Sustainable Urban Development Planner for Climate Change Adaptation (SUDPLAN)

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### Partners

1. Swedish Meteorological and Hydrological Institute
2. Austrian Institute of Technology
3. cismet GmbH
4. Czech Environmental Information Agency
5. Apertum IT AB
6. Deutsches Forschungszentrum für Künstliche Intelligenz
7. Stockholm Uppsala Air Quality Management Association
8. City of Wuppertal
9. Technische Universität Graz
Main Objective

- to develop an easy-to-use web-based planning, prediction, decision support and training tool, for the use in an urban context, based on a what-if scenario execution environment, which will help to assure population’s health, comfort, safety and life quality as well as sustainability of investments in utilities and infrastructures within a changing climate.

Targeted end-users

- City planners
- Scientific users, modellers

Developers/Application providers will support the two groups of users.
SUDPLAN overview

Web client (GUI, 2-3-4D visualization)

Scenario Management System

Stockholm
Wuppertal
Linz
Prague

Server with web services

Common Services

Servers with web services

Pilot specific services
Scenario Manager: overview

Scenario management environment

- 3D / 4D visualisation
- geo visualisation
- scenario manager
- orchestrator
- executor
- persistence manager
- access control

Scenario inventory

Sensor services
Catalogs
Access services
3D/4D visualization (mockup)
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Stockholm
Wuppertal
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Prague
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Overview of the SUDPLAN modelling of environmental factors, going from the European scale (left) to the urban and eventually finer scale (right). SUDPLAN involves the Common Services modelling as well as the specific modelling required by different pilot cities.
Pilots specific objectives in response to a changing climate

- **Stockholm**: Urban air quality and local scenario emissions, scaled down to individual streets and evaluated against EU directives (health impact)

- **Wuppertal**: Heavy, short rainfall events and their impact on the infrastructure, using high-resolution 3D/4D modelling of >800 creek sections and 650 km of drainage channels.

- **Linz**: Stormwater flooding events and its impact on waste water treatment plants and their combined sewer overflows, to avoid polluted drainage water to spill over into the river, using sensor system and runoff models

- **Prague**: Quantifying environmental pressure on Prague and its surroundings (air pollution, heat waves, drying up of soils as well as local floodings due to intense rainfall), modelling population dynamics as a response to environmental conditions
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Stockholm  |  Wuppertal  |  Linz  |  Prague
Common Services: key objective

Downscaling of Regional Climate Model results on the European scale to cover the urban scale (typically 2x2 km spatial resolution) for use in any European city

Two modes of operation:

- Based on the downscaled information, quantify, report and visualise the future risks for flooding, extreme rain intensities and high air pollution events
- Collaborate with existing, established infrastructures and models, e.g. integration of Common Services into other applications or services.
  - model execution/planning with SPS;
  - data access through SOS, WCS;
  - WFS & WMS also supported)
**Common Services: functionality**

1. **Climate scenarios on the European scale**
   - Precipitation (including extreme rainfalls), Air quality, ambient temperature, hydrology

2.1 **Intense rainfall: urban downscaling**

2.2 **Intense rainfall on the urban scale: storm water generator**

3.1 **Hydrology: urban downscaling** (HYPE with improved local input)
   - Water flows, and flow and turnover of nitrogen and phosphorus

3.2 **Hydrology: input to local hydrological models**

4. **Air Quality: urban downscaling** (MATCH, an Eulerian off-line chemistry-transport model from SMHI)
Common Services 1: Scenario data on the European scale

10-year averaged grids (mockup)

Opening page:
- map over Europe

Select 1:
- rainfall
- hydrology
- air quality

Select 2:
- climate scenario(s)
- variable to show

Rainfall:
- temperature
- precipitation

Hydrology:
- accumulated runoff
- specific runoff
- soil moisture

Air Quality:
O3, PM10, PM2.5, NO2, NOx, SO2, CO
Common Services 1: Scenario data on the European scale

Time evolution at a specific location (mockup)

Time series access:
- whatever location
- Different variables
- Different time resolutions (yearly, monthly, daily)
Common Services 2.1: Downscaling intense rainfall

User uploads precipitation time series (mockup)

Opening page:
- map over Europe

Select 1:
- urban domain
  & rain gauge location

Select 2:
- climate scenario

Upload own data:
- high resolution precipitation
  (present conditions)

Output:
- high resolution precipitation
  (future conditions)
Common Services 4: Downscaling Air Quality

User-specific urban emissions (mockup)

Opening page:
- map over Europe

Select 1:
- urban domain

Select 2:
- climate scenario

Upload:
- emission grids

Run model:

Display result:
- select variable
- select time
Conclusions

- SUDPLAN Common Services provide:
  - climate scenarios from global climate models => regional (Europe) => urban scale.
  - “best possible” estimates of future precipitation, temperature, hydrological and air quality.
  - OGC-compliant communication and service infrastructure
- Web-based Scenario Management Environment
  - supporting the planning and decision making process
  - to be compliant with emerging SISE (Single Information Space in Europe for the Environment) infrastructure.
- The end-users:
  - city planners & scientific users providing the functionality for city planners (IT, environmental modellers, statisticians etc.)
  - will be able to evaluate risk hazards of storm water local runoff, river flooding and elevated air pollution levels for planned or existing urban areas subject to a changing climate.
The research leading to this presentation has been founded by the European Community:

**Contribution to FP7 Call Objective**
- Call objective ICT-2009-6.4: "ICT for environmental services and climate change adaptation"
- Target Outcome A: "ICT for a better adaptation to climate change"
- FP7 Contract 247708

**Indicative Budget & Resources**
- Total budget 3.3 Million Euros
- EC funding of 2.5 Million Euros
- Duration 36 months starting January 2010,
- Overall resources 254 MM