Web-based Decision Support for Incident Situation in the Adriatic Sea

Nenad Mladineo
University of Split, Faculty of Civil Engineering, Architecture and Geodesy, Croatia
mladineo@gradst.hr

Marko Mladineo
University of Split, Faculty of Electrical Engineering, Mechanical, Engineering and Naval Architecture, Croatia
marko.mladineo@fesb.hr

Marin Stosic
Commodore
Coast Guard of the Republic of Croatia, Croatia
Republic of Croatia has a long and indented coast with many beautiful natural resorts, that are attracting tourists from all over the world!
**Problem:** Every year, more than 4,000 tankers with more than 55,000,000 tons of oil are on their way toward North Adriatic, and 85% of them doesn’t have some Croatian port as destination

**Result:** Republic of Croatia has a small economic benefit from tankers, but they represent enormous indirect threat to Croatia’s tourism, i.e. threat to the income of 7 billion €

**The only solution:** be prepared and react quickly!
Brief history

- In 2006 Ministry of Sea, Transport and Infrastructure launched the project “Determination of places of refuge for ships in distress”
- The project was led by Hydrographic Institute of the Republic of Croatia in Split in collaboration with Faculty of Civil Engineering, Architecture and Geodesy, University of Split and GISDATA d.o.o.
- Project resulted in the creation of GIS database ‘ADRIA-GIS’ and Desktop application ‘SPO Zaklonista’.
- Since 2007 applications are in use at the National Maritime Search and Rescue Coordination Centre (MRCC) in Rijeka.
Operative decision-making in incident situation on sea

Three main problems of operative decision-making in incident situation on sea:

1. Lot of criteria (that need to be considered)
2. Situation is constantly changing (many possible scenarios)
3. Decision-makers are not “experts at everything”
1st problem: *Lot of criteria*

- Lenght of Vessels
- Navigational Approach Ability
- Grounding Suitability
- Booming ability
- Bottom Keeping
- Wind protected
- Socio-economic Suitability
- Oil Spill Shoreline Sensitivity
- Biological Sensitivity
- Lenght of Vessels
- Port Facilities and Repairs Ability
- Emergency Unit Response Time
2nd problem: **Situation is constantly changing**

- Drifting problems
- Meteorological conditions
- Sea forecasting
- Stability problems
- Grounding
- Fire or explosion on ship
- Collision of ships
3rd problem: Decision-makers are not “experts at everything”
DSS or Decision Support System is a system that provides complete support to human decision-making process by providing all necessary information and warnings at the right time.
Wrong decisions do not affect only efficiency of the system, but consequences can be catastrophic!

Decision Support System (DSS) minimizes possibility that wrong decision has been made.
Taking into account the **rapid development of Internet technology** and the **need for multi-user application** (multi-agency model), further development of DSS has pointed to the need of transition from Desktop application to ...

**Web application**

“**Web-based Decision Support for Incident Situation in the Adriatic Sea (WDS-ISAS)**”
Web-based Decision Support for Incident Situation in the Adriatic Sea (WDS-ISAS)

- WDS-ISAS is **Microsoft Silverlight** application based on **ESRI ArcGIS Silverlight API** and **ArcGIS Server 10.1**

- WDS-ISAS is a **true web mashup application**, it combines many different data types from different sources.

- Main features are:
  - **Rich GIS database** on Adriatic sea
  - **Ship positioning tool**
  - **Multi-Criteria Analysis tool** for selection of optimal place of refugee
  - **GeoGate tool** for geo-referencing of images and videos
  - **Sea Forecasting data**, etc.

http://unistgis.maps.arcgis.com
**WDS-ISAS** combines all relevant data (different type from different sources)

- Web Map Service
- ‘DGU’ layers
- Radar data
- TXT File
- AIS data
- GML File
- Forecasting data
- GIF Image

**Web application “WDS-ISAS”**

- ‘ADRIA-GIS’ data
  (Hydrographic Institute of the Republic of Croatia)
- ‘IZOR’ data
  (Institute of Oceanography and Fisheries)
- ESRI Map Services
- ESRI Geoprocessing Services
WDS-ISAS: live feed of vessels position using AIS data from web services and nautical charts.
WDS-ISAS: selection of optimal place of refugee for ship in distress using Multi-Criteria Analysis module
**WDS-ISAS**: spatial search for important **ecological and emergency data** around ship position.
**WDS-ISAS**: import of **results** from oil-spill prediction model ‘**GNOME**’ using **GeoGate module**
Improving oil-spill prediction model

➢ In order to improve oil-spill predicting, a collaboration has been established with **Applied Science Associates (ASA)** and some experiments have been made using their **OilMapWeb** application

http://oilmapweb.com
WDS-ISAS: Live demonstration

http://unistgis.maps.arcgis.com
Acknowledgments

“Web-based Decision Support for Incident Situation in the Adriatic Sea (WDS-ISAS)” is still under development and evaluation by University of Split in collaboration with Coast Guard of the Republic of Croatia.
Thank you for your attention!

Contact:
Prof. Nenad Mladineo, Ph.D.
University of Split, Faculty of Civil Engineering, Architecture and Geodesy
mladineo@gradst.hr