# DESURBS Deliverable 2.3: Generic Integrated Security and Resilience decision support framework

Project full title: 'Designing Safer Urban Spaces'

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Authors: Ksenia Chmutina and Lee Bosher ,Loughborough; with Rob Rowlands, Jonathan Clarke and Jon Coaffee, Warwick; and Panos Melas, Lee Middleton and Zoheir Sabeur, IT Innovation

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## Acknowledgements

We acknowledge the work of all the partners involved in the DESURBS project, as their own work, thoughts and perspectives have informed, and will continue to inform, the work that the DESURBS partners at Loughborough University do.

We acknowledge the time, effort and knowledge of all those who have been engaged with and provided information to-date, and that without the considerable data collection that has already taken place, and that is expected to take place, the significance, rigour and value of WP2 and others' work would not be in line with the aim and objectives of the project.

We acknowledge the work and continuing influence of Dr Julie Fisher and Dr Steve Hare-Young, who worked on the DESURBS project for Loughborough University during the first and second years of the project.

## Table of Contents

# 1. Introduction

This report constitutes Deliverable 2.3 of the FP7 Security Program research project 'Designing Safer Urban Spaces' (DESURBS, Grant Agreement no. 261652). WP2 encompasses the development of an integrated security and resilience (ISR) design framework, specifically for identifying urban vulnerabilities and improving urban spaces with respect to security threats. It is informed by:

- identifying the public and private sector stakeholders responsible for the management of security risks and understanding their roles and interconnectivities (WP2.1)
- assessing security and resilience approaches suitable for urban spaces (WP2.2)
- consolidating security and resilience approaches suitable for urban spaces (WPs 2.3 and 2.4)

## 1.1 Purpose of the report

The purpose of Deliverable 2.3 is to report on the development of the DESURBS Integrated Security and Resilience (ISR) framework.

## 1.2 Structure of the report

In order to provide consistency across all WP2 outputs, structures of all deliverables revolve around the structure of the ISR itself. Therefore, the report will detail the identification of hazards and threats, the assessment of vulnerability, the determination of risk, the identification of risk reduction measures, and the prioritisation of those measures.

## 2. ISR framework development

The purpose of WP2.3 is to consolidate security and resilience approaches suitable for urban spaces, through the creation of a generic ISR decision-support framework. This work builds on both WP2.1 and WP2.2, where the relationships between key stakeholders, and the tools and approaches that have been used for security and resilience purposes have been investigated. The integral parts of WP2.3 are WP1.3 and WP1.5 that establish the initial, fully functional database that can be used as a resilient (re)design tool by the project's targeted end users (for instance urban planners, designers, engineers). It develops an objective rating scale for quantifying safety of different urban space designs and uses it to show that DESURBS solutions result in urban spaces less prone to, and less affected by, security threats.

The ISR framework therefore guides users in how to design safer urban spaces, through a stage-by-stage process that has emerged through the project's methodology (section 2.1). The ISR framework acts as the backbone of the Decision-Support System Portal (DSSP) developed in WP5 by IT Innovation, University of Southampton and that will be presented in Deliverable 2.4. Central to the development of the ISR framework has been the adherence to, and further development from, an international standard on risk management (British Standards Institution, 2011; 2009).

### 2.1 Methodology

As with the other deliverables for WP2, this report has been created through undertaking an extensive literature review, as well as data collection in the case study cities of Nottingham and Jerusalem. In regard to the review of literature, several databases were interrogated using keyword searches in MetaLib, which included the Construction Information Service (CIS), Web of Science, ICE Virtual Library, and Health and Safety Science Abstracts. References of key publications were also examined in order to provide up to date and appropriate material. The literature identified was of international origin, yet in regard to the work on Nottingham, UK-based publications and sources were predominantly used to provide the contextually specific insights that were required. Material that was more than 10 years old was not particularly prominent as there have been rapid developments on this topic in recent years. Searches for literature were undertaken in accordance with the themes and structure of the ISR framework, and roles and responsibilities of identified stakeholders. The literature review was supplemented by a number of key informant interviews with public and private sector stakeholders, in both the UK (by Loughborough University) and Israel (by Bezalel Design Academy). In total, 21 interviews were conducted with data collection in each case study city being co-ordinated by researchers at Loughborough University in accordance with UK, Israeli, and European Commission data collection and data protection rules and regulations.

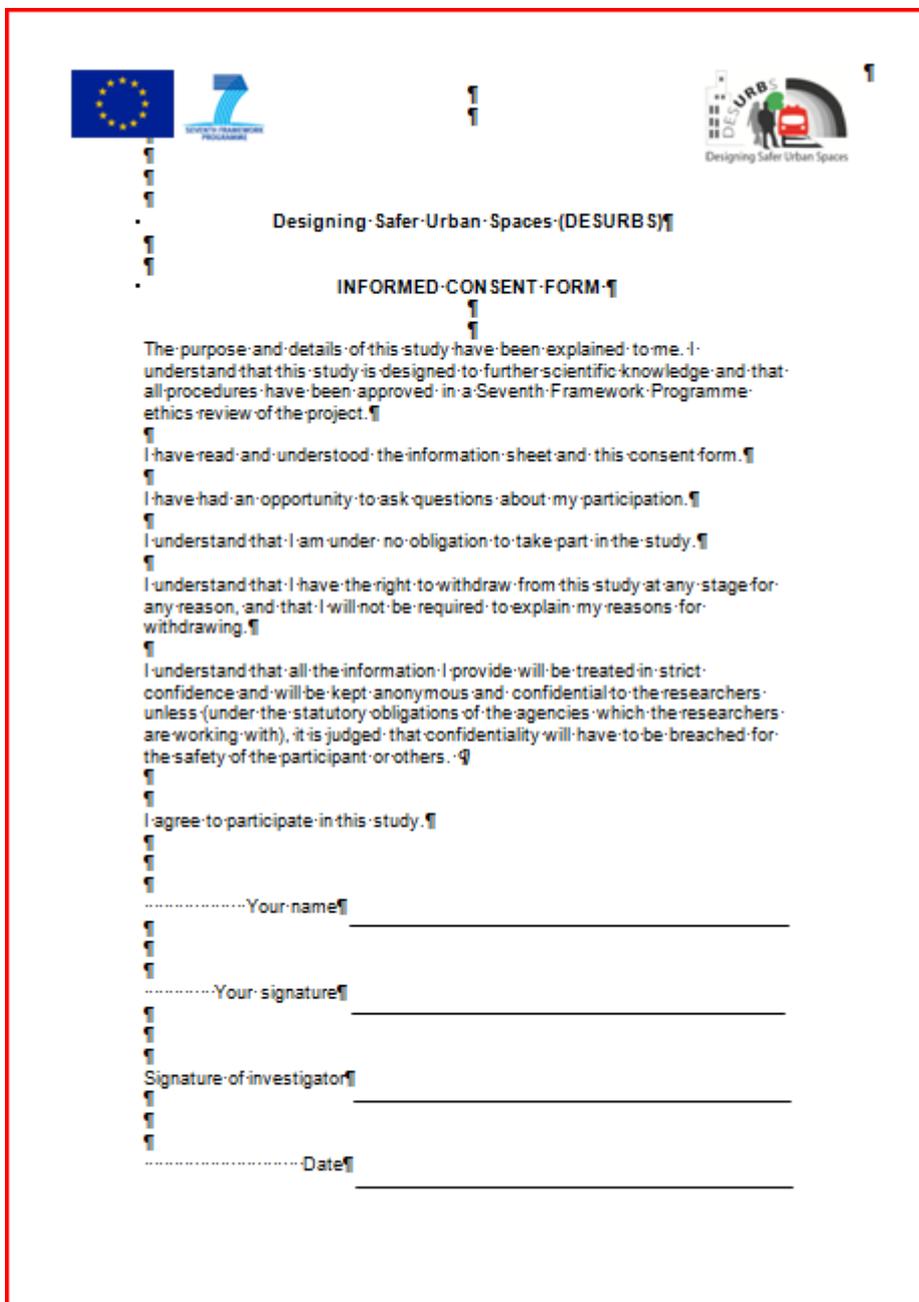To test the functionality of the prototype, four end-users were engaged during the latest stages of the online prototype development. They were encouraged to walk through the prototype and comment on their experience. Their comments are provided in Appendix A. The interviews and prototype testing were conducted in accordance with UK, Israeli, and European Commission data collection and data protection rules and regulations.

### 2.1.1 Ethics treatment

Ethical considerations are crucial in recognising and responding to 'human issues' involved in undertaking research, as such considerations encompass the potential for harm, informed consent, invasions of privacy and the use of deception. All the research conducted for this deliverable was taken respectfully of the appropriate data protection legislation. All personal data was processed fairly and lawfully, was obtained and used lawfully in relation to its given purpose, was not excessive in relation to said purpose, and was at all times secure and not transferred to any outside parties. Personal data use authorizations for Loughborough University in the United Kingdom and Bezalel Academy in Israel are provided in Deliverable 7.8. Interviews in the United Kingdom were carried out solely by Loughborough University; those in Jerusalem were carried out solely by Bezalel Academy.

No personal data were shared between project partners. All interviewees were presented with and asked to sign the DESURBS informed consent form (see below) prior to any interviews.

**DESURBS informed consent form for interviews:**



Designing Safer Urban Spaces (DESURBS)

INFORMED CONSENT FORM

The purpose and details of this study have been explained to me. I understand that this study is designed to further scientific knowledge and that all procedures have been approved in a Seventh Framework Programme ethics review of the project.

I have read and understood the information sheet and this consent form.

I have had an opportunity to ask questions about my participation.

I understand that I am under no obligation to take part in the study.

I understand that I have the right to withdraw from this study at any stage for any reason, and that I will not be required to explain my reasons for withdrawing.

I understand that all the information I provide will be treated in strict confidence and will be kept anonymous and confidential to the researchers unless (under the statutory obligations of the agencies which the researchers are working with), it is judged that confidentiality will have to be breached for the safety of the participant or others.

I agree to participate in this study.

................Your name _____

................Your signature _____

Signature of investigator _____

................Date _____

## 2.2 Stages of the ISR framework

The ISR framework stems from the literature reviews and data collection/analysis that have been undertaken over the duration of the project. The international risk management standard ISO 31000 'Risk management – Principles and guidelines ' (British Standards Institution, 2011; 2009) presents four stages, those being risk identification, assessment, evaluation, and treatment. In the ISR framework, 'treatment' has been expanded into two stages, to aid end users to 'identify' what measures can be used, and to 'prioritise' them in relation to their effectiveness (see Bosher, 2014). The five key stages of the ISR framework are detailed in Table 1.

**Table 1 Detailed contents of the ISR Framework (Bosher 2014 after Mansfield *et al.* 1996)**

| | ISR Stage | Descriptor | |
|---|---|---|---|
| 1 | Identify, characterize, and assess hazards/threats | **Hazard/Threat identification** – the process of finding, recognising and describing hazards/threats to which the space is exposed. Hazard/Threat identification involves the identification of:<br>• Type of hazard/threat<br>• The events/circumstances when the hazard/threat is prevalent<br>• Their causes<br>• Their potential consequences<br>It involves:<br>• Assessing historical data,<br>• theoretical analysis,<br>• seeking informed and expert opinions, and<br>• understanding stakeholders' needs. | |
| 2 | Assess the vulnerability of urban spaces to specific hazards/threats | **Vulnerability assessment** is the process of assessing the susceptibility of the intrinsic properties (the structure, materials, construction and planning) to a hazard/threat that can lead to an event with a consequence | |
| 3 | Determine the risk (i.e. the expected consequences of specific hazards/threats on specific assets) | **Identifying the level of risk** - magnitude of a risk or combination of risks, expressed in terms of the combination of the likelihood (chance of something happening) and the impact (consequences) of an incident caused by that hazard/threat.<br>It utilises a **Risk Matrix** as a tool for ranking and displaying risks by defining ranges for consequence and likelihood | |
| 4 | Identify ways to reduce those risks | 1. **Inherent safety** – eliminate the possibility of hazards/threats occurring<br>2. **Prevention** – reduce the likelihood of hazards/threats<br>3. **Detection** – measures for early warning of hazards/threats<br>4. **Control** – limiting the size of the hazards/threats<br>5. **Mitigation and adaptation** – protection from the effects of hazards/threats<br>6. **Emergency response** – planning for evacuation and access for emergency services | **Identifying (and prioritising) a course of action to address and treat the hazard/threat and its associated risks**. Treatment can involve:<br>• avoiding the risk by deciding not to start or continue with the activity that gives rise to the risk;<br>• removing the hazard/threat source;<br>• changing the likelihood or magnitude;<br>• changing the consequences;<br>• protecting assets/spaces from the effects of the risk<br>• preparedness planning for the impacts of risks (events)<br>• sharing the risk with another party or parties [including contracts and risk financing]; and<br>• retaining the risk by informed decision making |
| 5 | Prioritise risk reduction measures | | |

## 2.3 Rationale for basing the ISR framework upon ISO31000

By basing the ISR framework upon an accepted international standard such as ISO 31000 it is anticipated that the ISR will provide suitable relevance (in functionality and terminology used) across Europe and globally. The ISO 31000 standard has been deemed to be of relevance for the scope of the DESURBS project because it is an established framework for risk management that can be applicable to a number of dimensions encompassed by the DESURBS project, namely:

- A range of urban contexts (i.e. city, building, organisation)

- Covering a range of countries (Pan-European and global)

- A broad range of professions (i.e. planners, architects, security consultants, engineers, local authorities)

## 3. Overview of the ISR process in the DSSP

This section will present a 'walk-through' process that informs the logic behind DSSP. The ISR framework has been designed to help users to design safer urban spaces, through a stage-by-stage process, and acts as the core of the DSSP tool. In order to incorporate the ISR into the DSSP, it is important to align the ISR with the Urban Space Design Safety Scale (USDSS) (Table 2) developed in WP1.5 to provide a framework for making decisions in the DSSP. The USDSS is described in more detail in Deliverable 1.5.

**Table 2 ISR incorporation in the USDSS**

| | ISR stage | | USDSS step |
|---|---|---|---|
| 1 | Identify, characterise, and assess hazards/ threats | Hazard/ threat identification | Hazard identification + Impact = Exposure |
| 2 | Assess the vulnerability of urban spaces to specific hazards threats | Vulnerability assessment | Site Vulnerability + Design Vulnerability = Likelihood |
| 3 | Determine the risk (i.e. expected consequences of specific hazard/ threat on specific assets) | Identifying level of risk – it utilises a Risk matrix as a tool for ranking and displaying risks by defining ranges for consequence and likelihood | Exposure + Likelihood = ISDSS Rating |
| 4 | Identify ways to reduce those risks | Identifying a course of action to address and treat the hazard/ threat and its associated risk | Indicator based on risk assessment |
| 5 | Prioritise risk reduction | | |

From the end-user point of view, the ISR should address the following:

- Help in decision making;
- Provide a structure in which to understand hazards, threats and risks;
- Illustrate why the suggested steps should be taken;
- Offer a method of understanding the threats, hazards and risks the end-user faces in the designed space;
- Provide examples of how to undertake each risk;
- Offer a paper trail that will provide a record of which steps could be/have been taken by the end user

### 3.1 Stage 1: What are the hazards/ threats to this site

The aim of this stage is to help the end-user begin recognising the threats and hazards to which the chosen project space is exposed. This may sounds like a straightforward requirement but research has found that this critical stage is too often overlooked by key decision makers (see Bosher *et al.* 2007; Fisher *et al.* 2012; Chmutina et al., 2014). This is achieved through the description and identification of the hazards and threats provided by the end user. This stage involves two steps (steps 1 and 2 of the USDSS):

1. Supported by the series of statements, the end-user will be able to identify the hazards and threats.

2. Based on the impact table, a range of possible and likely impacts of X are identified. The impact rating developed in this step will then be used in stage 3.

The questions for the hazard identification are presented in Table 3. If the response to any of the questions is 'yes', this hazard/ threat[1] is identified as a potential risk to be dealt with.

**Table 3 Hazard identification questions**

| HAZARDS | INDICATIVE QUESTIONS |
|---|---|
| Terrorism and Crime | *"Is the proposed development located near an area that might be a potential target of a terrorist attack, e.g. government building, military base, TA Office, transport hub or tourist attraction?"*<br><br>*"Is there intelligence or statistics of targeting where the development is located?"* |
| Events with Crowds | *"Will the proposed development be used to host large-scale public events or gatherings?"*<br><br>*"Will there be facilities close to the development, which will potentially generate crowds, e.g. sports stadia, entertainment facilities or transport hubs?"* |
| Earthquakes | *"Is the development located in an area where earthquakes have occurred in the past, or are predicted in the future?"* |
| Floods and Storms | *"Is the development site located on a flood plain or close to the sea?"*<br><br>*"Have there been any floods or serious storm events within the vicinity of the development in recent years?"* |

Once the identification of potential hazards/ threats is complete, the end-user is required to identify a range of possible impacts based on a Table 4. The impact rating shown in is based on an overall 'score'[2] (from 1 'very low' to 5 'very high') and is discussed in more detail in Deliverable 1.5. End-users have to identify which level of impact is relevant under each heading.

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[1] It is important to notice that more than one hazard/ threat can be identified and worked on simultaneously.

[2] The score used in the calculations of the impact in stage 1 is based on the highest score given in any one category.

**Table 4 Impact of a hazard/ threat and Impact assessment scoring system**

| Impact | Social disruption and harm to life | Physical damage | Economic harm and business disruption |
|---|---|---|---|
| **Very High** | Massive loss of life (>1000) and attendant casualty level<br><br>Significant disruption for a prolonged period nationwide **(5)** | Significant and long-term damage to buildings and infrastructure **(5)** | Long-term damage to the financial well-being of similar businesses nationwide leading to bankruptcy/ closure **(5)** |
| **High** | Severe loss of life (101-1000 ) and attendant casualty level<br><br>Significant disruption for a limited period of time nationwide **(4)** | Widespread long-term public concern **(4)** | Long-term damage to the financial well-being of similar businesses throughout the region potentially leading to bankruptcy/ closure **(4)** |
| **Medium** | Substantial loss of life ( 51-100) and attendant casualty level<br><br>Significant disruption on a regional level for a prolonged period on time (**3**) | Public concern raised on a national basis for a limited period **(3)** | Significant loss over a prolonged period and / or impacting on the financial well-being of similar businesses in the immediate geographical area **(3)** |
| **Low** | Significant loss of life (10-50) and attendant casualty level<br><br>Significant disruption on a local level for a prolonged period of time **(2)** | Public concern raised on a regional basis for a prolonged period **(2)** | Significant financial loss confined to the site potentially leading to bankruptcy/ closure **(2)** |
| **Very Low** | Limited loss of life (<10) and attendant casualty levels<br><br>Local disruption for a limited period **(1)** | Public concern raised on a local basis for a limited period **(1)** | Limited financial loss confined to the site **(1)** |

The user is also provided with the breakdown showing the scores under each category (an example is shown in Figure 1). The impact rating developed in this step then informs stage 3, described in section 3.3 of this document.
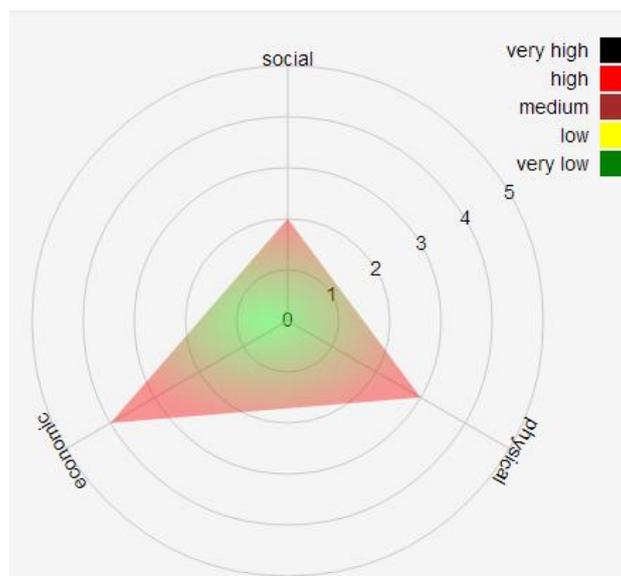
**Figure 1 Example breakdown of the impact assessment scores**

After completing this (and each following stages), the end-user is presented with a set of outputs for each hazard/ threat identified. The outputs include hazard/ threat impact rating; the exemplar case studies illustrating good (i.e. where the hazard has been identified and the benefits of this) and bad (i.e. where a hazard was not identified) practice; the list of documents that illustrate how to identify potential threats and hazards; and a list of tools useful at this stage, presented in detail in Deliverable 2.2

## 3.2 Stage 2: Assess the vulnerability of the space to the identified threats/ hazards

At this stage the end-users identify how vulnerable their project site is based on its location and design. This will be done in two following steps (steps 3 and 4 of USDSS):

1. Identification of site vulnerabilities

2. Identification of design vulnerabilities.

The identification of both groups of vulnerabilities is based on the WP1 Design Weaknesses described in detail in Deliverable 1.5. The general idea behind the assessment of the site and design vulnerabilities is similar to the impact assessment: it will be based on the overall 'scores' (1 to 5), and the breakdown of the scores will also be provided. The categories against which the vulnerabilities will be scored and their descriptors are provided in Table 5.

**Table 5 Vulnerabilities' categories and rating scale**

| Vulnerability/ Score | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| **Planning** | Full implementation of planning policy and procedures, with due consideration for potential risks at a land-use, individual site or strategic planning level. | Substantial implementation of planning policy and procedures, with due consideration for potential risks at a land-use, individual site or strategic planning level. | Some implementation of planning policy and procedures, with due consideration for potential risks at a land-use, individual site or strategic planning level. | Little consideration of planning policies and procedures, or potential risks. | No consideration of planning policies and procedures, or potential risks. |
| **Design** | Comprehensive built environment design with full consideration of the processes taking place within the resultant spaces, including how the built elements could potentially impede the effectiveness of safety and security functions | Substantial consideration within the built environment design of the processes taking place within the resultant spaces or how the built elements could potentially impede the effectiveness of safety and security functions. | Some consideration within the built environment design of the processes taking place within the resultant spaces or how the built elements could potentially impede the effectiveness of safety and security functions. | Little consideration within the built environment design of the processes taking place within the resultant spaces or how the built elements could potentially impede the effectiveness of safety and security functions. | No consideration within the built environment design of the processes taking place within the resultant spaces or how the built elements could potentially impede the effectiveness of safety and security functions. |

| | | | | | |
|---|---|---|---|---|---|
| **Management** | Comprehensive site management and monitoring programme, particularly around safety procedures and considerations of the developments ongoing processes and functions. | Reasonable site management and monitoring programme, including safety procedures and considerations of the developments ongoing processes and functions. | Basic site management and monitoring programme, with some consideration of the areas of safety procedures and the developments ongoing processes and functions | Little site management and monitoring programme, particularly in the areas of safety procedures and the developments ongoing processes and functions. | No programme of site management and monitoring. |
| **Structural** | Comprehensive structural design which considers integrity to a range of factors; proposed solution promotes robustness over considerations, such as cost. | Substantial consideration of structural designs integrity or robustness to a range of factors. | Some consideration of structural designs integrity or robustness to a range of factors. | Little consideration of structural designs integrity or robustness to a range of factors. | No consideration of structural designs integrity or robustness. |
| **Material** | Comprehensive consideration of materials performance and appropriateness for given design, with solution promoting maximum function over other considerations, such as cost. | Substantial consideration of materials performance and appropriateness for given design. | Some consideration of materials performance and appropriateness for given design. | Little consideration of materials performance and appropriateness for given design. | No consideration of materials performance and appropriateness for given design. |
| **Maintenance** | Comprehensive maintenance of built environment assets and processes, with proactive programme to replace and repair equipment vital to site function. | Substantial maintenance of built environment assets and processes, with programme of monitoring for defects to repair. | Basic maintenance of built environment assets and processes, with reactive repair of defects. | Little maintenance of built environment assets and processes, or defects repair. | No maintenance of built environment assets and processes. |

| | | | | | |
|---|---|---|---|---|---|
| **Mitigation** | Comprehensive hazard mitigation or risk assessment procedures, integrated into all levels of governance, design, construction and management. | Substantial hazard mitigation or risk assessment procedures. | Basic hazard mitigation or risk assessment procedures. | Little in the way of hazard mitigation or risk assessment procedures. | No hazard mitigation or risk assessment procedures. |
| **Emergency response** | Comprehensive emergency response design, co-produced by local emergency services providers. | Substantial consideration of emergency response in built environment design, including consultation and feedback from local emergency services providers. | Some consideration of emergency response in built environment design, with limited input by local emergency services providers. | Little consideration of emergency response in built environment design, or input by local emergency services providers. | No consideration of emergency response. |
| **Stakeholders** | Full engagement with all significant stakeholders, at the optimum stage in the design process. | Substantial engagement with all significant stakeholders, at different stages throughout the design process | Some engagement with critical stakeholders at some point in the design process. | Little engagement with critical stakeholders. | No engagement with critical stakeholders |

Overall vulnerability will be determined as a combination of a highest design vulnerability score and the highest site vulnerability score, as Figure 2 demonstrates.



**Figure 2 Overall vulnerability of the space**

The breakdown of vulnerabilities will be presented to an end user using a radar chart, example of which is given in Figure 3.
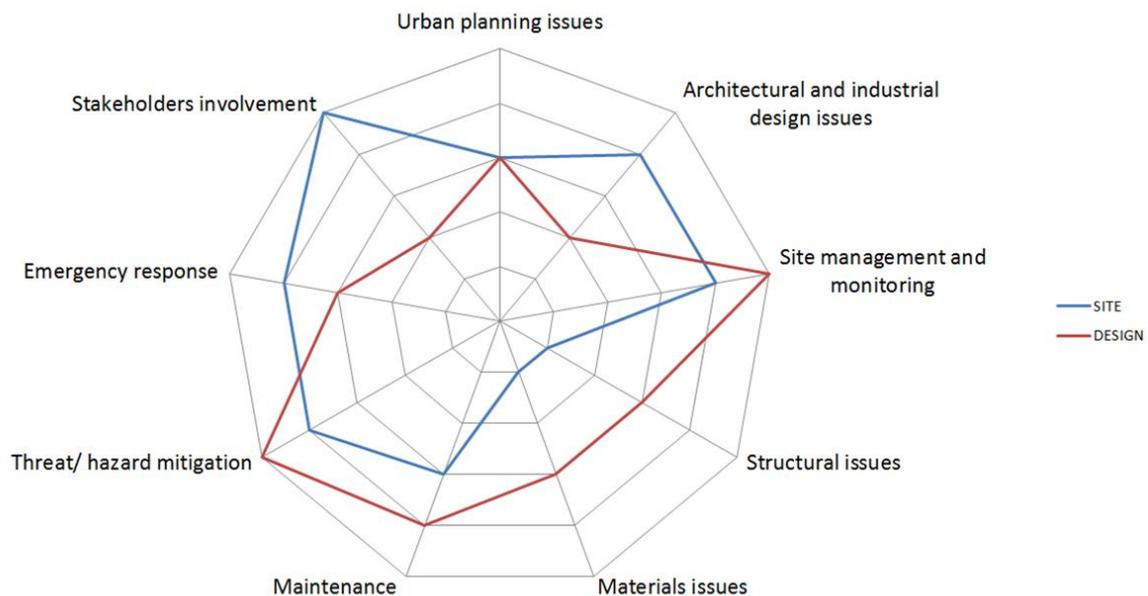


**Figure 3 Example breakdown of the vulnerability assessment scores**

Once stage 2 is complete, the end user is provided with a set of outputs that include the vulnerability rating that demonstrates the overall score and focuses on the weaknesses that need further addressing; two case examples illustrating the cases where vulnerabilities have been identified and why it was beneficial for the project, and where vulnerabilities were not identifies and their consequences; and the list of relevant documents and tools. The format of the output is similar to the ones in stage 1.

## 3.3 Stage 3: Determining risk

The objective of this stage is to demonstrate the overall magnitude of risk per hazard/ threat type. This stage is based on the information drawn from stages 1 and 2: a combination of the exposure to and impact (consequences) of a hazard, and the likelihood (change of something happening) of a hazard. The scores from stages 1 and 2 provide information for the determination of the risk illustrated in the matrix (Figure 4) based on the USDSS risk rating, described in detail in Deliverable 1.5.



**Figure 4 Risk rating matrix**

As in the previous stages, once the overall magnitude of the risk is identified, the end user will be presented with a set of outputs, including risk rating, case examples, and lists of relevant tools and documents.

## 3.4 Stage 4: Identifying ways to reduce the identified risks

The aim of this stage is to identify a course of action to address and treat the hazards/ threats and risks associated with them. Table 6 provides information on possible mitigation measures; based on the information in Table 6, suggestions of mitigation options appropriate for the identified hazard/ threat are provided to the end-user. It is however important to bear in mind that the best options will invariably be context specific.

**Table 6 Mitigation measures possible for each hazard/threat**

| Risk reduction option/ Hazard | Earthquake | Crowded event | Flood and storm | Terrorism |
|---|---|---|---|---|
| Inherent safety | N | # | # | # |
| Prevention of hazard | N | # | # | # |
| Detection of hazard | N | # | Y | # |
| Control of hazard | N | # | # | # |
| Mitigation of hazard | Y | # | Y | # |
| Emergency response | Y | # | Y | # |

'Y' –there are possibly a range of useful risk options available
'#' – some risk reduction options can be used but they are likely to be of only limited effectiveness
'N' –other than relocating the built asset there is little that can be done to reduce this hazard/ threat

## 3.5 Stage 5: Prioritising risk reduction measures

Once the potential course of action has been identified, it is important to prioritise the most suitable options. Thus the objective of this stage is to assist in identifying the most appropriate intervention(s) for a given project. The prioritisation will depend on a number of factors individual to each project; these include (but are not limited to):

- Cost vs. benefit of identified interventions
- Corporate social responsibility
- Business continuity
- Legal and statutory requirements
- Technical and social feasibility
- Proportionality of identifies interventions
- Complementarity with measures introduced to mitigate other hazards.

At the end of this stage the end users is provided with the case examples where, with hindsight, the correct or wrong options have been chosen. Similarly to the previous stages, they are also signposted to relevant tools and documents where appropriate.

## 3.6 Final DSSP report

Once all the stages are completed, the end-user will receive a report, which incorporates the results of all the stages including the following:

- Relevant bad and good practice case examples (from the case study incident data base developed in WP1);
- Scores of the impact assessment and vulnerability assessment ;
- Likelihood and exposure to risks;
- List of documents relevant for this particular case (including overview of both structural and non-structural risk reduction measures); and
- List of tools relevant for this particular case with the emphasis on the tools developed by the project partners.

It has to be emphasised that the report will not provide the answers but rather help in decision making by illustrating various examples and signposting to most suitable tools and documents that can assist the decision-making process.

## 4. Conclusion

In this deliverable we have given an overview of the ISR framework that has been developed to consolidate security and resilience approaches suitable for urban spaces, through the creation of a generic, decision-support framework. The ISR framework comprises five key stages that are primarily derived from an international standard for risk management (British Standards Institution, 2011; 2009). The ISR framework, which has feedback/review options at every stage, has gone through several iterations to this point.

This deliverable presented a detailed walk-through process of all the stages of the ISR, incorporated with the USDSS, which together will act as a backbone of the DSSP, as Figure 5 demonstrates.
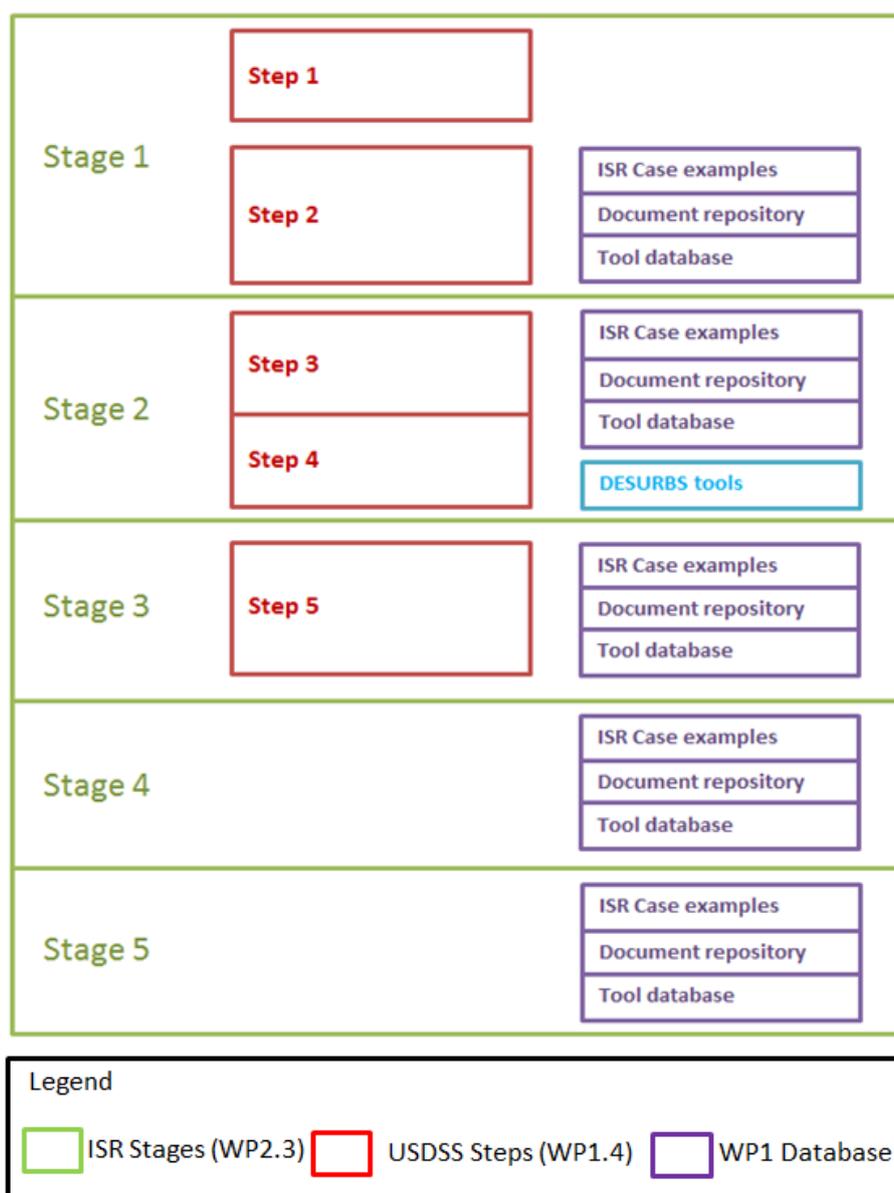


**Figure 5 The ISR and USDSS fit into ISR**

Further improvements and embedding of the ISR within the online decision-support systems portal (WP5, Southampton University) will be presented in the Deliverable 2.4.

## 5. References

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## Appendix 1: Stakeholders' initial comments on ISR prototype testing

| DSSP section | Flood manager (new small housing development, worked with two hazards: crowded events and flood) | Senior police officer (existing large shopping center, worked three hazards: terrorism, crowds and floods) | Architect (new housing development, worked with two hazards: crowds and floods) | Senior emergency manager (new housing development; worked with two hazards: flood and crowds) |
|---|---|---|---|---|
| **Main issue** | Issues with the use of Internet Explorer; iPad was used for testing | Log-in problem: issues with password creation | Log-in problem | Issue with the use of Internet explorer |
| **Extra information needed** | Not much extra information is needed. It is great that the tool contains things that are important for planning application, so even if overlooked the DSSP would remind the user about it. Also, it is great that it prompts to think about issues that maybe neglected thus focusing the end-user on what's needed. | May not be needed, as most of the questions are intuitive and if a person knows the development well, he/she should be able to answer most of the questions. | In some cases might not need know the answer to the question, so might be nice to have more space for free text | Did not require any extra information, instead DSSP prompts to think about issues that would not be normally considered (for example, many only think about risks without dividing it into impact and vulnerability). |
| **User-friendliness** | Very use-friendly, really liked the scroll down menus and links to tools and documents.<br>Would be nice if the progress bar what showing the upcoming stages as well as what's been done already (i.e. the names of the stages). | Yes, easy to use | Found it very easy to use and navigate | Found it extremely user-friendly, nice looking and easy to use. Compared to some other tools the end-user used before, this one 'did not frustrate' him. DSSP is not clunky, very fast, and is very engaging. |

| | | | | |
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| **Who could use** | DSSP has a very good potential, but need more links to policy/ legislation as local authorities have to comply with them. Keeping these kinds of documents up to date can be a problem.<br>Potential users include: local authorities and all the parties involved in planning application process (before and after), developers, planners, EA. | Architects, emergency managers, urban planners, CTSAs, EA, highway agencies, developers | Useful for those involved in planning application, but may not be very useful for designers as it does not provide specifics | Will be extremely useful for those involved in planning and construction process, but it would be good if they also engage with the emergency planners (the end-user was worried that many of those involved in construction process would not know much about DRR and thus would not realise the importance of DSSP). |
| **Overall** | Very easy to navigate, easy to understand what's required, particularly liked spider diagrams and summary dashboards.<br><br>Need more explanation on the process - i.e. what the end -user will go through and why, maybe an intro page with a brief description of all stages. It would help the end-user to think about the overall process. Currently the end-user does not know what to expect on the next page. | Very easy to understand but not too oversimplified, can be used by both experts and non-experts. The tool is very useful if you have limited knowledge; however if you have too much knowledge, than it would be useful to have some sort of free text sections where the ideas can be written down - these could be useful at the summary sections after each stage. | Liked the pop-up case examples and would want to see more than one per hazard/threat (they could address different scales of impacts for example).<br><br>Likes that the tool is very visual It certainly helps to start thinking about issues that may be neglected.<br><br>Thought that tables were quite text heavy, but got used to them by the time she was working through the second hazard | It's focus is on mitigation rather than only risk assessment which is novel and useful - it makes the end-user think about the reasons for risk.<br><br>However what DSSP does not address is the likelihood of an event taking place: for example, in this case there is a risk of a crowded event and the impact can be large, but the crowded event only takes place once a year. DSSP does not acknowledge this and shows everything as HIGH risk. |
| **Create new IRS case** | Couldn't remember what ISR stands for, need to spell it out. | Very clear. | Couldn't understand what ISR stands for | On the User Home Page, it would be good to see what steps DSSP includes, so that the end-user knows what to expect, and to provide a manual or a video that would run the end-users through the DSSP to demonstrate what can be done. |

| Identification of possible hazards and threats | Overall, very straightforward and easy to answer | On the dashboard that shows the chosen hazards it is unclear what USDSS stands for. | Wanted to add more information to the description of the development but did not know how to go back; suggested to add a 'Back' button<br><br>Wanted a free text area where she could make a note for herself that she doesn't know particular answer but needs to follow it up. | Very straightforward and easy to answer |
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| Assess the likely impact | Really liked the impact table and the triangle.<br><br>Liked links to the legislation and found it very useful as it is a god idea to signpost to good practice.<br><br>Liked case studies - good idea to use them as it is easier to understand the importance of the stage then.<br><br>It would be good to have a summary sheet (similar to the one that comes up after Stage 2) after this stage in order to keep things consistent. | Really liked case examples and links to tools and documents.<br><br>Impact table was easy to follow, did not have any problems here. | 'Save' button distracted from looking at additional sources, and when it was pressed the end user was taken to the next page straight away.<br><br>Really liked the triangle<br><br>In the pop-up case study, would be good to see in the title if it's a good or a bad example<br><br>It would be nice to have a manual handy (and printed out), so the end-user does not need to go back and forth to the impact table | Really liked the idea of 'additional information'<br><br>Was not sure whether he needs to click 'next' or 'return to dashboard'. |

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| **Site vulnerability** | Was confused in the beginning whether it is for a development project overall or just for a specific hazard.<br><br>The vulnerability table is useful, although when opened first it seemed very long. It was good that it was the same for all the hazards.<br><br>Need to make the description clearer.<br><br>Was very happy to see that 'maintenance' is included, as no one ever thinks about it. | Not clear if it is for a specific hazard.<br><br>Would be nice to have a print out of the vulnerabilities table - maybe we should include it into the manual. | Really liked the spider chart<br><br>Suggested that we need to provide explanation/ definition for each category, as different stakeholders would understand it differently<br><br>In the vulnerability table, couldn't quite understand what the scores mean (i.e. 1 is low and 5 is high). | Would be good to see the table separately (e.g. in the Manual), as had to get back to it quite often. At first glance, the table was very wordy, but eventually the end-user got used to it.<br><br>Really like that fact that you can click anywhere and the pop-up table disappears (rather than going back to [X] all the time).<br><br>Need to provide definitions for the categories: this end-user found it hard to understand what we mean by 'management monitoring'.<br><br>The end-user wanted to see a 'not applicable'/ not relevant option for the vulnerabilities. |
| **Site vulnerability summary** | Liked that the vulnerabilities are categorised according to the rating.<br><br>Really liked the summary dashboard, good way to emphasise the points. | Would be nice to have free text so that the end-user can reflect on the results - is it what they expected? Why? etc. | Might be good to emphasise that the end user should expect three outcomes: cases examples, tools and documents.<br><br>Really liked the case examples: nice and short, easy to read and straight to the point | Really like the spider diagram - attracts attention and it is very easy to see where the problem is. |
| **Design vulnerability** | Did not see the point in separating site and design vulnerabilities and suggested to merge them as one, or else explain really clearly what the difference is and how to answer the questions (i.e. bearing what in mind for each). | While it is understood why we separate site and design, often it is the case that site already exists so it is hard to think about its vulnerabilities and also thinking about it won't change the situation. Dividing to site and design is more applicable to new developments, so might be easier to merge them. | No comments | The end-user thought it would be good to explain at the very beginning what is the difference between risk and vulnerability - The end-user liked the fact that everything has to be finished before he could move one to the next stage - it made him concentrate a bit more. But again, we need to make it clear at the beginning. |
| **Identified risk** | Really liked the 'riskometer' - nice and visual. | No comments | Really liked the 'riskometer' | Really liked the 'riskometer' - nice and visual. |

| Reduce risk | All clear, no problems there, but the button 'reduce risks' needs to stand out a bit | No comment | 'Reduce risk' button should be more prominent<br><br>Really liked the idea of the dashboard when got back to it after choosing risk reduction options, but suggested that we need to highlight the chosen options or maybe only display the chosen options | Really liked this stage - brings everything together nicely.<br><br>We need to make clearer that the end-user MUST choose at least one option, otherwise they can't move to the next stage. |
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| Reduce risk significance | Documents and Case studies examples were very helpful.<br><br>Need to make the definitions of the risk reduction options stand out more.<br><br>Overall, it was a very good stage that makes the end-user thinks what the best option is and how to go about it. Found the text space really useful too, as allowed to write the comments specific for that site. | Really liked this page, the end-user said that it was the best stage of all. First 3 stages were very intuitive, whereas this one makes you think more as it requires an input.<br><br>Need to explain clearer that the end-user does not have to fill in the free text boxes. | No comment | Really liked documents and tools and the fact that you can go directly to them. |

| ISR report | Button 'view report' should stand out more<br><br>Report is very good, it is neat and concise and brings all the important information upfront. It is also very good to have appendix with all the relevant information. It provides a very good summary of the process and is consistent with planning application, so could be shown/ given to developers etc in order to make them think about the issues their site may experience.<br><br>PDF should pop up in a separate window so that the main report isn't lost. | Might be useful to put free text so the end-user can write down their thoughts about the process and things they need to pay attention at. | Would be good to have 'create pdf report' at the top of the page<br><br>'Lessons learnt' under the case examples might look better with the bullet points on separate lines<br><br>Would be good if each Stage would start on the new page and the title would be more highlighted<br><br>Under the reduce risk significance section, 'Selected' might look better on a new line rather than straight after the title of the option<br><br>Really like the visual representations at the beginning | Really liked the report overall - brings attention to all the issues, nice colours, easy to understand.<br><br>Would be good is the chosen risk reduction options are highlighted here.<br><br>In the report, the relevant hazards and threats should be highlighted: when scrolling down it is easy to miss whether the information is for the same hazard or for another one.<br><br>PDF report does not look very nice (the end-user much preferred the on-screen report). PDF needs to have logos and be more structured (e.g. every section starts on a new page). |
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