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Current situation and needs in man-made and natech risks management using Earth Observation techniques

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ABSTRACT

The Earth Observation (EO) techniques are becoming increasingly important in risk management activities not only for natural hazards and natural disaster monitoring but also to ride out industrial and natech accidents. The latest developments in the aerospace industry such as sensors miniaturization and high spatial and temporal resolution missions, devoted to monitoring areas of specific interest, have made the use of EO techniques more efficiently and are vready to be used in near real time conditions. This paper summarize the current state of knowledge on how EO data can be useful in managing all the phases of the Industrial/natech disaster, and from the environmental conditions before the accident strikes to the post accident relief, from the scenario setting and planning stage to the damage assessment.

Contents

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1. Introduction

Risk management is a complex activity that requires a multidisciplinary approach. When a disaster occurs, every minute is crucial to save lives, protect people, property and the environment and to react in a coordinated and conscious way which makes the real difference between a successful emergency management and failure. The events caused by disasters are somehow repetitive and form a cycle that can be divided in four phases: mitigation and preparedness (before the catastrophe strikes); response and recovery – reconstruction included – that occur after the disaster. The mitigation phase consists of all actions needed to reduce the impact of future disasters (Menoni et al., 2012). These can be divided in structural (technical and structural solutions) and non-structural measures such as land use-planning, legislation measure and evacuation planning (Galderisi et al., 2008). Preparedness phase comprises the actions taken to reduce the impacts when the disaster is forecast or imminent. Response pertains to actions taken during and immediately after the disaster, with the main aim to save and safeguard human lives. The term recovery refers to the process of restoring services and repairing damage after the disaster has struck (Alexander, 2002).

Keeping in mind this cycle the contribution of the scientific community and the use of innovative technologies such as those related to Earth Observation are of strategic importance during all the phases of the emergency management (Joyce et al., 2009). The emergency management planning can be considered similar to an urban or regional planning process; both require that the local conditions and geographic characteristic of the place are properly considered, especially in term of hazardousness (Alexander, 2006).

Moreover, the crisis events are often characterized by rapid evolutionary dynamics, with scenarios that can often change significantly in a very short time. Therefore, better emergency management necessarily passes through the quality and quantity of observations and information, as well as the speed at which the information can be transferred and made clear and usable by decision makers.

The industrial risk, from a risk classification point of view, can be considered as a part of the wide category of man-made hazards. The man-made hazards, with some variations depending on different classifications, include: technological hazards, nuclear risk, transport risk and other anthropic activities such as business, infrastructure and technological networks management, that can be a source of danger to humans and the environment (AA. VV., 2006); in the man-made hazards perspective the environmental risk is related to the probability of an event caused by unexpected alteration of physical and chemical parameters in the environment (water, air and/or soil), that have immediate or short-term effects on the health of the resident population. Another definition, used in technical papers, highlights the difference between “human-made disaster” that are caused directly by human activities and “human-induced disaster”, natural disaster that are accelerated/aggravated by human influence (Van Westen, 2002).

In this heterogeneous framework of hazards, risks and events, some significant industrial accidents are known to be caused or triggered by natural disasters. In the international literature, this type of accident is defined as natech or "Natural-Technological" event. One of the natech definitions recite as follows: "Technological accidents, like fires, explosions and toxic releases that may occur in industrial complexes and along the distribution network as a result of natural disasters of natural matrix" (Clerc and Le Claire, 1994; Lindell and Perry, 1996; Cruz et al., 2004).

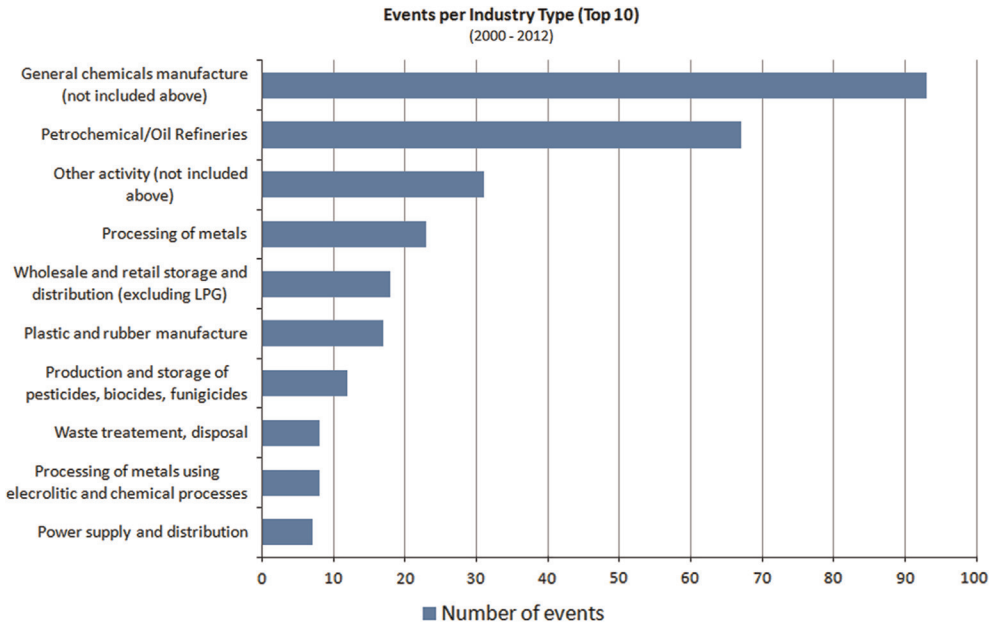

Fig. 1. Number of events and Industry (2002–2012). eMARS JRC – European Commission, Major Accident Hazards Bureau.