

Water, Terrorist attacks, Industrial accidents, and modeling possible impacts of these incident in coastal ecosystems with computational model

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Introduction

- Sustainability has become an important topic in the political agenda of many countries.
- Water plays an extremely important role in human survival and regional socioeconomic development, particularly in arid and semi-arid areas.
- How to use the water resources in a sustainable way is an important problem for sustainable development, especially in areas where water resources are extremely scarce.



Introduction/2

Normal economic and social activities, behaviours that violate laws and regulations, and accidents may all result in basin pollution.



Accidental water pollution in basins results in water quality deterioration.

Basin pollution threatens human health, influences normal economic and social activities, and results in severe property loss

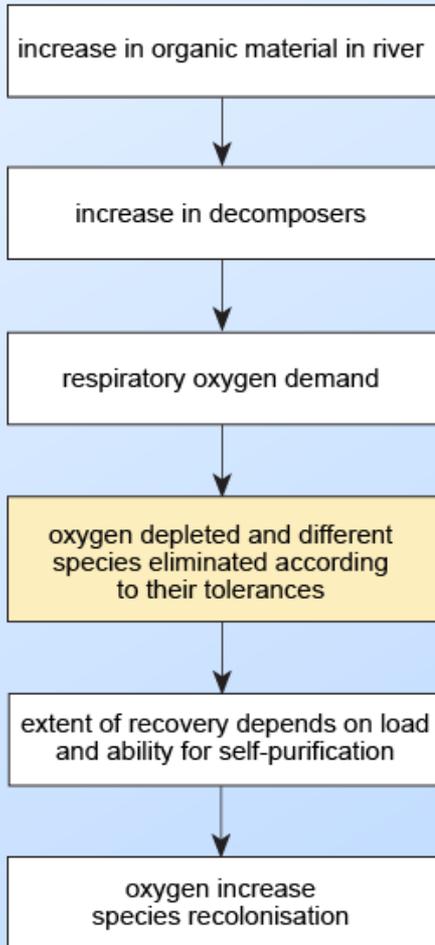
Water pollution incidents

- Water pollution incidents can be categorized into three types.
- The first occurs when a great volume of pollutant is discharged within a short time period from an accident.
 - The tailing dam accident in Baia Mare, Romania in 2000.



Water pollution incidents

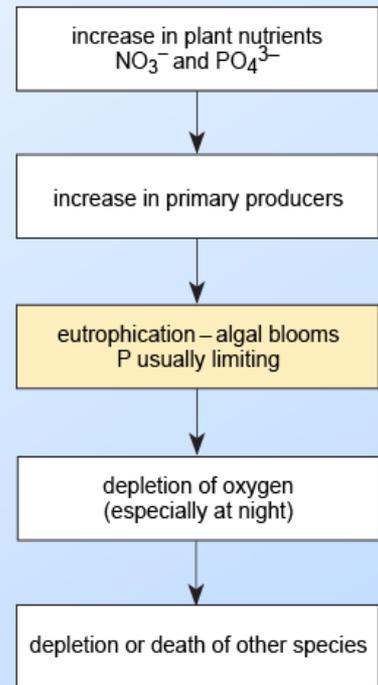
Events following organic pollution



The second type of water pollution incident is an accumulative effect of pollutant discharge over a long period which eventually causes severe water pollution at a certain time point.

The drinking water source pollution in Wuxi by algae in Tai Lake occurred in May 2007 is an example of the second type.

Events following eutrophication



Water pollution incidents

The third type is Water Terrorism, as the most important type of Environmental Terrorism, which has historically posed serious threats to water supplies, endangering the sustainability of communities and environmental resources.

This form of terrorism threatens the sustainability of water resources as well as the functionality and robustness of water supply networks. The three main types of water terrorist actions are:

- 1) direct attacks and sabotage actions against water networks,
- 2) **chemical, biological and radioactive attacks** and
- 3) cyberattacks.

The vulnerability of water supply infrastructures against water terrorism is aggravated by the large number and the spatial dispersion of their components as well as their high symbolism that renders them an attractive target for terrorists and potential invaders.

Water pollution incidents

Speedy reaction time, appropriately coordinated actions of the first responders, and reliable detection systems are essential to minimize the spread of pollution and preventing its entry into natural dispersion paths.

But....

Once a water pollution incident occurs, no matter what type it is, it can be a serious threat to the local economy, people's livelihoods, health, and the aquatic ecological system in a short time.

Moreover, the impact on the environment and human health may be difficult and costly to control.

If the response is not appropriate, it could have cross-boundary effects.

Therefore, it is a pressing task of each national and local **7 government to prevent water pollution incidents and take appropriate actions to mitigate their impacts once they occur.**

WHAT IS THE BEST WAY TO SOLVE THESE PROBLEMS ?

- An emphasis on prevention of pollution is more cost-effective, easier to implement and enforce.
- In other words, prevention tends to be better than cure.
- Pollution prevention and preparedness involves risk assessment, a comprehensive chemicals inventory, information management, emergency planning, and pollution control measures
- The timely, appropriate response is critical to prevent pollution from spreading and minimizing environmental impact.

WHAT IS THE BEST WAY TO SOLVE THESE PROBLEMS ?

To Build the Capacity of First Response.

It is essential that first responders (Scientists, Responsible Authorities etc) have access to accurate and up to date information about the risks of chemicals to which they may become exposed and information on what to do in the event of an accidental release of those chemicals.

Given the number of chemicals in production, storage and use and their various and complex properties, it is essential that first responders are able to identify the chemicals they are dealing with. They need to understand the chemical's properties, potential impact, and the most appropriate approach and equipment to manage any incident.

This information saves valuable time at the time of an incident and can ensure that responders take appropriate, safe action to contain a spill or release.

WHAT IS A GOOD WAY TO SOLVE THESE PROBLEMS ?

One possible and simple approach is to model the effects of a terrorist attack and accident with hazardous materials on the different groups of species: the predators, the common/dominant species, and the opportunistic species using classical models of growth, competition, and predation

STELLA software is a graphic, icon-based modeling software package from Isee Systems—The Visual Thinking Company (<http://www.hps-inc.com>), which can be used in the construction of relatively complex models.

Model equations were based on Gamito and Gotelli.



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