DESURBS Deliverable 1.2: Incidents database specification

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1. Introduction

This report constitutes draft Deliverable 1.2 of the FP7 Security Program research project 'Designing Safer Urban Spaces' (DESURBS, Grant Agreement no. 261652). It is the second deliverable of work package 1 (WP1) of the project and is a summary of the work completed in the second task (WP1.2) of that work package. The purpose of this draft Deliverable 1.2 is to present the emergent specification of the relational database. It builds on the analysis of the of security incidents outlined in the previous report (D1.1).

1.1 Background

As security-related risk in cities has intensified our concern with anticipating, preventing, preparing, responding and recovering from the disruptive challenges brought about by such enhanced risk has become a key concern of urban managers and built environment stakeholders such as urban planners, urban designers, civil engineers and architects. Security risks to urban areas are widespread. From crime and public order to terrorism, "securitising" cities has been a focus of policy responses. This has occurred alongside ongoing natural threats such as earthquakes and flooding, which include in many cases increasingly human induced risk – and the ever present risk of accidents in evermore crowded urban areas. Through it all enhancing resilience - the capacity to adjust to threats and mitigate or avoid harm and has physical, economic and social components – has become is the aim for urban stakeholders. Shaping new and existing urban spaces through planning, design and management is central to this.

Resilient design is therefore a holistic activity involving a range of activities which shape and manage the built fabric so as to reduce its vulnerability to a range of hazards and threats. It is concerned with both the spatial form and redesign of the built environment as well as the processes that help shape it. Yet designing and redesigning urban spaces to make them more secure is often constrained by the limited local knowledge and experience of dealing with these different types of hazard and security threat. By sharing, analysing and understanding past experiences of how these risks have impacted on urban spaces improvements in the practice of resilient urban planning, design and management can be made.

1.2 The DESURBS Project

DESURBS is a research-based project which aims to develop tools which assist built environment professionals and urban managers to create and maintain safer urban spaces. Through a series of integrated work packages and based on knowledge from past incidents, DESURBS is developing an online, interactive decision support tool to help users identify strength and weaknesses in urban spaces and take the most appropriate steps to identify, mitigate against or eliminate the risks to them through enhancing resilience.

The main objective of this project is to create a decision support portal to tackle this problem. The portal will consist of a continuously evolving urban space security event database, an Integrated Security and Resilience (ISR) task plan formulation framework for engaging and assisting local stakeholders in the decision support process; and comprehensive supporting models and tools to improve the design of new and renewed urban areas. Improved design will contribute to the creation and maintenance of safer places, protect surrounding natural environments and making the urban space itself less vulnerable to damage.

The overall strategy of the DESURBS work plan is straightforward and aimed at achieving the best possible workflow. The work is divided into seven work packages of which WP1 is the first.

1.3 Work Package 1 (WP1)

WP1 involves establishing the urban security and resilience database that looks at a range of past urban security incidents and 'near misses' and that is sufficiently comprehensive to inform the identification of weak points in a variety of urban spaces in cities old and new, and to inform the design of more robust and resilient spaces in the field of urban planning/design/engineering. The security incidents analysis is to act as the basis for the creation of a relational database that can be a useful resilient redesign tool for urban planners, designers and engineers. This report provides details of this analysis. WP1 lays the foundations for the project. It contains four tasks:

- To identify a range of past urban security incidents and 'near misses' in differing urban environments that is sufficiently comprehensive to:
- To inform the identification of weak points in urban spaces;
- To inform the design of more robust and resilient spaces in the field of urban planning/design engineering
- Illuminate the need for and usefulness of the comprehensive supporting tools to be developed in the project in WP4.

This is broken down into 4 sub-work packages:

WP1.1 established a list of security incidents and was reported on in DESURBS Deliverable 1.1*, Security incidents analysis*.

WP 1.2 specifies the form and content of the relational database and is the subject of this report.

WP1.3 establishes the initial, fully functional database (including the rating scale from WP1.4) that can be used as a resilient (re)design tool by our targeted end users (urban planners, designers, engineers).

WP1.4 develops an objective rating scale for quantifying safety of different urban space designs and use it to show that DESURBS solutions result in urban spaces less prone for and less affected by security threats.

The subsequent Work Packages in the project build around WP1. In WP2 we elaborate an Integrated Security and Resilience (ISR) design assessment framework which details a multi-disciplinary methodology that engages local stakeholders and focus groups to help recognize and understand the risks and vulnerabilities present, in the context of the competing functionalities (social, economic, aesthetic, managerial) and limitations in a given urban area. In WP3, we develop mapping and visualization tools to facilitate efficient use of the project's outputs. In WP4 we develop and adapt supporting models, tools and technologies that advance the state-of-the-art for quantifying different vulnerability aspects of urban spaces to identified threats and risks, to be used to help carry out the ISR design methodology within the framework developed in WP2. The activities of WP2, WP3 and WP4 are informed and developed with reference to case studies in Jerusalem, Barcelona and Nottingham, where the project has established ties with local governmental and municipal planning authorities. In WP5 we combine all of the above into an internet-based, user friendly Decision Support System Portal. WP6 and WP7 are for dissemination and management, respectively.

2. Role of WP1.2

This report covers work carried out in work package 1.2 (WP1.2), which is

- To specify the form and content of the relational database;

In the previous report, D1.1, we outlined the construction and analysis of a list of incidents and near misses in crowded urban spaces. This illustrated:

- A set of weaknesses in the planning, design and management of urban spaces
- Examples of these weaknesses occurring in urban spaces
- A demonstration of how the tools being developed in the DESUBS project might have mitigated against these weaknesses and incidents and/or have aided their management.

WP1.1 provided the foundation for the development of this database. In collating key information about each incident an initial database was established. This has enabled us to identify what information is important to capture in using cases within a relational database, identifying the key fields and the way in which these are structured.

WP1.2 builds on this work. It utilises the initial database created for WP1.1 and the analysis of incidents as a working foundation. It establishes the specification of the relational database, which is a core output of WP1 and which feeds directly into WP1.3.

Whilst this report focuses on WP1.2, it inevitably makes links to the rest of WP1 and the objectives of other work packages where it is appropriate.

3. Database Specification (WP1.2)

3.1 Incident List and Initial Database (WP1.1)

As indicated in the previous section, WP1.1 developed a provisional database of security incidents. Whilst its primary function was to highlight the weaknesses in urban space and the potential benefit of the DESURBS tools in preventing or mitigating against these incidents in the future, it also laid the foundations for the later work in WP1 and linked to ongoing work in WP2, WP3, WP4 and WP5.

This incident list provides a rich set of data which can be utilised by end-users to learn from previous mistakes. This dataset will be incorporated into the DSSP as outlined in section 3.2.1 below.

3.2 Relational Database (WP1.2)

The Microsoft Access database that is a catalogue of security incidents retained for analysis in WP1.1 contains records of information about each incident, but these are not tailored in format or in content to being useful as part of a working tool for practitioners trying to achieve resilient redesign of urban spaces. The task of WP1.2 is to develop this list of incidents into a relational database which will in turn dovetail with the tasks undertaken and products developed in the other work packages of the project. The relational database contains the data required within the DSSP. Initial development work had focussed on expanding the WP1.1 incident list. However, it became clear that this would not meet the requirements of the ISR (WP2) and the DSSP (WP5). The relational database therefore needs to be constituted of a series of related datasets which can be utilised within the DSSP.

Using the WP1.1 text database as our base, we can ascertain that this format alone is not sufficient. A single incident analysis might include maps, charts, pictures, diagrams, data tables and other contextual information to clearly bring out the essential features and lessons learned from that incident, and at a level that is not just simply for laymen or interested readers, but for expert urban space designers, planners and engineers that already use the state-of-the-art tools available in their respective trades. Additionally, the database should be open source so that users do not have to rely on third-party proprietary software packages to access the DESURBS results.

To this end we have constructed 3 datasets within the Relational Database:

3.2.1 Incident List

As already outlined in D1.1, the work of WP1 has established a list of security incidents and near misses provides a useful overview of incidents by direct risk type and illustrates a number of weaknesses.

The dataset has now been rationalised and cleaned to ensure it is fit for purpose. The database field structure is illustrated in table 3.1. It is designed to provide non-registered users of the DSSP with basic, generic information about the types of incident that have occurred as a result of 6 different hazard types (Industrial Accidents; Earthquakes; Events; Floods and Storms; Terrorist Incidents; Tunnel Collapse and Ground Movements) and the design weaknesses that they highlight.

Field	**codename**	**Data Type**
Incident Name	incident_name	String
Incident Type	incident_type	String
City	city	Strong
Country	country	String

Date Of Incident	incident_date	Date
Place Type	place_type	String
Geocode Of Location	geocode	Geocode
Description Of Incident	incident_desc	String
History And Likelihood Of Similar Incidents	likelihood	String
Incident Impact - Economic	economic	String
Incident Impact - Social	social	String
Incident Impact - Physical & Material	physical	String
Incident Impact – Infrastructure/Utilities Disruption	infrastructure	String
Weakness: Structural	w_structural	Tick-Box
Weakness: Structural (Notes)	w_structural_note	String
Weakness: Industrial Design	w_industrial	Tick-Box
Weakness: Industrial Design (Notes)	w_industrial_note	String
Weakness: Materials	w_material	Tick-Box
Weakness: Materials (Notes)	w_material_note	String
Weakness: Urban Planning	w_urban	Tick-Box
Weakness: Urban Planning (Notes)	w_urban_note	String
Weakness: Hazard Mitigation	w_mitigation	Tick-Box
Weakness: Hazard Mitigation (Notes)	w_mitigation_note	String
Weakness: Emergency Response	w_emerg_resp	Tick-Box
Weakness: Emergency Response (Notes)	w_emrg_resp_note	String
Weakness: Site Management	w_site_mgt	Tick-Box
Weakness: Site Management (Notes)	w_site_mgt_note	String
Weakness: Maintenance	w_maintenace	Tick-Box
Weakness: Maintenance (Notes)	w_mainenance_note	String
Weakness: Stakeholder Involvement	w_stakeholder	Tick-Box
Weakness: Stakeholder Involvement (Notes)	w_stakeholder_note	String

Table 3.1 – Field Structure of WP1.1 Incident List Dataset

This dataset will underpin the information available to all users of the DSSP. It will be used to underpin the visualisation tool of incidents and design weaknesses accessible to everyone at the front end of the portal.

3.2.2 ISR Case Examples

The ISR Case Examples database has been designed with a structure that compliments the ISR stages. Initial development of the database had proposed expanding the WP1.1 Incident List. However, on closer examination it was realised that this dataset would not meet the needs of the ISR. To use every case would require extensive updating and the acquisition of data which may not exist. Through discussions between the lead teams for WP1 (Birmingham), WP2 (Loughborough) and WP5 (Southampton) it was decided that a new dataset was required.

The structure of this dataset reflects that of the ISR stages identified in WP2, as illustrated in Table 3.2 below. The requirements of the dataset are that cases need to be “stored” in a format which a) allows them to be drawn in to the relevant part of the ISR and b) produces a meaningful case study for users. Therefore we have developed the following specification which reflects these needs.

Field Description	Data Type	Additional Notes
General Information (Included for all cases)		
Incident Name	String	*Give a brief, commonly used name to the incident*
Incident Type	String	*Identifying Field selected from one of the 6 hazard types (Industrial Accidents; Earthquakes; Events; Floods and Storms; Terrorist Incidents; Tunnel Collapse and Ground Movements)*
City	Strong	*The name of the city in which the incident took place.*
Country	String	*Use the UN Standard 3-letter (not numeric) code for the country available from http://unstats.un.org/unsd/methods/m49/m49alpha.htm*
Geocode	Date	*Insert as **dd/mm/yyyy** format*
Date of incident	String	*To be selected from one of the following only using a drop down list:* ○ *Transport Terminal* ○ *Shopping Centre* ○ *Business District* ○ *Sports Venue* ○ *Entertainment Venue*
Place Type	Geocode	*To geocode use http://www.gpsvisualizer.com/geocode and enter the address of the incident. The Geocode should be in a format 53.4833,-2.2435 or entered into Google maps and returned as a URL e.g. http://maps.google.co.uk/maps?q=53.4807125,+-2.2343765*
Description of Incident	String	*A brief description of the main elements of the incident. (300 words max)*
Design & Construction of the site; how it was planned and how it is used.	String	
How was the space planned and designed?		*Outline, where available, the planning and design steps taken in the realisation of this space. Include details of*
Layout & Land Use		*A brief synopsis of site location and spatial configuration (e.g. different land uses, access points, connectivity to other spaces, street furniture, etc). Where available please collate maps, plans and diagrams and send as electronic multimedia files separately (see below)*
Use Profile of the Space		*On which days and what times of day is the space used?*
Stage 1 - Identify, characterize, and assess hazards/threats		
Was the hazard or threat identified prior to the incident?	Yes/No	
If so, how was hazard or threat identified?	String (if yes)	Only complete if ”yes” to previous question.
If not, how would the incident have been prevented/mitigated?	String (if no)	Only complete if ”no” to previous question.
Was there a history of similar incidents?	String	

Was this taken into account?	Yes/No	
If so, how?	String (if yes)	
Were there any lessons associated with hazard/threat identification that can be learned from this case example?	String	

Stage 2 - Assess the vulnerability of urban spaces to specific hazards/threats

Were any vulnerabilities identified prior to the incident occurring?	String	
If so, how were they identified? How were they affected during/post-event?	String	
If not, how would the identification of vulnerabilities aided in prevention/mitigation?	String	
Was there a history of similar incidents?	String	
Was this taken into account?	Yes/No	
If so, how(2)?	String	Only complete if ”yes” to previous question.
Did assessing vulnerabilities highlight any matters not previously known?	String	
Were there any lessons about vulnerability identification that can be learned from this case example?	String	

Stage 3 - Determine the risk (i.e. the expected consequences of specific hazards/threats on specific assets)

Was a risk assessment performed for this space?	String	Yes/no
When was it undertaken and was it updated?	String	
Was there a legal/moral requirement to undertake a risk assessment for this space?	String	Yes/No Provide detail of the specific requirements in this case.
If so, what risk assessment was used?	String	
What were the outcomes?	String	
Were the outcomes illustrated by the incident as envisaged by the assessment?	String	

If not, how would undertaking a risk assessment have prevented/mitigated the incident?	String	
Was there a history of similar incidents?	Yes/No	Yes/No Outline the history
If yes, provide details.	Strong	Only complete if ”yes” to previous question.
Was this taken into account?	Yes/No	
If so, how?	String	Only complete if ”yes” to previous question.
Did assessing risks highlight any matters not previously known?	String	
Were there any lessons about risk assessments that can be learned from this case example?	String	

Stage 4 - Identify ways to reduce those risks

Stage 4a – Inherent Safety

When the risk was identified, could the hazard/threat have been avoided?	String	
What measures were put in place to ensure the risk did not happen?	String	
What additional benefits did ensuring inherent safety have, e.g. mitigating other risks?	String	
What unintended (or known) consequences did ensuring inherent safety result in?	String	
Why was this level of risk reduction chosen over others?	String	
What lessons about inherent safety can be learned from this case example?	String	

Stage 4b - Prevention

When was the risk prevented?	String	
How was the risk prevented?	String	
What additional benefits did preventing the risk have, e.g. mitigating other risks?	String	
What unintended (or known) consequences did preventing the risk result in any?	String	

Why was this level of risk reduction chosen over others?	String	
What lessons about hazard prevention that can be learned from this case example?	String	

Stage 4c - Detection

When was the risk detected?	String	
What methods were used to detect the hazard?	String	
How successful were these in reducing its impact?	String	
Did incorporating detection equipment have any additional benefits, e.g. mitigating other risks?	String	
Did incorporating detection equipment result in any unintended (or known) consequences?	String	
Why was this level of risk reduction chosen over others?	String	
What lessons about hazard detection that can be learned from this case example?	String	

Stage 5 - Prioritise risk reduction measures

Stage 5a - Control

When were mitigation measures incorporated to control the hazard?	String	
How was the risk controlled?	String	
How successful are these in reducing potential/real impact?	String	
What additional benefits did incorporating such measures have, e.g. mitigating other risks?	String	
What unintended (or known) consequences did incorporating such measures have?	String	
Why was this level of risk reduction chosen over others?	String	
What lessons can be learned about hazard control from this case example?	String	

Stage 5b - Mitigation

When were mitigation measures incorporated?	String	
What measures were incorporated?	String	
How successful are they in reducing potential/real impact?	String	
What additional benefits did incorporating such measures have, e.g. mitigating other risks?	String	
What unintended (or known) consequences did incorporating such measures have?	String	
Why was this level of risk reduction chosen over others?	String	
What lessons can be learned about hazard control from this case example?	String	

Stage 5c – Emergency Response

When were response procedures incorporated?	String	
What measures were incorporated?	String	
How successful are they in reducing potential/real impact?	String	
What additional benefits did incorporating such measures have, e.g. mitigating other risks?	String	
What unintended (or known) consequences did incorporating such measures have?	String	
Why was this level of risk reduction chosen over others?	String	
What lessons can be learned about hazard control from this case example?	String	

Table 3.2 – Field Structure of Case Examples Dataset

Cases in this database will be selected in order to highlight specific stages of the ISR for each hazard type. This is an ongoing process through WP1. Unlike the WP1.1 incident list there is no intention for every field to be completed for each case. Cases are selected because they provide information, in particularly learning points, that are important to a particular stage of the ISR. The dataset when complete will fit into the pattern illustrated below in table 3.3. In total there will be a maximum of 54 case examples.

	Case Example 1	Case Example 2	Case Example 3	Case Example 4	Case Example 5	Case Example 6	Case Example 7	Case Example 8	Case Example 9
Context									
Stage 1									
Stage 2									
Stage3									
Stage 4a									
Stage 4b									
Stage 4c									
Stage 5a									
Stage 5b									
Stage 5c									

Table 3.3 – Relationship of case examples to ISR Stage.

3.2.3 Document Repository

The final dataset is a collection of standards, regulations and other documentary material which can be attached to the end-users self generated report to provide supportive information which will aid decision making. The documents will be selected to provide coverage for all six hazard types covered by the DESURBS project and for all five stages of the ISR. Documents will include:

- Relevant EU and other transnational and international standards, codes and regulations dealing with hazard identification, assessment and mitigation.
- Selected national and local documents which provide an illustration of specific standards, codes and regulations adopted in localities designed to improve the response to hazards.

Identification of these documents will take place in WP1.3 using the matrix below.

ISR Stage		**Terrorism**	**Industrial Accident**	**Event**	**Ground Movement/ Tunnelling**	**Earthquake**	**Storm & Flood**
Identify, characterize, and assess hazards/threat	EU and other transnational						
	national level						
	local						
Assess the vulnerability of urban spaces to specific hazards/threats	EU and other transnational						
	national level						
	local						
Determine the risk (i.e. the	EU and other transnational						

expected consequences of specific hazards/threats on specific assets)	national level						
	local						
Identify ways to reduce those risks	EU and other transnational						
	national level						
	local						
Prioritize risk reduction measures	EU and other transnational						
	national level						
	local						

Table 3.4 - Structure of Document Repository

The documents will be stored internally within in the DSSP either as a document in a PDF format or as a direct link to a website if no document is available. The document will be referenced via a URL and end users will be able to access the document for download via this link.

3.4 Technical Specification

The initial design of the incident database in WP1 is from the perspective of design experts. It covers the various aspects that are pertinent to the incidents for a professional. Additionally, it provides analysis and comment on how to reduce these risks. The design consists of a number of related documents for each incident. The content therein is very rich in content but does not fulfil the requirements for a relational database. Data stored in a relational database has the following properties:

1. Data normalisation : eliminates non-atomic values and redundancy of data preventing loss of data integrity
2. Indexes : common search terms are indexed for faster queries
3. Linked information : data from multiple sources are linked with each other so searches can bring up information from all of them

The design outlined in WP5 (Interim Deliverable 5.1a) extends the design of the database to cover all these aspects. The content will remain the same but will be ordered differently. The database consists of a central table describing the key features of the incident such as name, date, and description and a number of associated tables covering related analyses such as impact and weakness. In all cases ancillary tables are used to restrict vocabulary and reduce redundancy in the database. A feature of the design is that for a single incident there exists the possibility to have more than one related table of each analysis. This means it is possible for multiple professionals to add information if required.

4. Conclusions

This report has outlined the ongoing work to specify the form and content of the relational database. It has built on the basic database structured employed in compiling the WP1.1 incident list and combined with the feedback gained from populating that list developed a more advanced database specification.

The structure of the database reflects the stages throughout each incident (before, during and after), the considerations that were made at each stage and action taken in response to the incident and/or its risk, and the lessons learnt at each stage which can be used in other cases. The fields have been designed to ensure that data is captured comprehensively and can be readily selected and filtered for use in the Decision Support Portal (DSSP).

WP1.3 will build on the work outlined here with the population and ongoing review of the datasets together with their incorporation into the DSSP.

This project is co-funded by the European Commission within the 7th Framework Programme