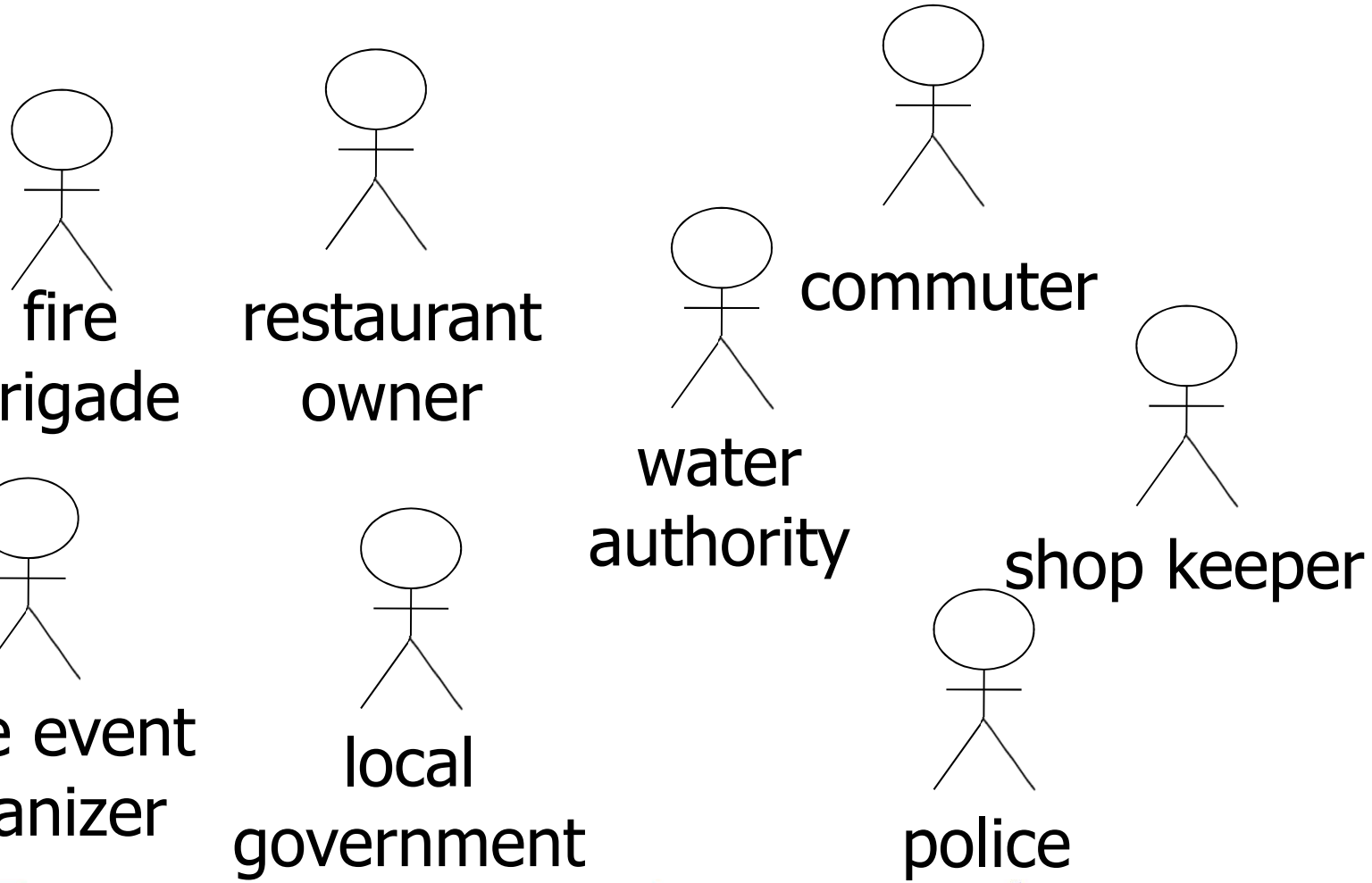
- Street level (30x30m)
- Every minute
- Up to a day in advance



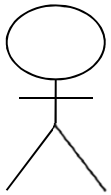


Courtesy: Li Pen Wang, MetOffice/RainGain

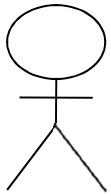
Urban weather: dynamic, diverging information needs



Extreme Rainfall in the City
diverging information needs

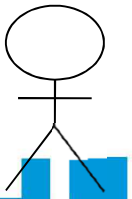


- Predictions (hour-days forecast)
  - how much rain will fall on this shopping street, square, vital crossroads?

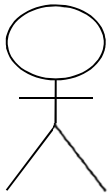


- Real-time (nowcast)
  - where are floodings and which are critical?

- Analysis (hindcast)
  - How did models perform/hydrological system react?

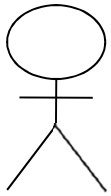


Extreme Rainfall in the City
diverging information needs



Issue warnings,
Operational control of weirs/pumps
Planning of emergency services

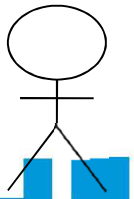
- Predictions (hour-days forecast)
  - how much rain will fall on this shopping street, square, vital crossroads?



Assess severity,
Focus emergency efforts,
Operational control

- Real-time (nowcast)
  - where are floodings and which are critical?

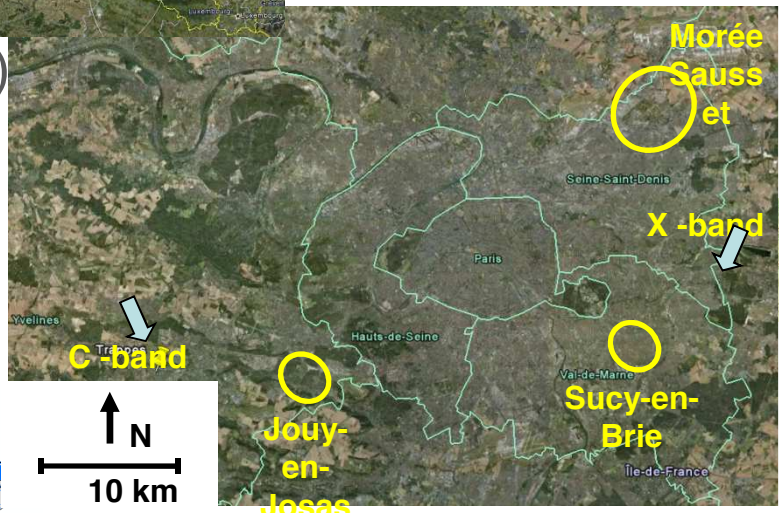
- Analysis (hindcast)
  - How did models perform/hydrological system react?

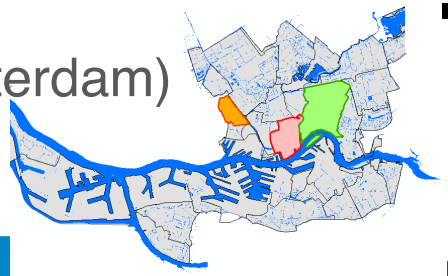


What can be improved,
Who is to blame for claims

RainGain: 4 cities, 10 pilot sites

- Cranbrook (London Borough of Redbridge)
- Purley (London Borough of Croydon)
- Torquay City Centre (Torbay, Devon)
- Leuven (Noord/gehele stad)
- Gent (PLURisk)
- Moree-Sausset (Paris Seine-St.-Denis)
- Jouy-en-Josas (Paris Seine-St.-Denis)
- Sucy-enBrie (Paris Hauts de Seine)
- Kralingen-Crooswijk (Rotterdam)
- Centrum (Rotterdam)
- Spaanse Polder (Rotterdam)





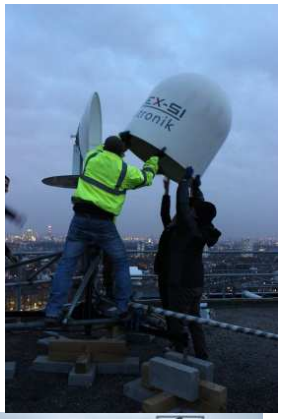
- Include examples of factsheets

RainGain

High resolution rainfall data in 4 cities

- summary -

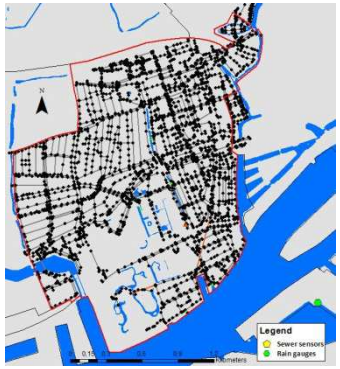
- London: Upgraded C-band radars ; temporary Selex RainScanner (3-4 months, single pol/no Doppler); 3 rain gauges per pilot
- Leuven: C-band radars, X-band radar (single pol/no Doppler), 8 rain gauges
- Paris: C-band radar, new radar (dual pol, X-band), 8 to 26 rain gauges per pilot
- Rotterdam: C-band radars, new radar (dual pol, X-band), 1 rain gauge per pilot



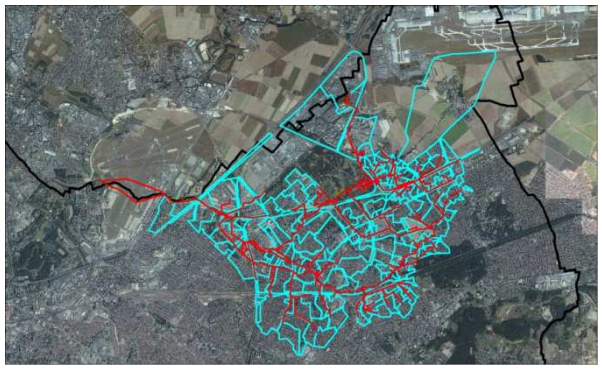
RainGain pilot sites
- drainage areas characteristics -

- Cranbrook - 9 km^2 - sloped, semi-culverted brook
- Purley - 6.5 km^2 - sloped, drains to natural depression
- Torquay - 14.6 km^2 - coastal, steep slopes, freq floods
- Leuven - 30 (120) km^2 - mild slopes, occasional flooding
- M-Sausset - 34 km^2 - almost flat, retention basins
  - - Kodak - 1.44 km^2
- J-en-J - 2.5 km^2 - sloped, canalised brook, basins
- S-en-Brie - 2.69 km^2 - sloped, new basin planned
- Sp Polder - 1.9 km^2 - flat, industrial
- Kra-Cr - 8 km^2 - flat, residential, occasional flooding
- Centrum - 3.7 km^2 - flat, retention basin

RainGain pilot sites
- High resolution modelling -



- London: Infoworks; hybrid model for real-time, fast flood simulations
- Leuven: Infoworks; 2D flood simulation for detailed flood information
- Paris: Multihydro; fully distributed model for maximum benefit of radar data+detailed flood information
- Rotterdam: Sobek; 2D flood simulation; possibly fully distributed model for max benefit of radar data+detailed flood info

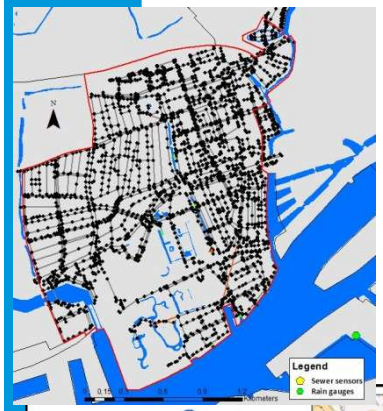


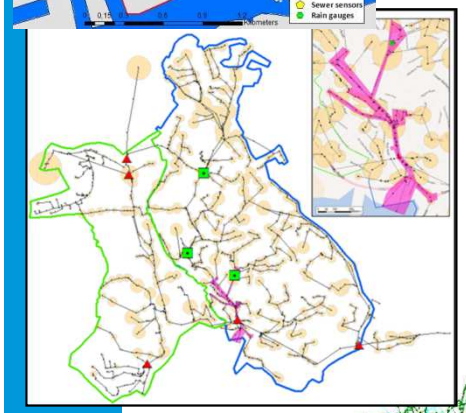
RainGain pilot sites
- status of hydrodynamic models -

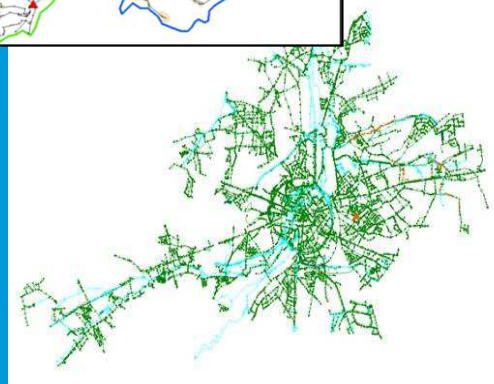
- Cranbrook - Infoworks 1D sewers, 1D and 2D flood
- Purley - Infoworks 1D sewer system
- Torquay - Infoworks 1D sewers, 1D and future 2D flood
- Leuven - Infoworks 1D sewers, future 1D and 2D flood
- M-Sausset - Canoe 1D sewers; Multihydro for Kodak
- J-en-J - Multihydro
- S-en-Brie - Canoe 1D sewers, future Multihydro
- Sp Polder - Sobek 1D sewers, future 2D flood
- Kra-Cr - Sobek 1D sewers
- Centrum - Sobek 1D sewers

WP4:

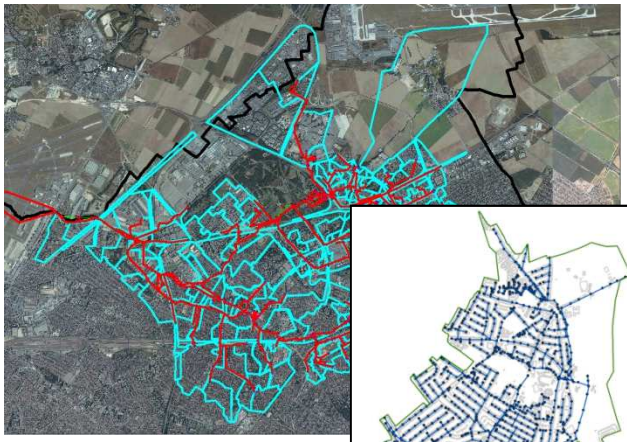
Share and exchange data, models and acquired knowledge in pilot sites

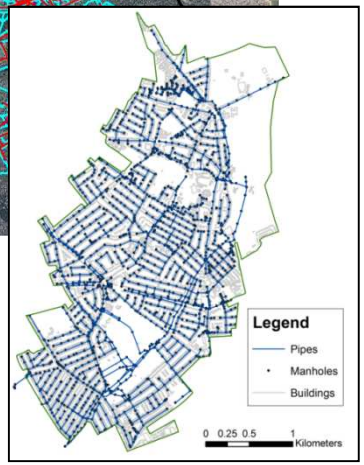






- Infoworks
- Sobek
- Canoe
- Multihydro





CityX.rainradar.com?

For future implementation in daily water management practice

RainGain pilot sites
- General and Technical Factsheets -

- Location, environmental setting
- Current pluvial flood problems
- Management objectives flood control

Fine-scale rainfall measurement and prediction to enhance urban pluvial flood management

Pilot location: Morée Sausset Catchment, Paris area (France)

Location and Environmental Setting

The catchment named "Morée-Sausset" (from the names of two former rivers that used to drain it, which are now the two main sewers of the area) is located in the North-East of the Seine-Saint-Denis County. It is a predominantly urban area of 3,400 ha. It includes industrial areas (mainly in the North), residential zones and green areas. The area is rather flat (the average slope of the sewer pipes is 0.009 m/m) and has experienced a rapid urbanization over the last decades. The average coefficient of imperviousness is roughly 50%. The sewer system is a separate one in this area. There are neither weirs nor pumping stations in the sewer network on this area. Storm water is then routed to Seine River through the Garges-Epinay sewer.
The Kodak catchment, which is a 144 ha mainly residential area located in the South-East of the greater area, is studied more in detail. It contains a green area currently under decontamination which corresponds to a former Kodak factory.

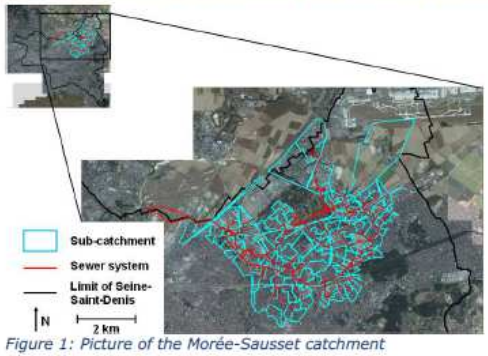


Figure 1: Picture of the Morée-Sausset catchment

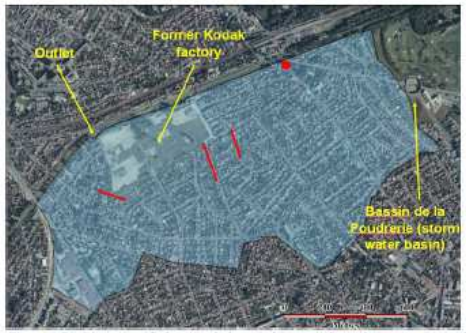


Figure 2: Picture of the Kodak catchment (weak spots in red)

Fine-scale rainfall measurement and prediction to enhance urban pluvial flood control

Pilot location: Purley Area, London Borough of Croydon (UK)

Monitoring

Rainfall

Rain gauges:

- **6 tipping bucket rain gauges** with 0.2 mm resolution operated by the Environment Agency + **4 new tipping bucket rain gauges** will soon be installed by Imperial College London as part of the RainGain project.

Radars:

- The area is within the coverage of two C-band radars et Office (see *Figure 5*):

nies Radar	Thurnham Radar
C-band	C-band
rizontal*	Dual-polarisation
No*	Yes
ıbolic 3.6 m diameter, 43 dB gain	
1°	
5.4 – 5.8 GHz	
m up to 50 km range/2 km up to 75 km range	
5 min scan repeat cycle**	
1.5, 2.5, 4.0, 5.0	0.5, 1.0, 1.5, 2.5, 4.0

o dual-polarisation and Doppler
ct the potential benefits of reducing
ıin will be tested

Water depth sensors

- 10 permanent flow sensors in sewers operated by Thames Water
- 2 new water depth sensors in sewers will be installed by ICL as part of the RainGain project (see *Figure 6*).

Medium term flow survey data: A medium term flow survey consisting of 79 flow monitors and 18 rain gauges (average of 1 gauge per 8.5 km²) was carried out by Thames Water between 28/01/11 and 13/07/11. These data will be used for calibration of the models of the Purley Area.

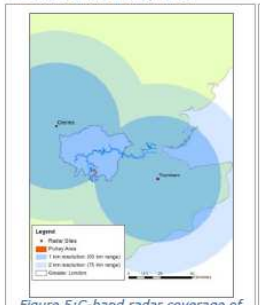


Figure 5:C-band radar coverage of the Purley Area

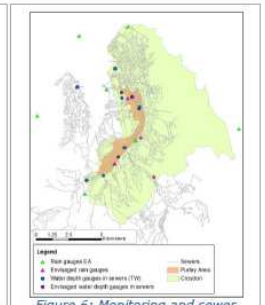


Figure 6: Monitoring and sewer system of the Purley Area

- Monitoring: rainfall sensors, water levels sensors
- Elevation data; Flood models

RainGain outreach
- National Observer Group meetings -

National Observer Group meetings:

- BE: 18 April 2012, 15 May 2013
- FR: 20 April 2012, 22 April 2013
- NL: 13 March 2012, 12 March 2013
- UK: 29 February 2012, 16 April 2013

Attendance: 30-50 people: cities, water authorities, policy makers, meteo agencies, companies, consultancy, emergency planners

RainGain outreach
- National Observer Group meetings -

National Observer Group meetings:

Some highlights:

- Guest speakers from local and regional governments (EA, GLA, ASTEE, Datacentre)
- Discussions about information requirements end-users: data resolution, lead time of forecasts versus uncertainties

- Workshop pack (UK, London pilots): easy to understand information about options for flood risk reduction Customised selection of local options
- Initiative to organise local government meeting in Oct 2013 (FR, Val-de-Marne: UK, LGFF)

RainGain
- WP4 Actions -

- WP4A14 State of the art pilots: General and technical factsheets - done
- WP4A15 Analysis of flood events: pilot sites historical data and flood modeling (WP3); reported on general factsheets – done
- WP4 A16 Development of solutions: based on high resolution rainfall and flood information - 2013-2014
- WP4A17 Training on implementation of high resolution rainfall and flood information products - 2014-2015

Rain Gain

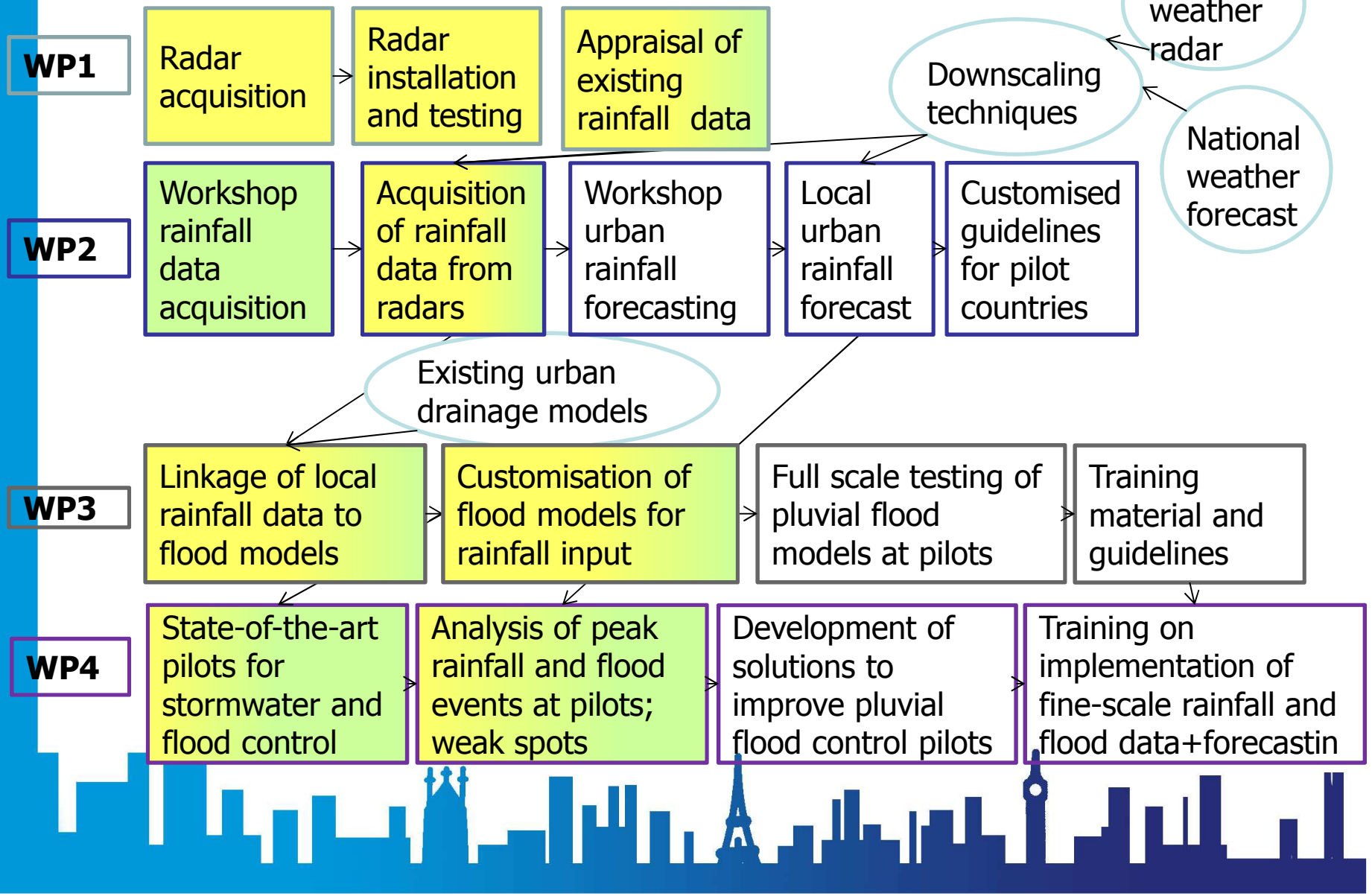
Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

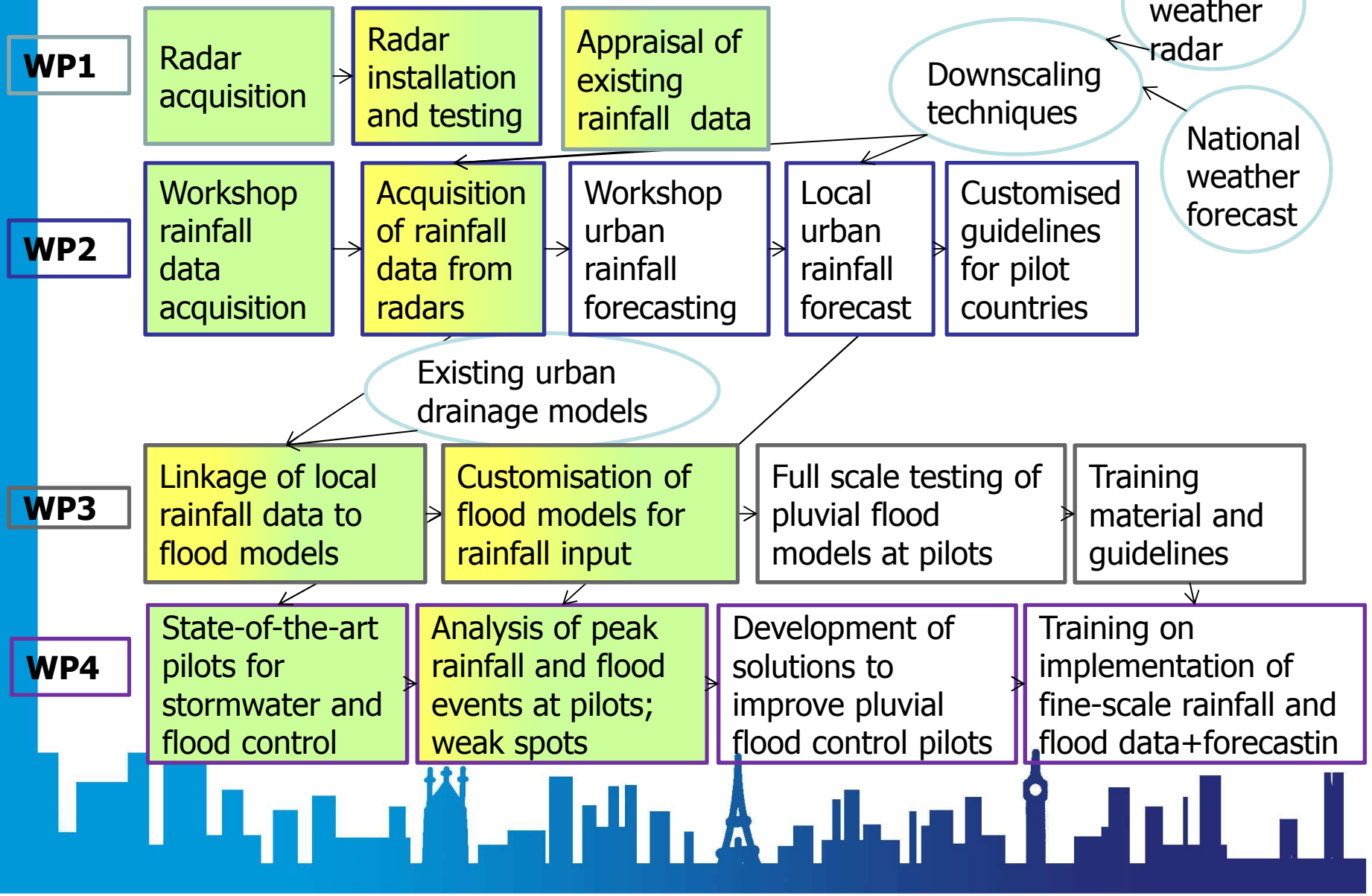
nwe

INTERREG IVB

RainGain- WPs and Actions

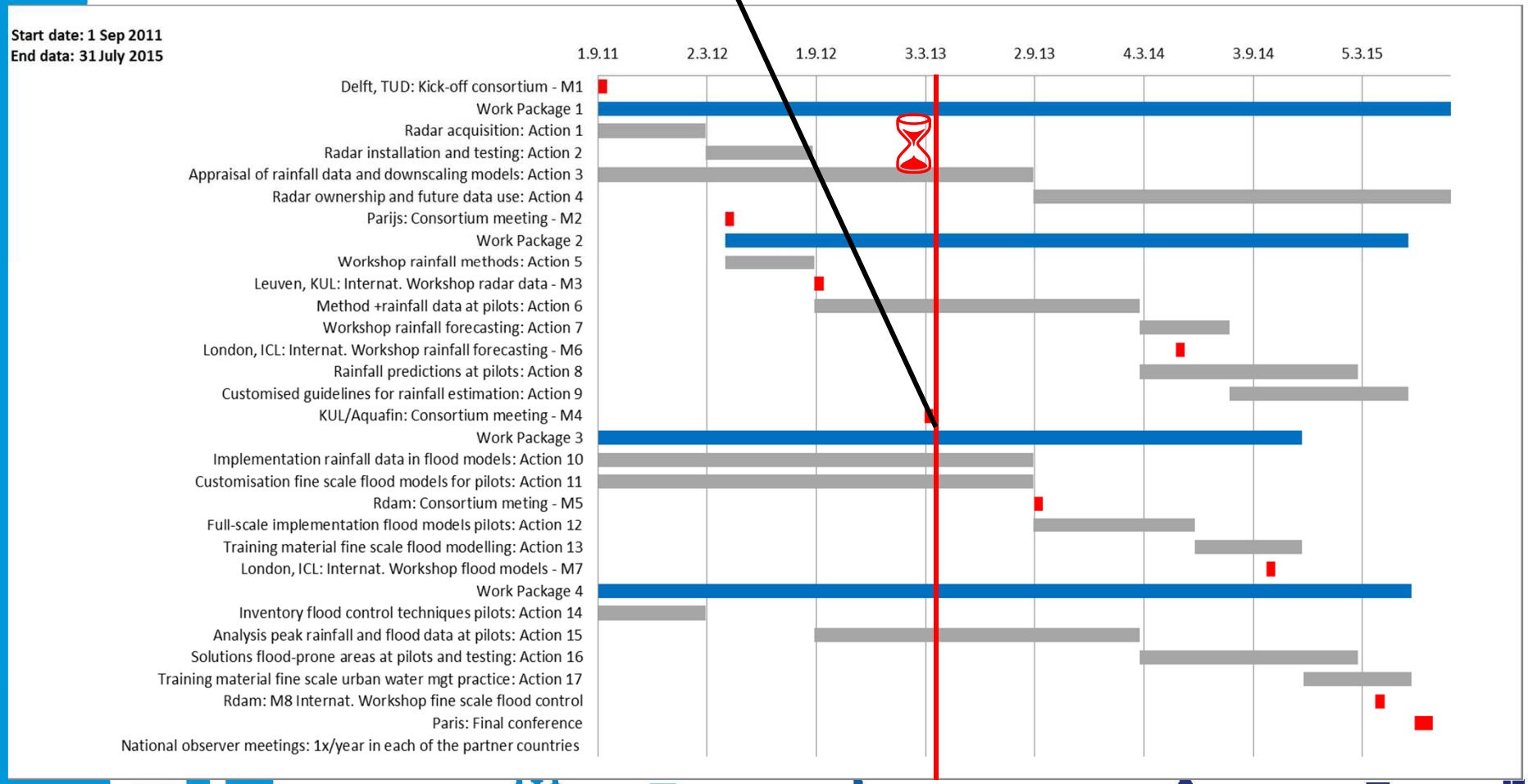


RainGain- WPs and Actions



RainGain Projectplanning

Project consortium meeting
15-16 April 2013: London



RainGain
- 2013 -

- Installation of radars pilots Paris and Rotterdam: November 2013
- Finalising review document radar-rainfall estimation
- Linkage rainfall inputs and pilot flood models FEWS

- National observer groups
- Project meeting Paris: 21-22 October 2013
- Local government meeting Paris: October 2013

RainGain
- 2013 -

- Next project meeting: spring 2014
  - International workshop rainfall forecasting
    Location: Antwerp (Aquafin)

- Date: ?


RainGain
Extreme rainfall in cities:
- High resolution rainfall data collection
- High resolution modelling
- Contributing to urban flood resilience
Interested? Want to get involved?
Visit: www.raingain.eu
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