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Capability Project

Conceptualization of a RECONASS extension with additional sensors to detect other threats

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ABBREVIATIONS AND ACRONYMS

ABBREVIATION	DESCRIPTION
CDC	US Centers for Disease Control
CSC	Chemical Supply Chain
CTRA	Chemical Terrorism Risk Assessment of the US Department of Homeland Security
CWA	Chemical Weapon Agents
IMAAC	Interagency Modeling and Atmospheric Assessment Center
MIT	Massachusetts Institute of Technology
NARAC	National Homeland Security Association
PCCDN	Post Crisis Needs Assessment Tool in regards to Construction Damage and related Needs
TIC	Toxic Industrial Chemicals

EXECUTIVE SUMMARY

The purpose of this deliverable is to conceptualize of how the value of the RECONASS monitoring system can be increased by extending it to include sensors to detect dangerous chemical and biological agents. This includes a detailed review and assessment of existing threats that are relevant in the RECONASS context, as well as the state of the art of sensor technology to detect and measure those contaminations. The conceptualisation then proceeds with an assessment of which sensor types could best be incorporated in the system, and how. This includes an analysis of how the system can be extended via adding fixed sensors to the monitored RECONASS building(s), but also how UAV-based sensors can be employed as part of the monitoring system. It is further assessed how a monitoring network comprising a number of RECONASS-equipped buildings could function collectively when dealing with exposure to hazardous substances, and how an incorporation of weather information and dispersion modelling, but also auxiliary data layers such as cadastral information, also allows the number of people exposed to a given threat to be determined. This setup can also be used to determine the likely source of contamination in case it is unknown, allowing rapid countermeasures.

The deliverable is organised as follows.

- In Chapter 2 major biological and chemical threats relevant in the RECONASS context are reviewed. This includes air- and waterborne biological agents, and pathogens and distinguished from biotoxins (for example Anthrax and Ricin). The section on chemical agents is more extensive, since, in contrast to hazardous biological substances, they can more easily be obtained, transported, released and dispersed through the air. Those threats are divided into Toxic Industrial Chemicals (TICs) and Chemical Weapon Agents (CWAs) (such as Mustard gas and Sarin that have been used in recent conflicts).
- Chapter 3 reviews the state-of-the art in sensor technology, including fixed solutions and those than can be deployed on drones. Biohazard monitoring is only addressed briefly, since the majority of agents require elaborate laboratory-based identification. Instead the chapter focuses on how many years of research have been devoted into the development of methods to detect dangerous chemical agents, and the review in this chapter shows how for many species very compact, fast, precise, accurate, and inexpensive commercial solutions have been developed.
- Chapter 4 evaluates how relevant sensors could be added to the RECONASS system to provide an early alarm and continuous monitoring. It shows how, given that the threat detection scenario covered by RECONASS is limited to explosions and seismic events, and due to the technologically versatile nature of the system, an extension with additional functionality is possible. Therefore, the possibility to include such additional sensors in the RECONASS system is evaluated, focusing on chemical agents, given the current lack of near-real time portable solution for biohazard detection.
- Finally, Chapter 5 addresses how additional geospatial data, such as census and meteorological, can add further value in terms of constraining the size of the affected area, threat concentration variations and dynamics, or the potential source of the threat than hazardous biological substances.

The chapter concludes that chemical agents, including both Toxic Industrial Chemicals (TICs) and Chemical Weapon Agents (CWAs), pose a more serious and realistic threat to build-up urban area than biohazards. For the latter also hardly any portable sensors exist that can readily be integrated in the RECONASS system. Conversely, for most chemical agents that form a credible and serious threat miniaturised, portable, and low-cost sensor solutions have been developed that can rapidly and reliably detect and monitor a hazardous chemical substance. Data from such sensors can be added to the PCCDN tool of the RECONASS system, making use of the network infrastructure and protocols described in D2.3 and D5.3. This can add substantial value to the RECONASS system by widening the range of threats it can detect and analyse.