

# Development of DSS for Environment Protection in Cases of Marine Incidents

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The research presented in this paper deals with development of effective Decision Support System (DSS) for defining the places of refuge (PoR) for ships in distress at sea taking a special concern for environment protection. Such system includes a model support based upon Geographical Information System (GIS) and different operational research models, which results in establishing a integral DSS. The issue of "places of refuge" is one aspect of contingency planning in the consideration of which the rights and interests of coastal states such as Croatia as well as the need to render assistance to vessels that are damaged or disabled or otherwise in distress at sea ought to be taken into account. Croatian coast is very indented with more than 1000 islands and, at the same time, Adriatic Sea hosts lot of tankers. This situation brought out a need for efficient system for granting access to a place of refuge could involve a political decision which can only be taken on a case-by-case basis with due consideration about all possible consequences. In so doing, consideration would need to be given to balancing the interests of the affected ship with those of the environment.

In November 2003, the International Maritime Organization (IMO) Assembly adopted two resolutions (guidelines) addressing the issue of places of refuge for ships in distress - an important step in assisting those involved in incidents that may lead to the need for a place of refuge to make the right decisions at the right time.

The guidelines recognize that, when a ship has suffered an incident, the best way of preventing damage or pollution from its progressive deterioration is to transfer its cargo and bunkers, and to



repair the casualty. Such an operation is best carried out in a place of refuge. However, to bring such a ship into a place of refuge near a coast may endanger the coastal State, both economically and from the environmental point of view, and local authorities and populations may strongly object to the operation. In order to make a decision process as efficient as possible a GIS based DSS is defined. Such DSS contains all relevant data necessary for environmentally and socially sound risk assessment.

Multicriteria analysis, with GIS-generated input data, would be used to establish worthiness of a place of refuge for each ship category, taking into account kinds of accident. Tables of available intervention resources would be made, as well as analysis of their availability in respect of response time, and quantitative and qualitative sufficiency.

Integrated GIS support with data about both coastal and sea characteristic (including 3D model of coast with 3D bathymetry) enables pre-identification of places of refuge that greatly enhances the saving of life at sea and pollution prevention.