THE TOOLKIT METHOD

Planning integrated measures against flooding for urban areas

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The Toolkit Method's aim

The Toolkit Method (TM) is a planning instrument aimed at providing a general evaluation of the feasibility of a protection strategy against flooding for an urban area. Such strategy may include different kinds of technical and technological solutions and their mutual combinations which are site specific.

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CONSTRAINS

Urban areas – particularly historic ones – are complex environments in which different aspects need to be taken into account and integrated since the planning phase

Even in a small area different kinds of restrictions may be present. Each single problem may require a specific solution

SITE COMPLEXITY

Urban areas are subjected to different laws and regulations, dealing with site transformability, land uses, etc.

PLANNING REGULATIONS

Some buildings and areas are protected for their function (i.e. hospitals) or for their historic or environmental importance

SPECIAL PROTECTION

Managing intervention in a densely populate area may prove itself very costly due to interferences it may causes

COSTS

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PREVIOUS EXPERIENCES: THE ARSENALE

Planning and developing a restoration plan for the northern part of the Arsenale called for and integrated approach involving cultural heritage preservation, sustainable design, environmental protection and functional integration.

PREVIOUS EXPERIENCES: BOSTON

- Existing development plans;
- Neighborhood expectations;
- Mixed functions;
- Environmental restoration;
- Interventions progressivity;
- Interventions replicability.

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OBJECTIVES

1 **INTEGRATED**

A single instrument, in which site data and project information is collected.

2 **USER-FIRENDLY**

A Simple interface, with a limited number of istruments to guide the user along the process

3 **ADAPTABLE**

A system of Libraries, to provide multiple solutions which can fit in various contexts

4 **SHAREBALE**

Single, Open format file which can be easily used to cooperate on the same project

5 **COMPARABLE**

Different solutions can be easily drafted and compared

6 **IMPLEMENTABLE**

Libraries can be implemented and customized. Additional information can be included in the project

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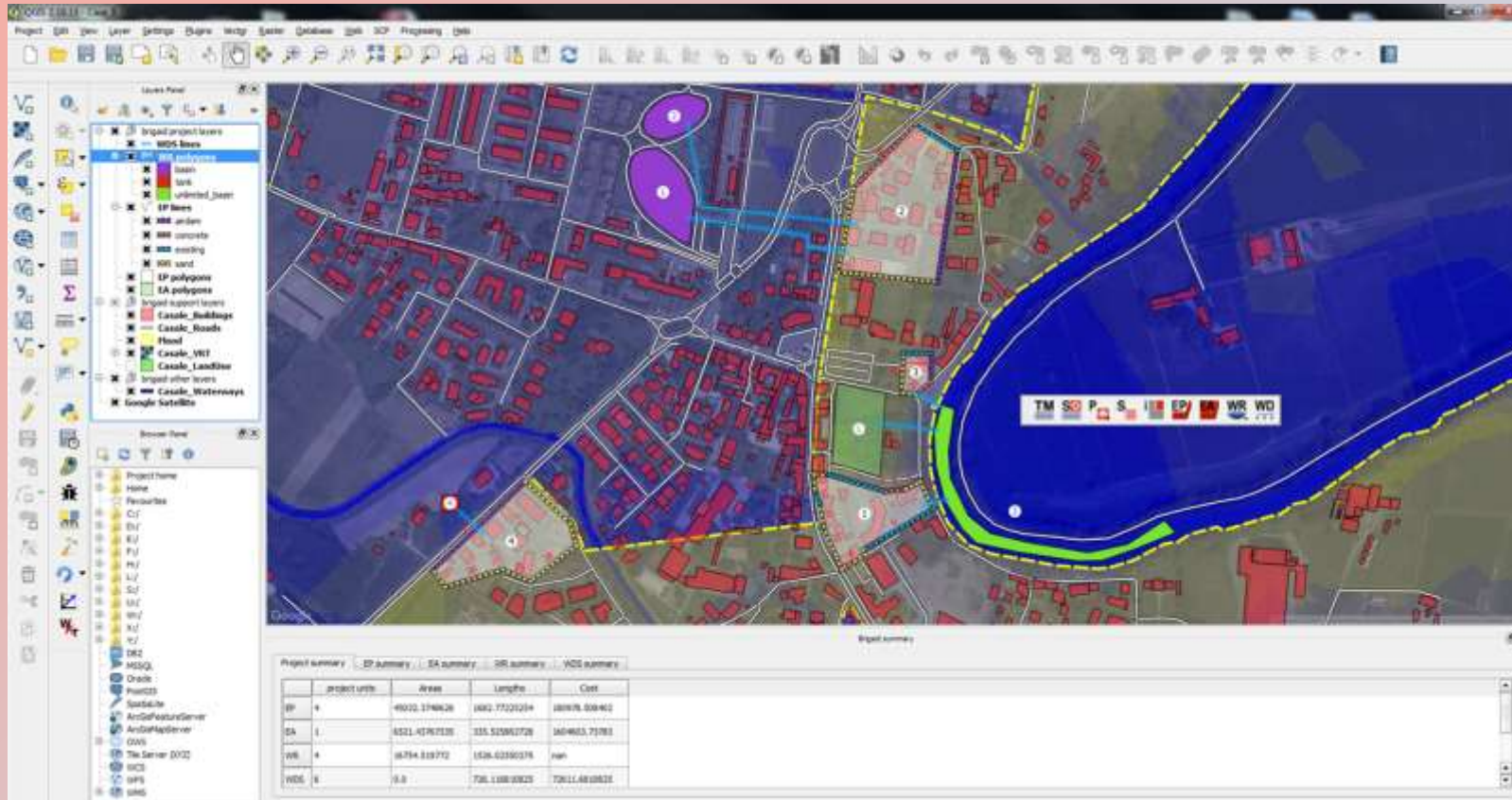
The Toolkit Method (TM) plugin has been developed for **QUANTUM GIS**, an open source free software for which a wider set of additional tools are already available.

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LIMITED INPUT DATA

In order to develop an easily operable instrument input data is contained at minimum. This allows also its utilization in a larger number of sites
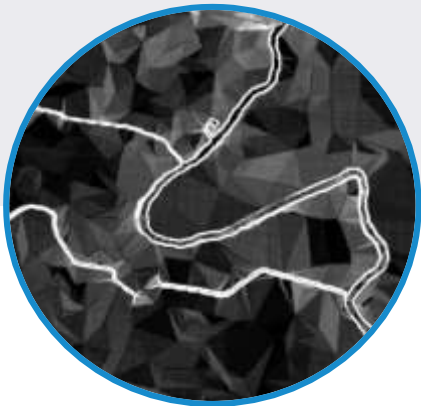
Digital terrain model is assumed as the base for the site altimetry. Data are available through the European Data Portal.

A map containing buildings footprints and streets shapes. Possible source: https://www.geofabrik.de

Flood map is derived from external sources such as risk databases or hydraulic modelling tools

Runoff coefficients can be assigned manually by the user or imported trough existing maps

DTM

BUILDINGS, STREETS

FLOOD MAP

RUNOFF COEFFICIENT & RAIN DEPTH

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...AND SOME EXTRAS IF AVALIABLE

To improve preliminary analysis, or if more data are available, users can include some extra maps

Sewage system maps can be imported to check possible interferences

It can be use to assign automatically the runoff coefficients to the study area

Strategic infrastructure can be imported to verify possible critical issues

User can add extra maps which may be significant for the study site.

SEWAGE SYSTEM   **LAND USE**   **INFRASTRUCTURES**   **[…]**

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Fixed
Temporary
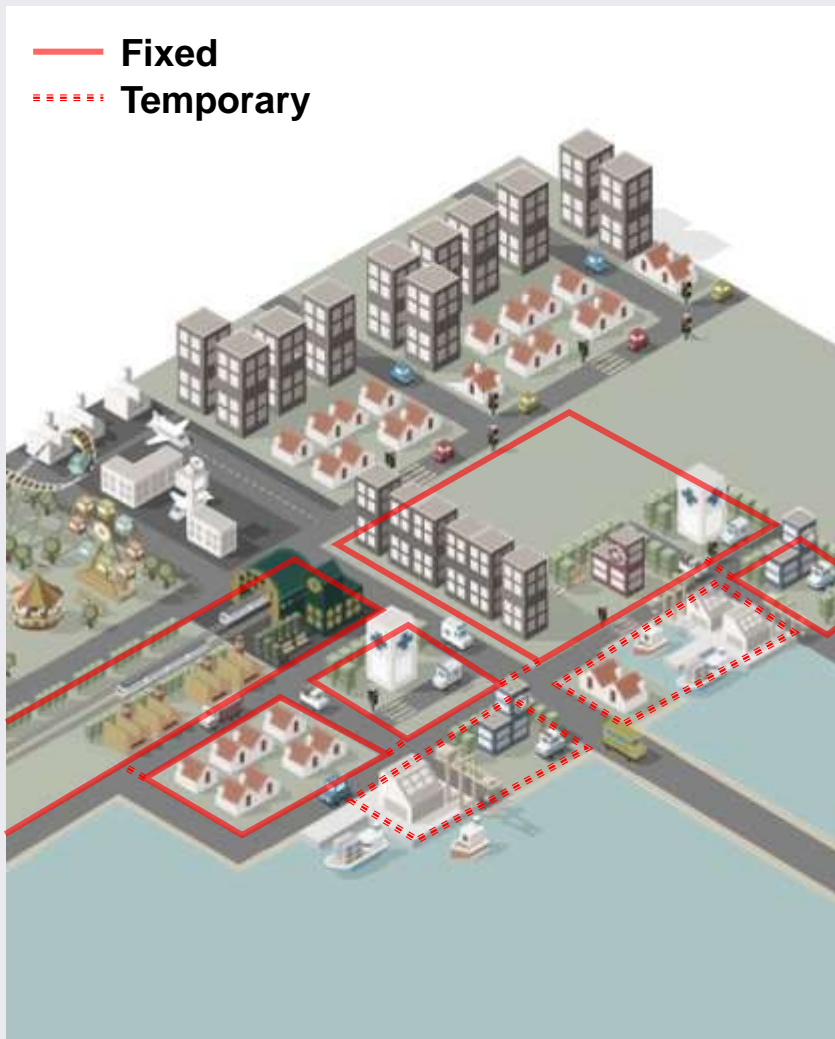
Protected Perimeters

Two basic tools are available, the first – **protected perimeters** – allows the user to draft protection along borders defining the maximum level at which defense is set. The user can then assign a specific protection measure to each segment of the perimeter.

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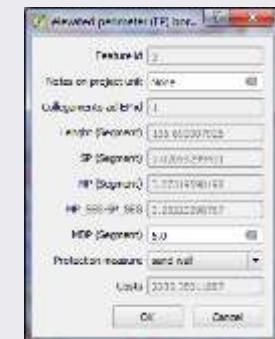
Protected Areas

When more extensive transformations are admitted the whole area can be raised to a new user-defined protection level. Also in this case different technological options are available for each **protected area**.
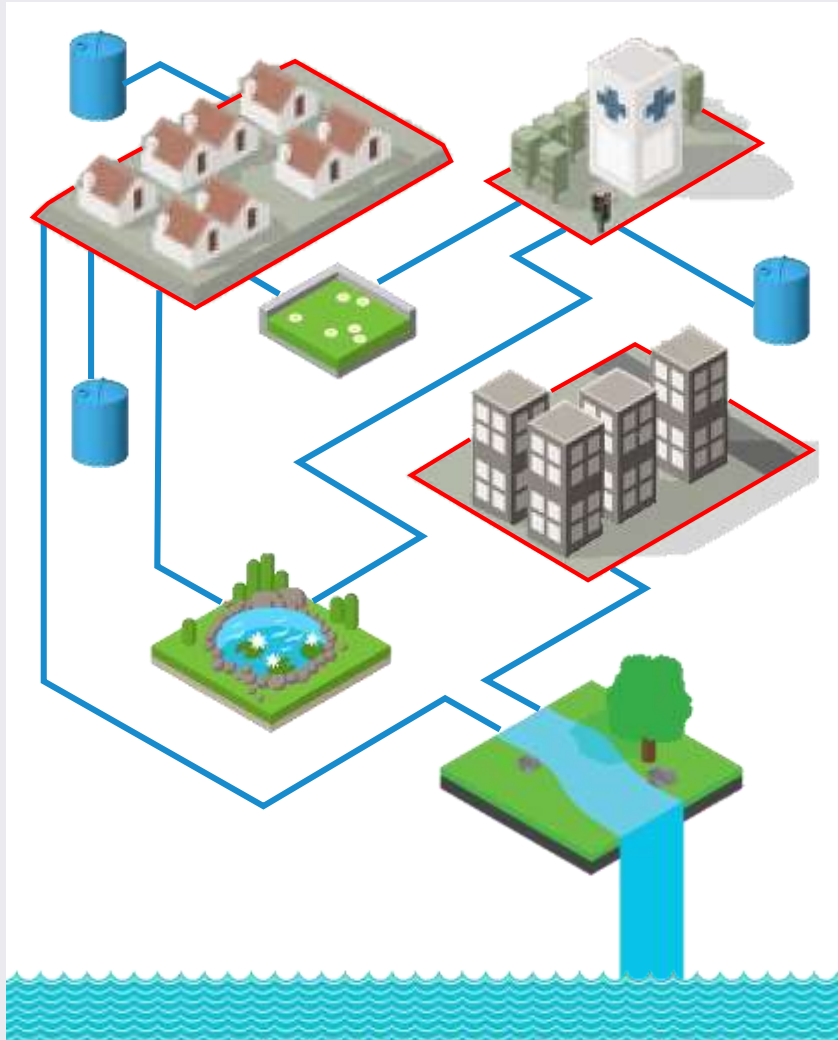
Rainwater management

Once **protected perimeters** and **areas** had been defined the user can proceed adding **water receiving bodies** and **water discharge systems**. Then the plugin allows to automatically perform a general check on rainwater management.

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Strategies & Measures

The plugin guides the user from drafting a general plan of protection to the assignment of specific measures to each sub-component of the project.

✔ Protected Perimeters	Retaining wall, inflatable barrier, sandbag, movable gate, […]
✔ Protected Areas	Levee, Impervious garage, piloties, jack-up piles, […]
✔ Water receiving bodies	Water tank, infiltration trench, floodable park, green roof, […]
✔ Water discharge system	Pipes, channel, ditch, […]
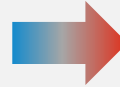
Protection Measures & Libraries

Different kinds of technological devices can be assigned to each segment of the protected perimeters or to the systems planned to collect and discharge water.

✔ Water tank

✔ Infiltration trench

✔ Green roofs

✔ Floodable park

✔ […]

✔ Ipervious wall

✔ Inflatable barrier

✔ Movable gate

✔ Temporary barrier

✔ […]

Data structure & Model checking

The plugin automatically create a project file which contains and organizes all the project information. The TM's bar instruments automatically perform consistency checking between the INPUT DATA and the PROJECT DATA along the design process.

INPUT DATA

Basic data required to start a project (DTM, buildings, flood map, runoff coefficients, etc.)

PROJECT DATA

Layers containing designed components (i.d. perimeters, areas, etc.) and related information

OTHER DATA

Additional maps and information which the user may include to develop the project

Reports & data exchange

The toolkit includes a INFO button to display data during the design process and a PRINT button to export a concise report containing project map and figures.
The file structure, including an authorship field for the designed elements, allows data sharing and collaboration during the project development.

EVALUATING ALTERNATIVE OPTIONS

Different design approaches can be developed for the same site, including different solutions or actuation stages. A project file can be generated for each of them and then comparisons can be made

UNICLASS 2015
Directive 2014/24/EU
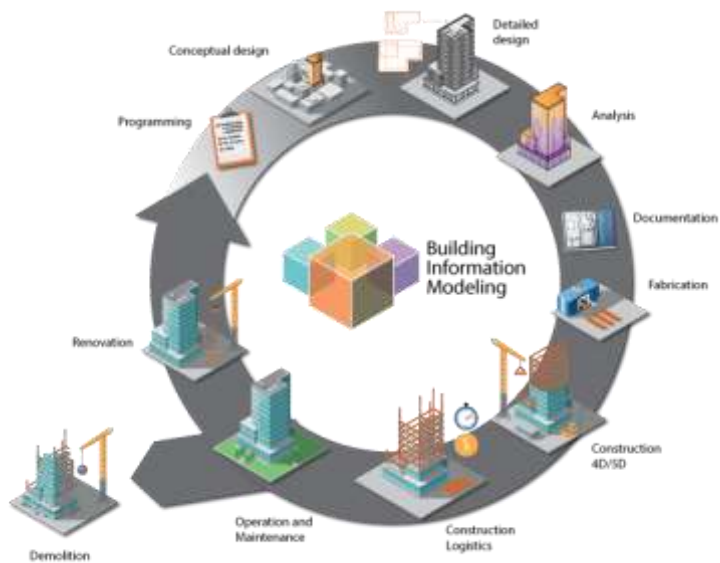
Further development: Integrating BIM

The TM is intended to develop a feasibility study including different measures against flooding. Each element included in the libraries will be associable with a UNICLASS 2015 code. This option is intended to provide data consistency within a BIM process since the beginning of the design process. Preliminary estimates will hence be performed through the plugin.

PIAZZA SAN MARCO

A first operable version of the plugin has been developed so far, a possible test site for further validation and implementation during Brigaid's testing cycles is S. Marco square for which extensive and detailed information is avaliable.
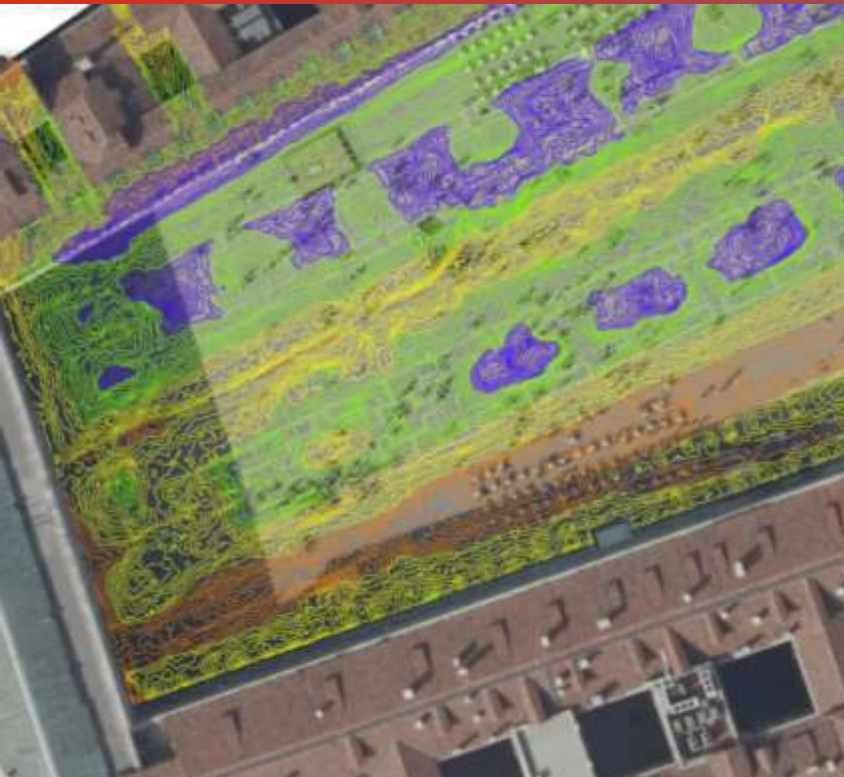
THANK YOUR ATTENTION!

The toolkit Method (TM) is a plugin for an **open-source, free** software, intended to support planning & design.
Specific instruments can be **customized** to client needs.

Please visit us at the innovation market

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