

WP 3 – Representative models of Built Environment Typologies (BETs) prone to SUOD/SLOD. Case studies selection and data collection

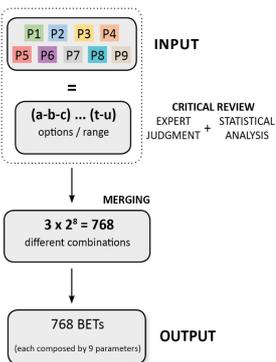
T 3.1 - Definition of representative BETs models prone to both SUOD and SLOD. BE characterisation as function of the building-open space-infrastructures interfaces (e.g. Façades on Square, Street, Pedestrian route) in terms of morphology and construction technologies. Development of tools/methods for BETs representation in extensive models (BIM based) and fast models (VR/AR oriented)

D3.1.1 – BETs DEFINITION AND REPRESENTATION REPORT

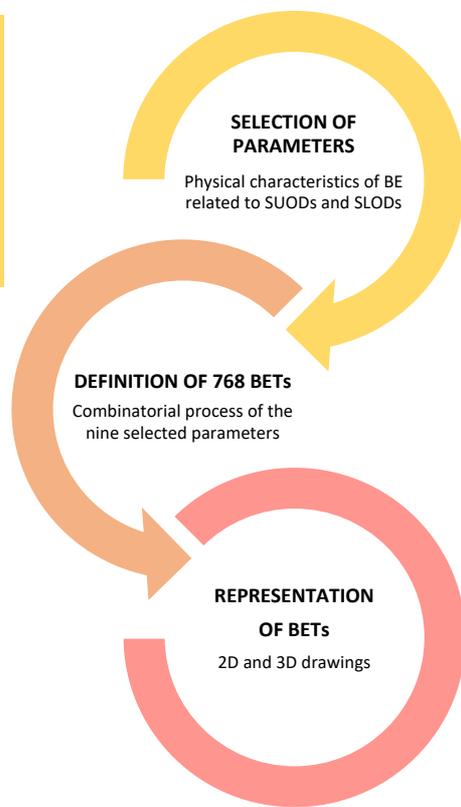
To study the impacts of disasters on the BE, the characterisation of the urban environment needs to be simplified into parameters that should be handled and modified depending on different contexts. According to this purpose, the current deliverable sets out to systematise the whole parameters, which influence the disaster response, allows providing criteria for evaluating the performance of the Built Environment (BE) in emergency conditions, that is defined in other terms as resilience of an urban system. The final focus is the definition of Built Environment Typologies (BETs) as essential components of the BE composed by the smallest amount of morphological, geometric and constructive characteristics that summarise the whole relevant physical aspects influencing the response to both SUODs (WP1) and SLODs (WP2).

The selection of the parameters composing BETs has been carried out based on the knowledge acquired from WP1 (SUODs) and WP2 (SLODs). This step relies on the experts' judgment that allows to select physical parameters that characterise the OS (Open Space) in morphological, geometrical and constructive terms and play a key role in determining risks.

After selecting the nine parameters describing BETs, a statistical analysis of a set of 133 squares of the main Italian cities has been carried out for gathering information to assign numerical values to the selected parameters. This step ensures the reliability of BET models obtained given that they contain characteristics that are both relevant to SUOD/SLOD risks and prevalent among the main cities of the entire Italian territory.



The nine selected parameters, which univocally describe both AS (Areal Space) and LS (Linear Space), have been characterised through the definition of threshold for each of them in order to distinguish different variation range (options) that have been alternatively chosen and combined for the definition of the BETs. In this regard, the statistical analysis provides a useful aid to define the variation range of P1, P3, P4.



Finally, the definition of BETs has been performed by a combinatorial process of the nine parameters and their options. The final result consists of 768 different combinations ($3 \times 2^9 = 768$). This great amount of BETs requires a huge computational effort. Therefore, some representative "basic" BETs configurations will be selected for BIM and VR/AR models developed in WP3. In fact, this work connects the broad state of art carried out in tasks 1 and 2 and the modeling and simulation procedure of task 3.

| PARAMETER | | OPTIONS | |
|-----------|---------------------------------------|---------|---|
| CODE | descriptor | CODE | range |
| P1 | Morphological configuration | a | Compact ($1 \geq R \geq 0.75$) |
| | | b | Elongated ($0.75 > R > 0.25$) |
| | | c | Very elongated ($R \leq 0.25$) |
| P2 | Dimensions | d | $H_{max} > w$ |
| | | e | $H_{max} \leq w$ |
| P3 | Structural type | f | SA (all fronts) |
| | | g | SA (not all fronts) |
| P4 | Permeability (accesses) | h | $\sum \alpha_i > 36^\circ$ (a., b.) / $\lambda > 0.06$ (c.) |
| | | i | $\sum \alpha_i \leq 36^\circ$ (a., b.) / $\lambda \leq 0.06$ (c.) |
| P5 | Special buildings | l | yes |
| | | m | no |
| P6 | Homogeneity of constructive technique | n | yes |
| | | o | no |
| P7 | Porches | p | yes (>25% of Frontier) |
| | | q | no (0 – 25% of Frontier) |
| P8 | Slope | r | no (slope constant) |
| | | s | yes (quote difference/stairs) |
| P9 | Green | t | yes |
| | | u | no |

In conclusion, graphical 2D and 3D representations of six examples of the 768 BETs provide the characterisation of all the parameters. Moreover, the validation is carried out through the application of this procedure to real case studies, which have been studied in the WP1 and WP2.

