



BRIDGING THE GAP FOR INNOVATIONS
IN DISASTER RESILIENCE

THE TOOLKIT METHOD



Planning integrated measures against flooding for urban areas

Brigaid 1st Conference
Venice 9th -10th November 2017

Francesco Lanza – Thetis SpA



There is a plugin update available

Coordinate

1371147,5715638



Scale 1:5,453



Magnifier 100%



Rotation 0,0



Render



EPSG:3857 (O

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 populated area may prove itself very costly due to interferences it may causes

COSTS



PREVIOUS EXPERIENCES: THE ARSENALE

Planning and developing a restoration plan for the northern part of the Arsenale called for an 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.

OBJECTIVES

1 INTEGRATED

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

2 USER-FRIENDLY

A Simple interface, with a limited number of instruments 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

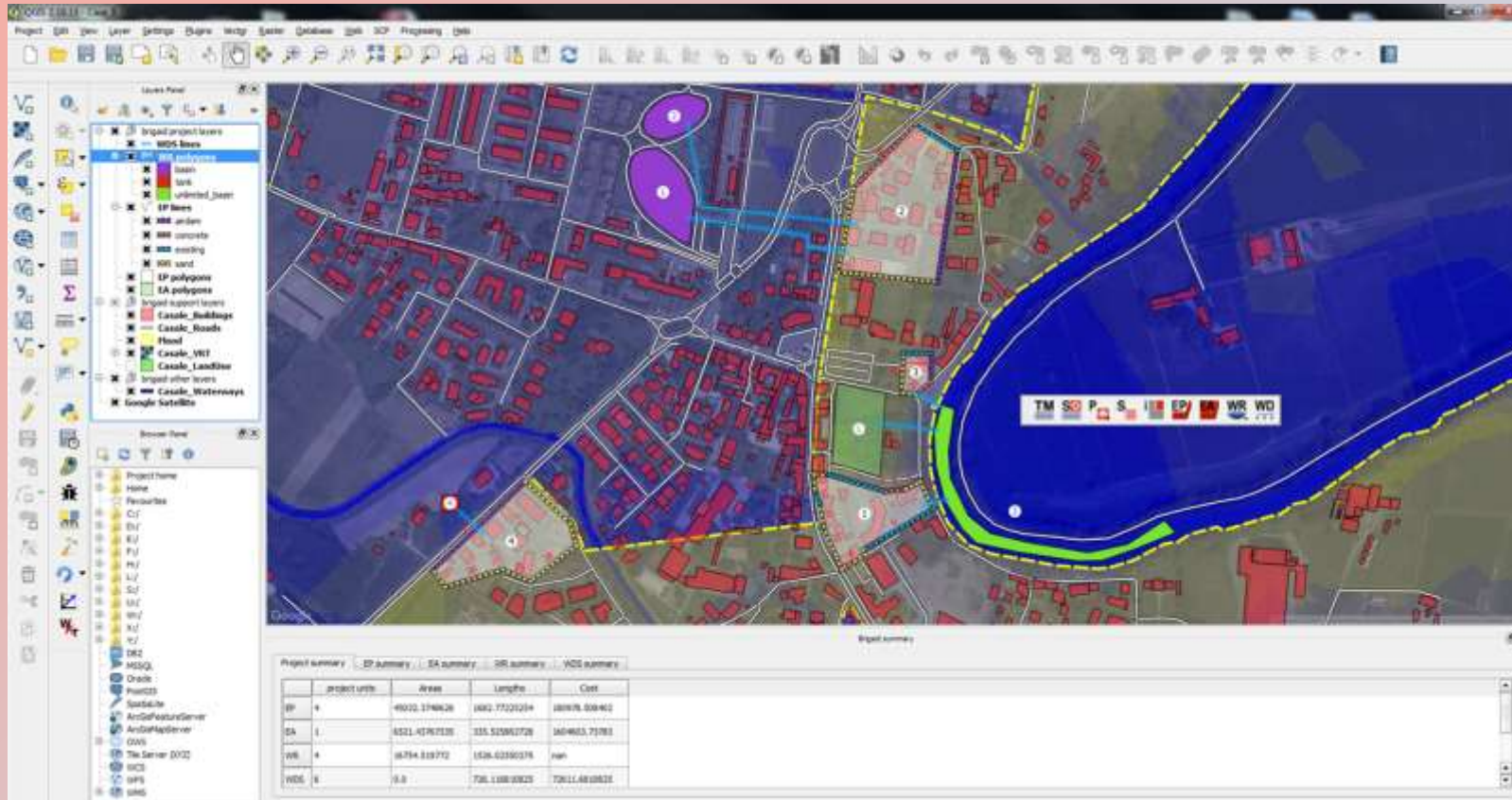
Single, Open format file which can be easily used to cooperate on the same project

5 COMPARABLE

Different solutions can be easily drafted and compared

6 IMPLEMENTABLE

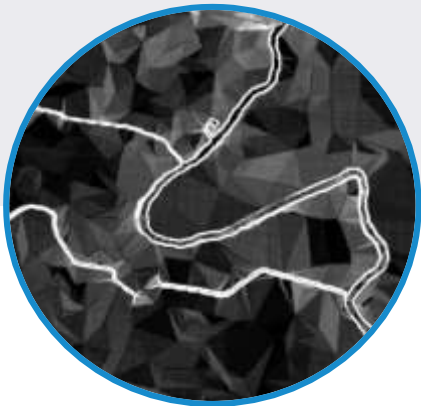
Libraries can be implemented and customized. Additional information can be included in the project



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.

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.

DTM



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

BUILDINGS, STREETS



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

FLOOD MAP



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

RUNOFF COEFFICIENT
& RAIN DEPTH

...AND SOME EXTRAS IF AVAILABLE

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

SEWAGE SYSTEM



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

LAND USE



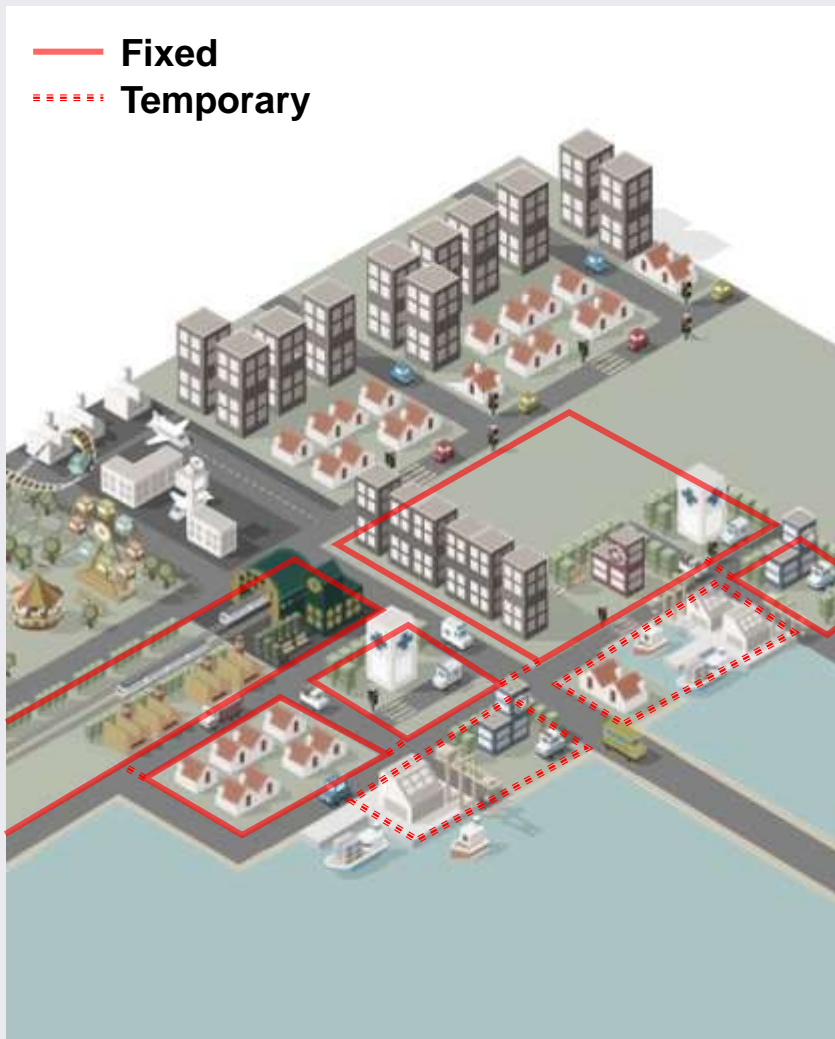
Strategic infrastructure can be imported to verify possible critical issues

INFRASTRUCTURES



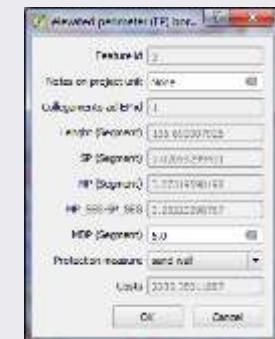
User can add extra maps which may be significant for the study site.

[...]



Protected Perimeters

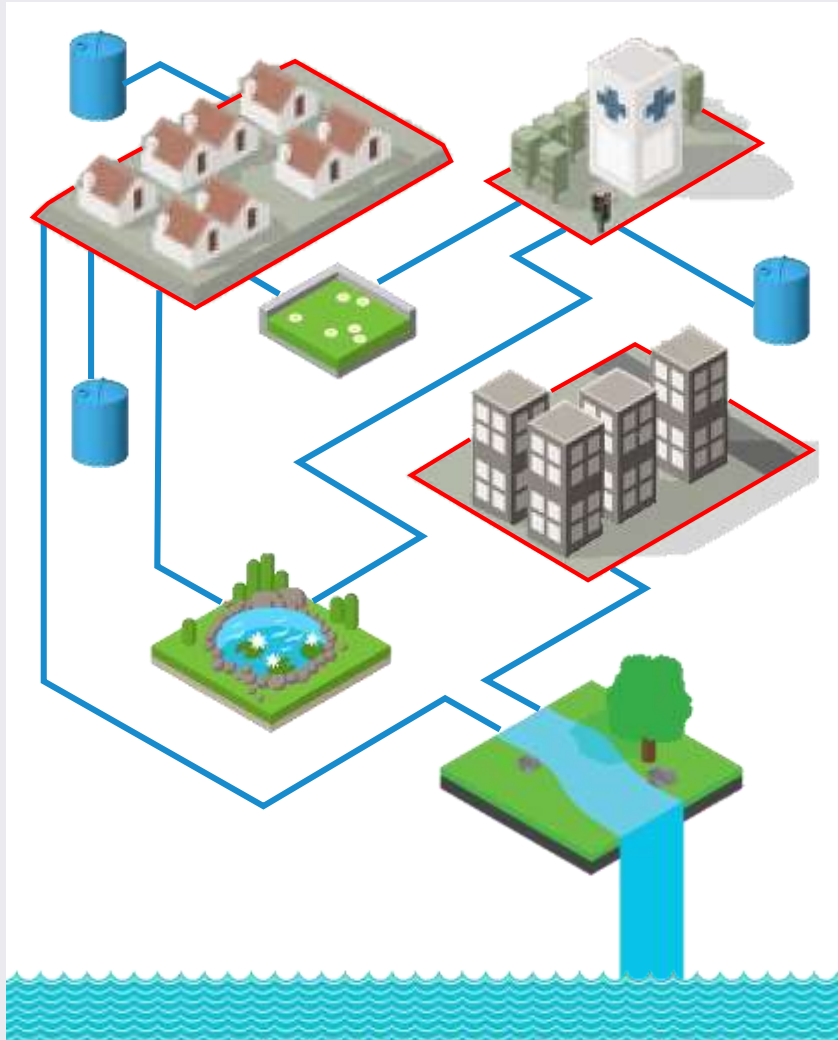
Two basic tools are available, the first – **protected perimeters** – allows the user to draft protection along borders defining the maximum level at which defense is set. The user can then assign a specific protection measure to each segment of the perimeter.



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.



Strategies & Measures

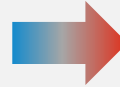
The plugin guides the user from drafting a general plan of protection to the assignment of specific measures to each sub-component of the project.

✓ 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



✓ [...]

✓ Impervious 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



summary
report
Case_III

Feature	Project code	Name	Length	Unit
EP	1	100000.00	100000.00	100000.00
EA	1	100000.00	100000.00	100000.00
WR	1	100000.00	100000.00	100000.00
WDS	1	100000.00	100000.00	100000.00
TOTAL	11.0	100000.00	100000.00	

ID	NAME	AREA	PER	SP	IMP	IMP_CODE	TYPE	COST	UNIT	MC
1	EP_1	Name	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00
2	EP_2	Name	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00
3	EP_3	Name	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00

EP

ID	NAME	AREA	PER	SP	IMP	IMP_CODE	TYPE	COST	UNIT	MC
1	EA_1	Name	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00
2	EA_2	Name	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00
3	EA_3	Name	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00

EA

ID	NAME	AREA	PER	SP	IMP	IMP_CODE	TYPE	COST	UNIT	MC
1	WR_1	Name	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00
2	WR_2	Name	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00
3	WR_3	Name	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00

WR

ID	NAME	AREA	PER	SP	IMP	IMP_CODE	TYPE	COST	UNIT	MC
1	WDS_1	Name	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00
2	WDS_2	Name	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00
3	WDS_3	Name	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00
4	WDS_4	Name	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00
5	WDS_5	Name	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00	100000.00

WDS

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.

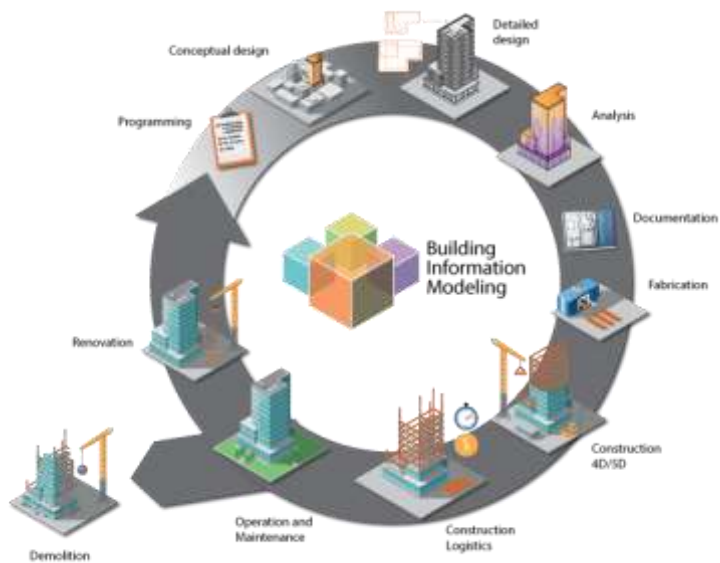


EVALUATING ALTERNATIVE OPTIONS

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

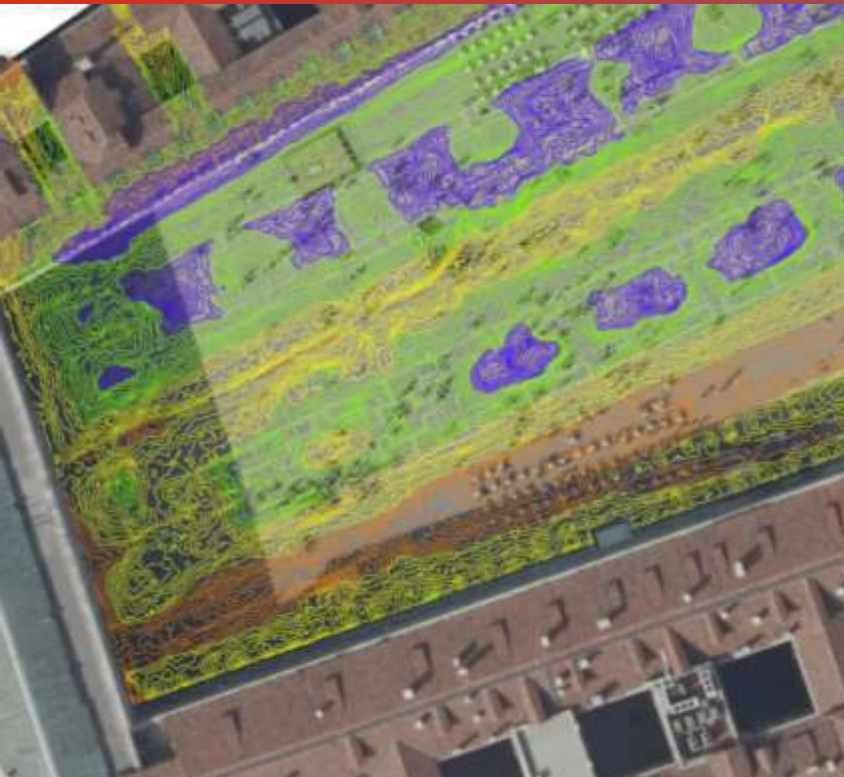


Further development: Integrating BIM

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 available.




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



Francesco Lanza
Thetis SpA – Castello 2737/f
30122 Venice
Tel. 0039 041 2406276
Mob. 0039 340 5899092
francesco.lanza@thetis.it




BRIGAIID
BRIDGING THE GAP FOR INNOVATIONS
IN DISASTER RESILIENCE

The Toolkit Method (TM)

Planning integrated measures against flooding for urban areas

Description
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. It has been developed as a QGIS plugin. It is based on a limited set of easily available data (DTM, buildings and streets map, land use, flooding map, etc.) and it guides the user through the design of protected areas and perimeters to which different kind of technical solutions can be assigned. The plugin includes also a set of elements for a preliminary evaluation of rainwater management within the protected areas. All the data are collected and ordered within a single project file which can be used as a base for a collaborative design process.





End-users
Public entities:
• Administrations
• Urban Planning offices
• Organizations for Cultural Heritage conservation
• Protection agencies
Private entities:
• Engineering, Architecture and Planning companies
• Citizens Associations

Implementation
• Regions
• Harbour cities prone to flooding, e.g.
• Italy: Veneto, Friuli, Venezia, Catania, Genova, Agrigento, Caserta
• Europe: Prag, Passau, Bonn, Leod, Chemnitz, Rosenheim, Tübingen

Further Development
• Implementation of library sets of protection measures (protected perimeters, protected areas, etc.)
• Inclusion of UNICLASS 2015 within the library classification system in order to provide data consistency within a BIM process
• Optimization with existing QGIS and GRASS GIS additional tools and end-user customization.

Markets
• Public administration services
• Decision support systems
• Sustainable development
• Cultural Heritage protection

Contact information
Francesco Lanza
francesco.lanza@thetis.it
0039 0406276
www.BRIGAIID.eu



The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 700608