



MOHID Water in Action

Luis Fernandes, Frank Braunschweig, David Brito, Rodrigo Fernandes & Susana Braunschweig
MOHID Meeting @ IST – 7-8 June 2018



Action Modulers – Some history



- Action Modulers is a private consulting company, located in Mafra, Portugal.
 - Established in 2004
 - 2 Main Business Areas
 - 10 fixed employees in Nov 2017
- Action Modulers provided services and software solutions worldwide
- Action Modulers is a **ist spin-off**

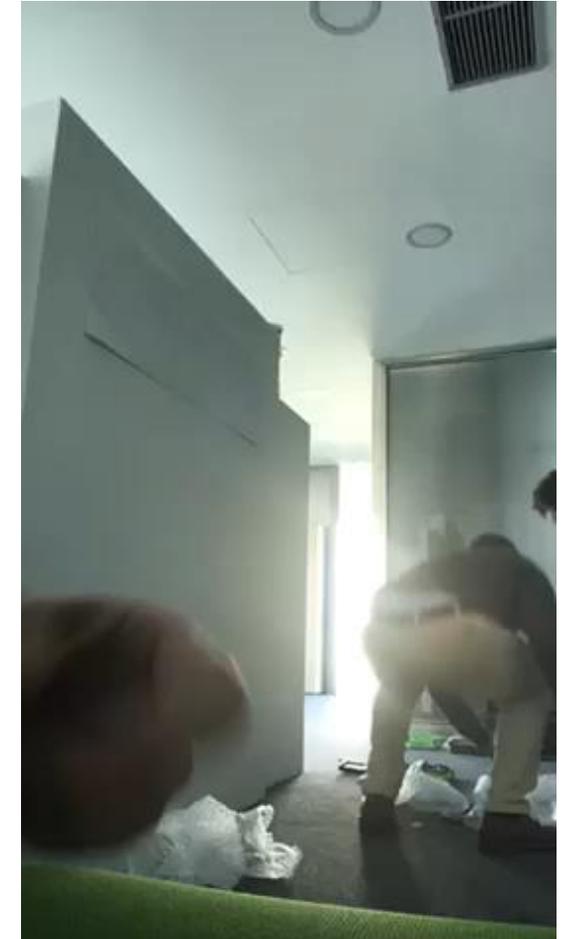


Action Modulers to Bentley



Action Modulers R&D Unit was acquired by Bentley Systems in Oct 2017

- Engineering software company – Infrastructure design, construction and operation
- Founded in 1984 in the U.S.
- 3500+ employees in 50+ countries
- **Lisbon office since May 2018**



The team



Frank Braunschweig
25 years MOHIDing

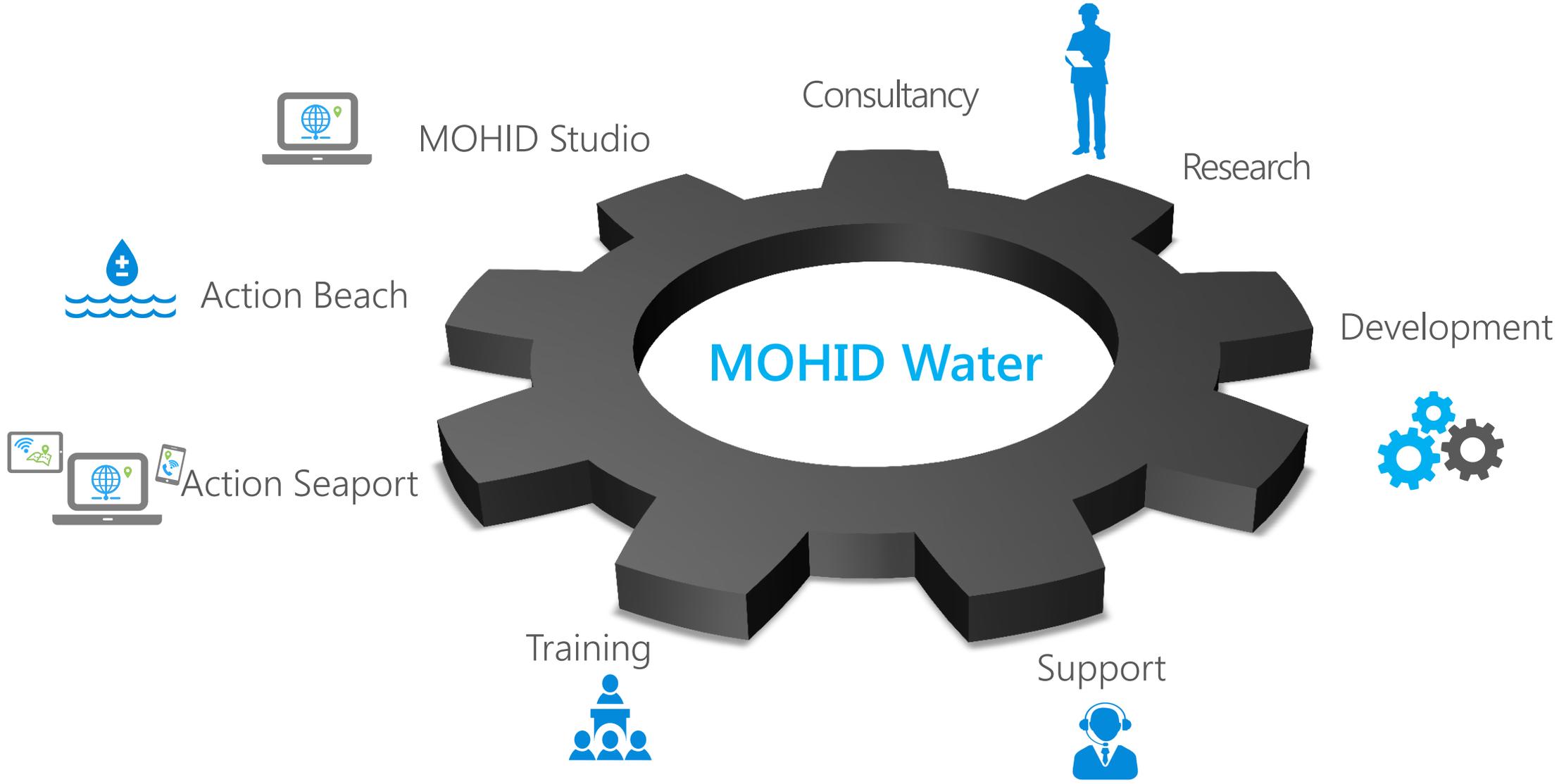
David Brito
13 years MOHIDing

Susana Braunschweig
5 years Marketing MOHID

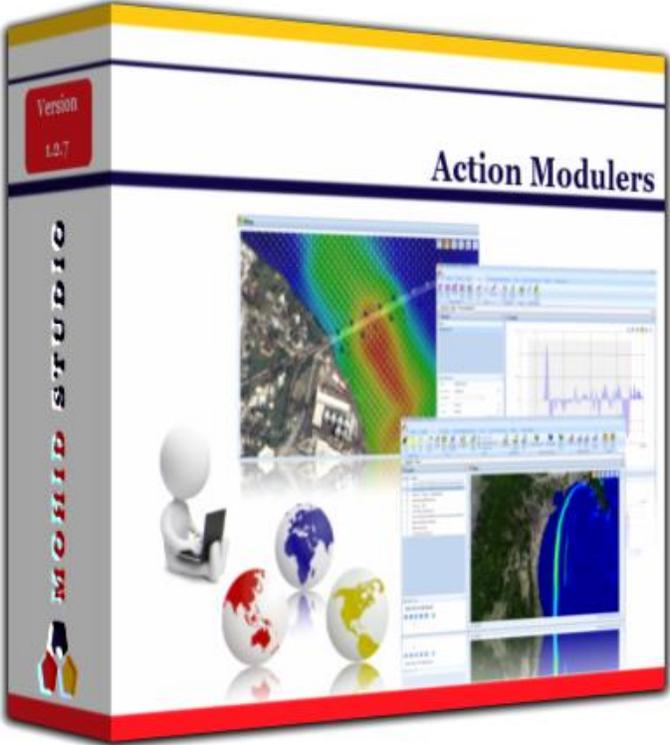
Rodrigo Fernandes
17 years MOHIDing

Luis Fernandes
17 years MOHIDing

MOHID Water is at the core of our business



MOHID Studio



API-Alcacer - MOHID Studio - MOHID Studio Professional

Home Project Map XY Graph Risk Management Operational Modelling Oil Mapping Environmental Monitoring Coastal Risk Administration

New Open Close Manage New Open Properties Remove Manage New Properties Delete Copy Compare Clean Log-Off Run Now Scheduler Execute Models

Map Explorer Startup

Project Tree

- API-Alcacer do Sal
 - General Data
 - Boundary Conditions
 - Digital Terrain
 - Initial Conditions
 - T_100
 - T_1000

Model Controller

Mohid Land Model
Running
21%
Output Cancel

Simulation 1

MOHID Studio Version 3.0.0.1860 | License: MOHID Studio Professional | Memory Usage: 667Mb | Processor Time: 3228s

PIAAC-AMAL - MOHID Studio - MOHID Studio Professional

Home Project Map XY Graph Operational Modelling Environmental Monitoring Administration

Local WMS Tiles XYZ Geometry Grid Grid Data Netw. Gr. D. Vector Lagr. Netw. N. Vect. Esri Nasa Raster Del. Up Down Styles Objects

Background Layers MOHID Specific Layers Time Based HDF Layers Common Data Manage Layers

Map Explorer

Layers

Visible	Name
<input checked="" type="checkbox"/>	RunOH_21 [water column]
<input checked="" type="checkbox"/>	TileLayer - Bing - Aerial

Date & Time

2012-01-01 05:00:00

Render Time: 65ms
Lon= -7.6642 Lat= 37.1251 Zoom= 3.085

MOHID Studio Version 3.0.0.1860 | License: MOHID Studio Professional | Memory Usage: 1012Mb | Processor Time: 3228s

Training



Reference Projects - Research



Project Information

PROJECT

Enhancing HNS preparedness through training and exercising

LOCATION & COUNTRY

NE Atlantic region: Portugal, Spain, France, United Kingdom

FUNDING

EU Project "Humanitarian Aid and Civil Protection"
<http://mariner-project.eu/>

PARTNERS

CETMAR, Intecmar, Universidad de Vigo, CEDRE, Public Health England, CIMAR.

DATES

January 2016 - December 2017

ACTION MODULERS' MAIN TASKS

Chemical spill modelling and environmental impact, integrated in a web-based common operational picture.

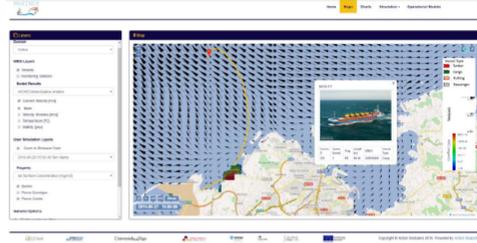
SOFTWARE & SUPPORT

Action Modulers offers a wide range of customizable software products. We also provide professional support to implement your projects.

CONTACTS

Estrada Principal, nº 29 rc
Paz
2640-583 Mafra
Tel.: +351 261 813 660
sales@actionmodulers.com
www.actionmodulers.com

MARINER - Enhancing HNS preparedness through training and exercising



MARINER project focuses on improving planning, preparedness and response to HNS (Hazardous and noxious substances, also known as chemical) spills in Europe by:

- Capitalizing and translating relevant HNS R & D outcomes into operational resources applicable by planners and responders;
- Improving training and exercise capabilities;
- Upgrading and/or improving tools to support decision making and response;
- Increasing awareness and encouraging information exchange.

Action Modulers is the leader of the task *Modelling and Environmental Impacts* and participates in all other work packages.

Action Modulers improves the operational use of tools for modelling HNS transport, behaviour and biological impact, mainly upgrading an HNS spill model properly integrated into a web-based and mobile friendly Common Operating Picture (COP), and hence improving maritime situational awareness when facing HNS pollution management.

In addition, Action Modulers is also contributing to the definition of protocols and guidelines for environmental impact assessment of HNS Spills, as well as the development of innovative multimedia training materials on HNS spill modelling.

Outcomes of the projects can be found on the project website. For further informations, please contact us.



Project Information

PROJECT

Multinational Response and Preparedness to Oil and Chemical Spills

LOCATION & COUNTRY

Canary Islands (Spain), Madeira Archipelago (Portugal), Morocco

FUNDING

EU Project "Humanitarian Aid and Civil Protection"
<http://marpocs.eu/>

PARTNERS

CEDRE, IST, PLOCAN, ULPGC, ARDITI-OOM, INRH

DATES

January 2016 - December 2017

ACTION MODULERS' MAIN TASKS

Model-based decision support tools and risk assessment. Oil and chemical spill model development.

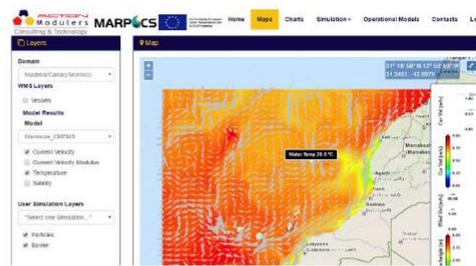
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MARPOCS - Multinational Response and Preparedness to Oil and Chemical Spills



MARPOCS aims to implement an integrated operational framework for preparedness and response to oil and HNS spills in the Atlantic sub-region involving Morocco, Madeira and Canary Islands in the context of Lisbon Agreement, easily transferable and extendable to other areas.

The general objective is achieved by the sharing and development of common guidelines, methodologies, decision support tools and exercises adapted to the regions of study and promoted by effective implementation and training of local, regional and national authorities.



Action Modulers developed the concept of the project and leads the task entitled *Decision Support Tools and Risk Assessment*. The main contributions to the project are:

- Decision Support systems supported by 3D oil & HNS spill modelling system, using high resolution meteocean forecasting systems
- Dynamic shoreline holistic risk from spills in the area of interest, to improve management of the distribution of response resources, and to allow real time risk shoreline monitorization)
- Automatic early warning spill forecasting system connected to existing maritime surveillance automatic detection services
- Training sessions and hands-on demonstrations with authorities



Project Information

PROJECT

Improvements of Shorelines Defenses Against Marine Pollution

LOCATION & COUNTRY

Tagus Estuary Portugal
La Rochelle, France
Falmouth, England

TYPE OF PROJECT

EU Research Project co-financed under "Humanitarian Aid and Civil Protection".
<http://isdamp.eu>

DATES

January 2013 - December 2014

ACTION MODULERS' MAIN TASK

Integration of mathematical models, web interface, operational server and central data base.

SOFTWARE & SUPPORT

Action Modulers offers a wide range of customizable software products. We also provide professional support to implement your projects.

CONTACTS

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ISDAMP - Improvements of Shorelines Defenses Against Marine Pollution

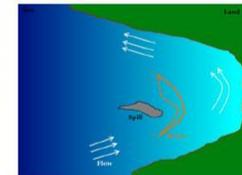


The main strategy of the project ISDAMP is to adapt numerical devices of research to the needs of local operators. The results of these devices and its use in real situations will enable an appropriate answer to maritime disasters.

The objectives throughout the 24 months of the project are:

- Implement operational models in the study areas (model MOHID);
- Develop operational models of floating barriers (BAR3D model);
- Integration of the models through the OpenMI library;
- Development of software components for the exploitation of the system;
- Perform real and simultaneous tests in the three regions of the study;
- Improve operational skills with training for system users;

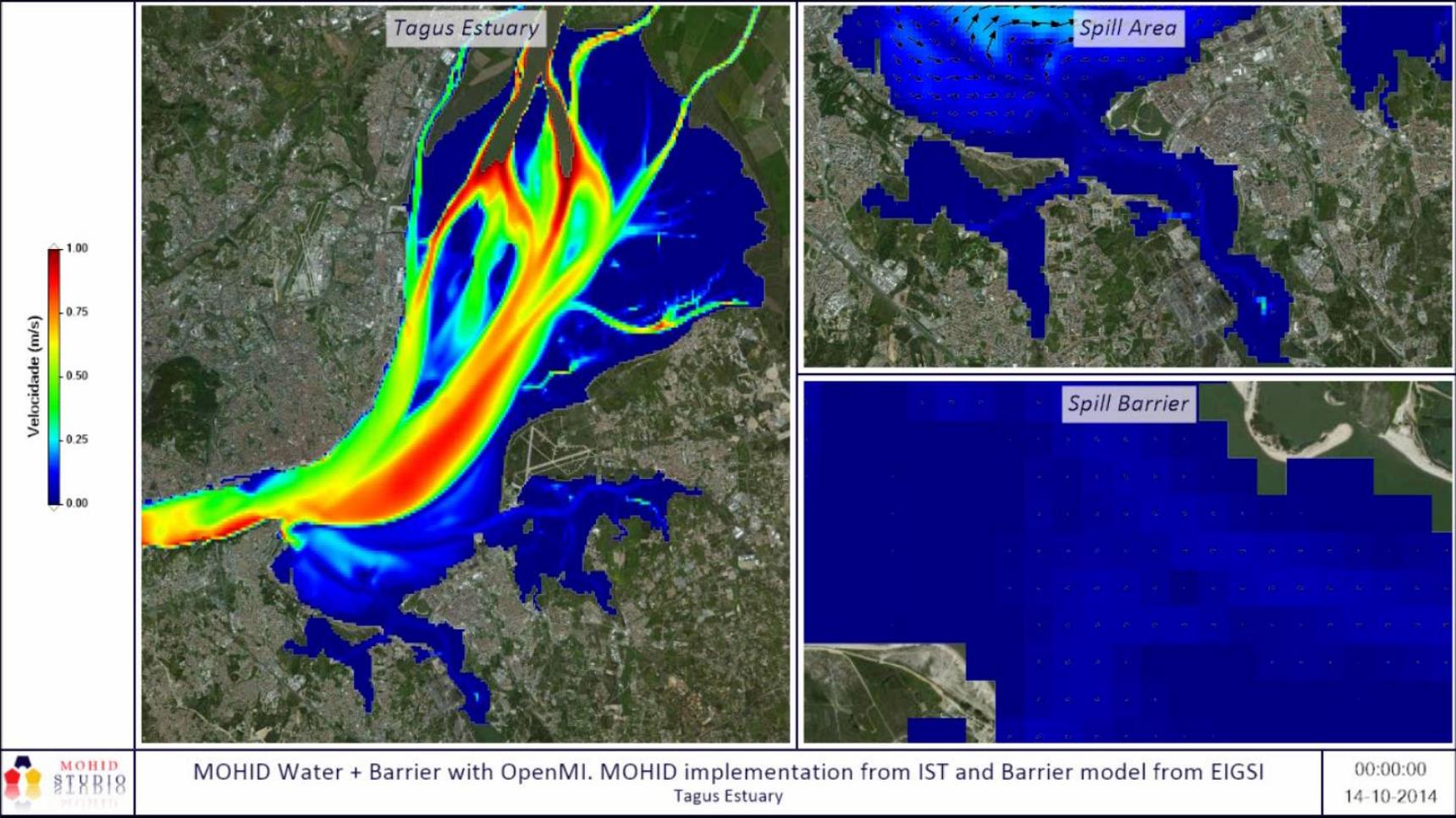
- Promote among local and regional actors the best practice of efficiency.



The main results of the services provided by ACTION MODULERS will include:

- Integrated model (MOHID Water and Bar3D) to optimize the response to oil spill emergency;
- Operational software components for continuous data processing included into ACTION Server;
- Integration of new features into MOHID Studio;
- Training in the use of the system.

Reference Projects - ISDAMP



Reference Projects - Consulting



Project Information

PROJECT
Operational bathing water quality prediction in Constanta, Romania (Action Beach)

LOCATION & COUNTRY
Constanta, Romania

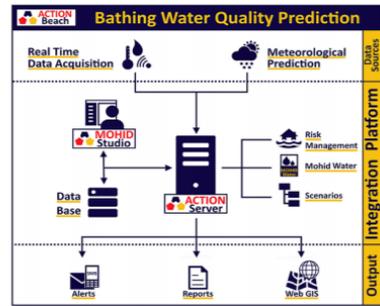
CLIENT
National Institute for Marine Research and Development
Blvd Mamaia no. 300
Constanta 3, RO-900581
Romania

PARTNER

DATES
Jan 2016 - March 2016

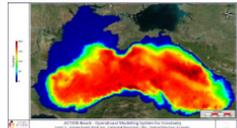
ACTION MODULERS' MAIN TASKS
Implementation, installation, configuration, training and maintenance of Action Beach in Constanta, Romania.

Operational bathing water quality prediction in Constanta, Romania



An operational bathing water quality prediction system was implemented in Constanta, Romania. The core of the system is a 3D high resolution numerical model MOHID Water which is operated daily through ACTION Beach.

MOHID Water was implemented using a nested approach, using three nested levels: (i) Black Sea, (ii) Romanian Coast and (iii) Constanta Coast.



MOHID Water uses as initial condition temperature and salinity data sets from CMEMS and as boundary conditions meteorological conditions from GFS,

river discharges from Danube, Dnieper and the Strait of Kerch (Don and Kuban). At the Bosphorus strait, boundary conditions take into consideration the surface/bottom inflow/outflow. The nested models (Romanian Coast and Constanta Coast) use the correspondent upper level solution as open boundary condition. Currently the model produces daily 3 day forecasts.

ACTION Beach is used to manage, store and publish the entire workflow. GFS solution is downloaded daily and stored on the server and MOHID Water models are run as soon as new boundary conditions are available. All data is stored on a server and will be published soon in a mobile friendly web page.

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Operational water quality prediction in Constanta, Romania (Action Beach)



Project Information

PROJECT
Optimization of Korean Operational Oceanographic System

LOCATION & COUNTRY
South Korea

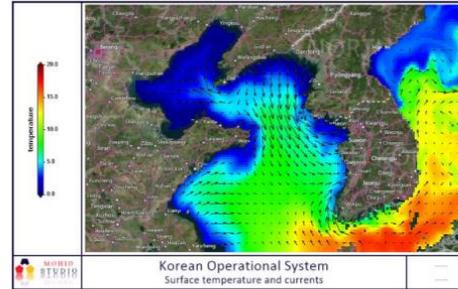
CLIENT
KIOST – Korean Institute of Ocean Science and Technology
<http://eng.kioست.ac/>
South Korea

PARTNER

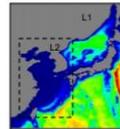
DATES
2016

ACTION MODULERS' MAIN TASKS
Technical and scientific support, as well as MOHID source code optimization, in order to optimize Korean Operational Oceanographic System.

Optimization of Korean Operational Oceanographic System



This project involved technical and scientific consultancy in the optimization of the Korean Operational Oceanographic System (KOOS), to cope with the scheduled computational grid resolution increment to 300m along the Korean coast.



The services provided focused on two main topics: a) Improving the setup methodology of MOHID Water, the numerical model used in the forecasting system, by providing guidance in the definition of the high resolution domains, interfacing the downscaling process using an offline

method, thus efficiently eliminating redundancies; b) Increasing the computational speed of the model through revision and expansion of the numerical code of MOHID Water related with parallelization routines (using MPI and OpenMP) and/or memory allocation and access and by redesigning the domain decomposition approach used in the Korean operational system, optimizing the workload partition. Additionally, the interoperability of the two parallelization methods (MPI and OpenMP) was analyzed and tested. The new proposed methodologies and the development outputs will be implemented by KIOST in the new version of the Korean hydrodynamic operational forecast system.

Optimization of Korean Operational Oceanographic System

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Project Information

PROJECT
MOHID Water training courses

LOCATION & COUNTRY
Portugal, Germany, Brazil, Argentina, Colombia, Mexico, South Korea, Turkey, Oman

CLIENTS
MOHID worldwide users community, GWZ Dresden (Germany), INVEMAR (Colombia), EKMAN, ENVIRONLINK & IEAPM (Brazil)

PARTNERS
KIOST (South Korea), GEOMAR & UNAM (Mexico), UNC (Argentina), EPAGRI (Brazil), IGEM (Turkey), SQU (Oman)

DATES
Oct 2010- May 2015

ACTION MODULERS' MAIN TASKS
Providing technical and scientific support and training on MOHID model for researchers and professionals.

MOHID Water training courses



ACTION Modulers has been actively leading scientific/technical training and support regarding MOHID Modelling System since 2010, having held several MOHID training courses in 4 different continents for more than 150 professionals. The courses consist of two main formats: open or private. Open courses are typically organized in collaboration with one or more institutions (universities, research institutes or private companies) and were open to the general public. The training level in these courses can either be basic or advanced. In basic level, an introduction of MOHID and MOHID Studio is provided, enabling the user to come in contact with the model and its capabilities and learn about the different tools available to explore them, by helping in the pre-processing, execution and post-processing tasks.

Advanced courses were held focusing on specific themes and areas of application of the model. These courses were designed for MOHID users with experience in the model that wish to extend their capabilities in exploring the numerical software to fit their purposes.



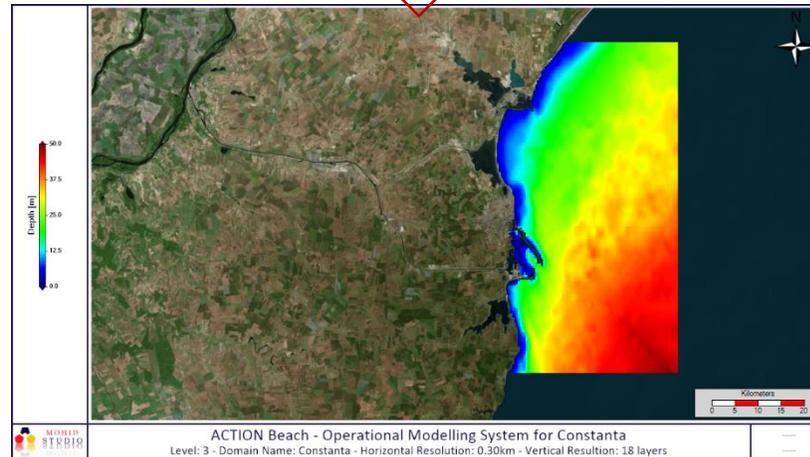
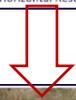
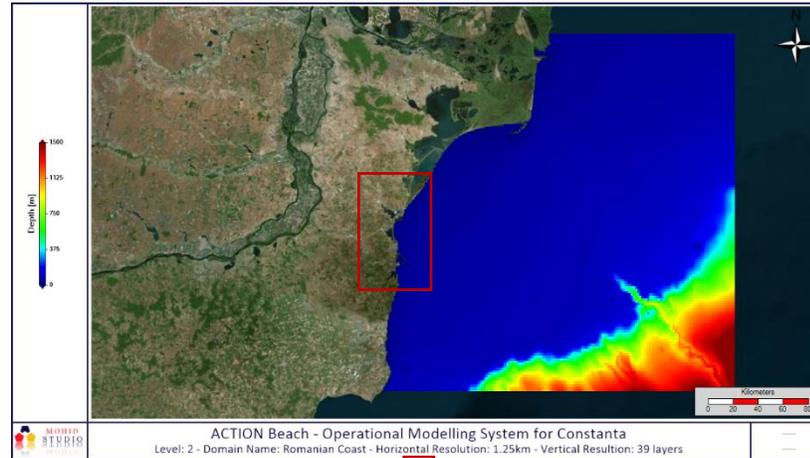
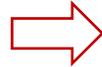
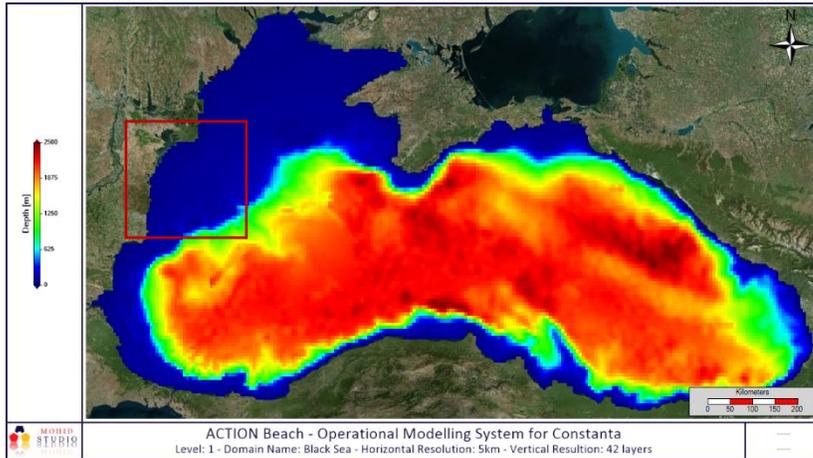
Private courses are normally organized for research institutes and private companies to train their research or engineering teams with MOHID Modelling System typically focusing on a specific application or project. Topics like operational modelling can also be addressed.

For any further please don't hesitate to contact us.

MOHID Water training courses

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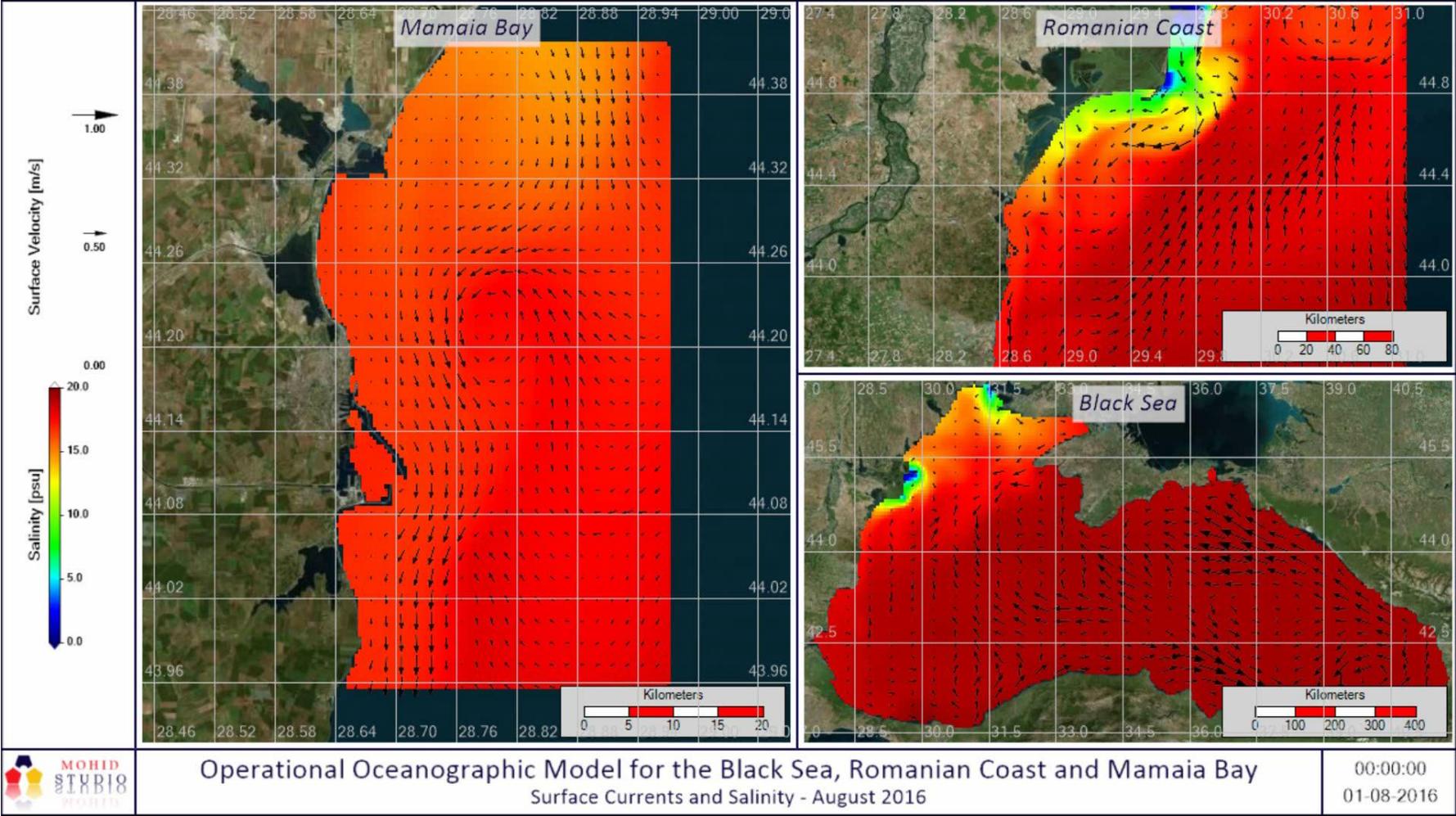
Reference Projects - Romania



- Level 1 - Black Sea
- Level 2 – Romanian Coast
- Level 3 - Constanta

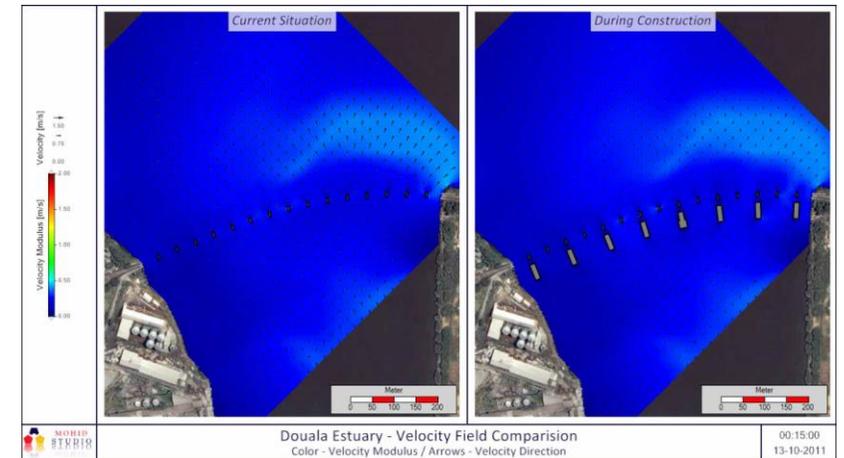


Reference Projects - Romania



Other projects

- Korean oceanographic operational forecasting system
 - Implementation and improvement
- WWTP Submarine outfall discharge in Galicia, Spain
 - Dispersion scenario studies
- Brine discharge modelling in Canary islands, Spain
 - Dispersion scenario studies
- Hydrographic conditions for bridge construction, Cameroon
 - Scouring estimation
- Dredged material dispersion and disposal, Brazil
 - Port dredging operations planning and impact mitigation
- Harbor construction impact assessment, Angola
 - Impacts on hydrodynamic, wave and sediment transport

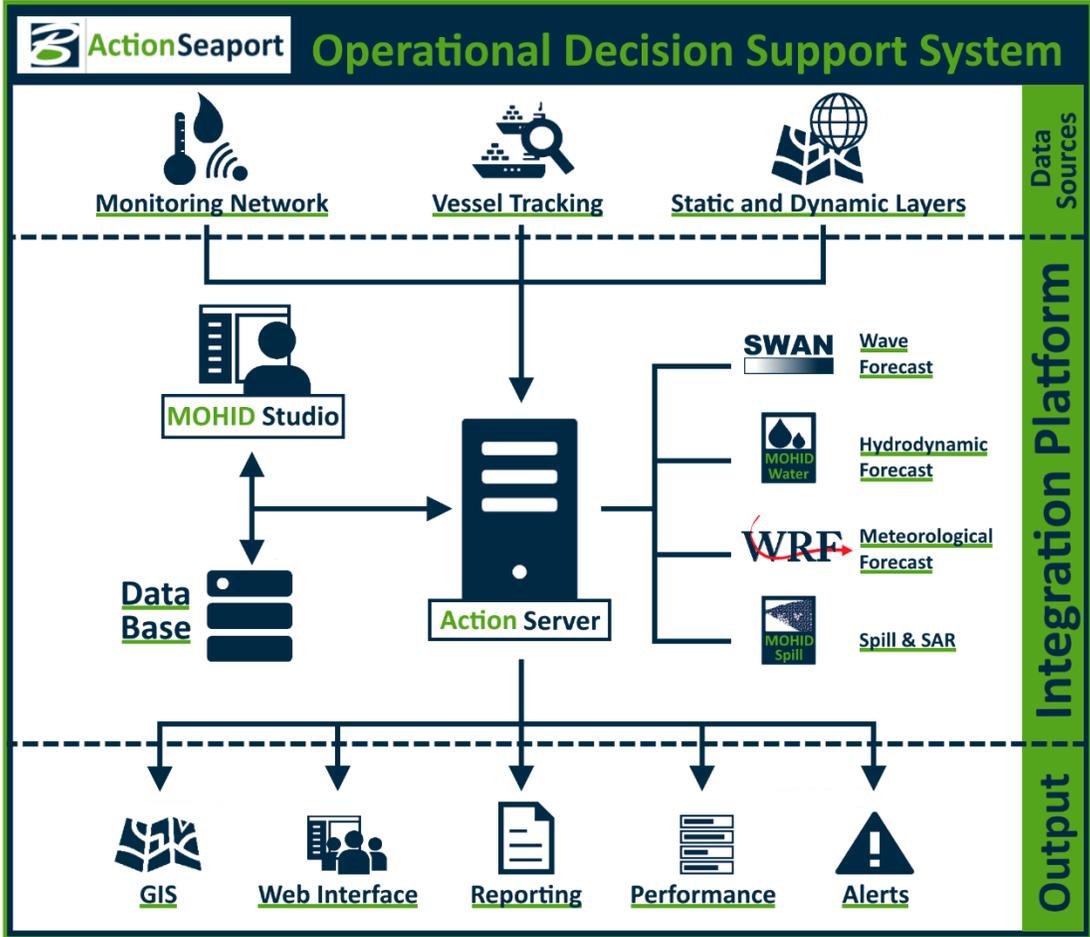
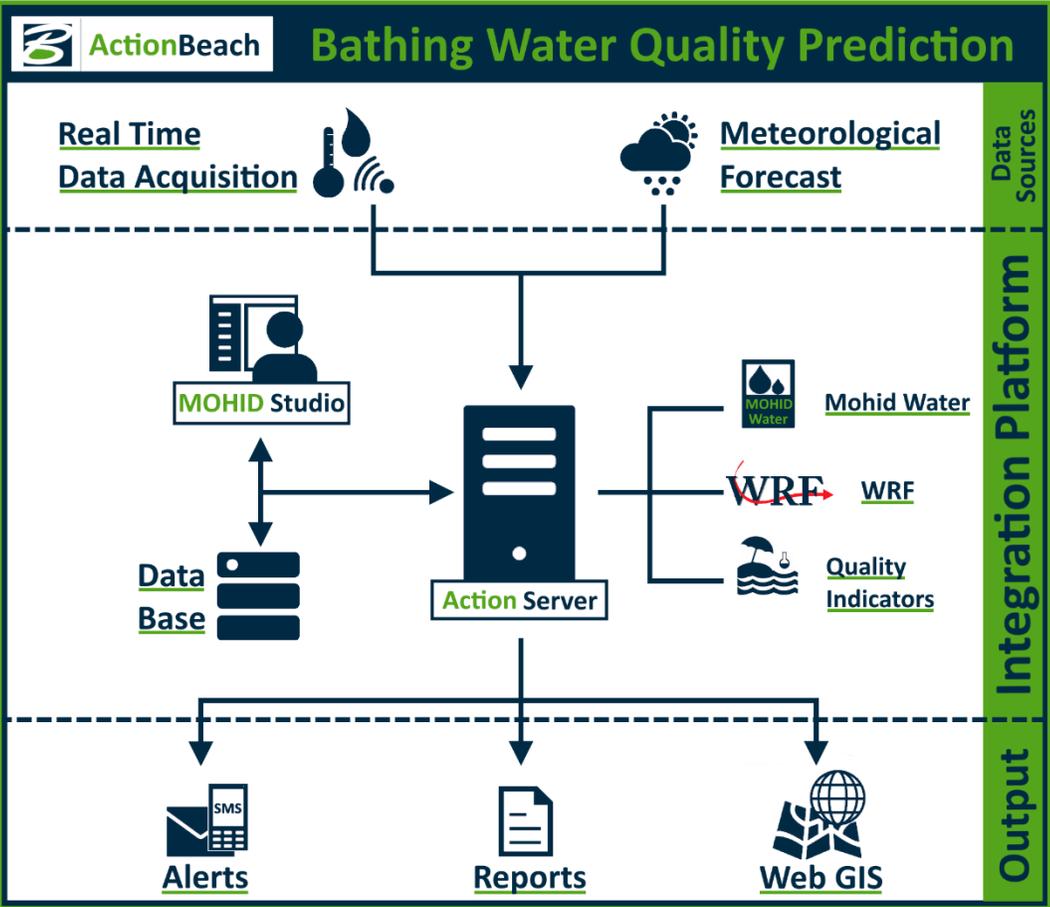


MOHID Water Support

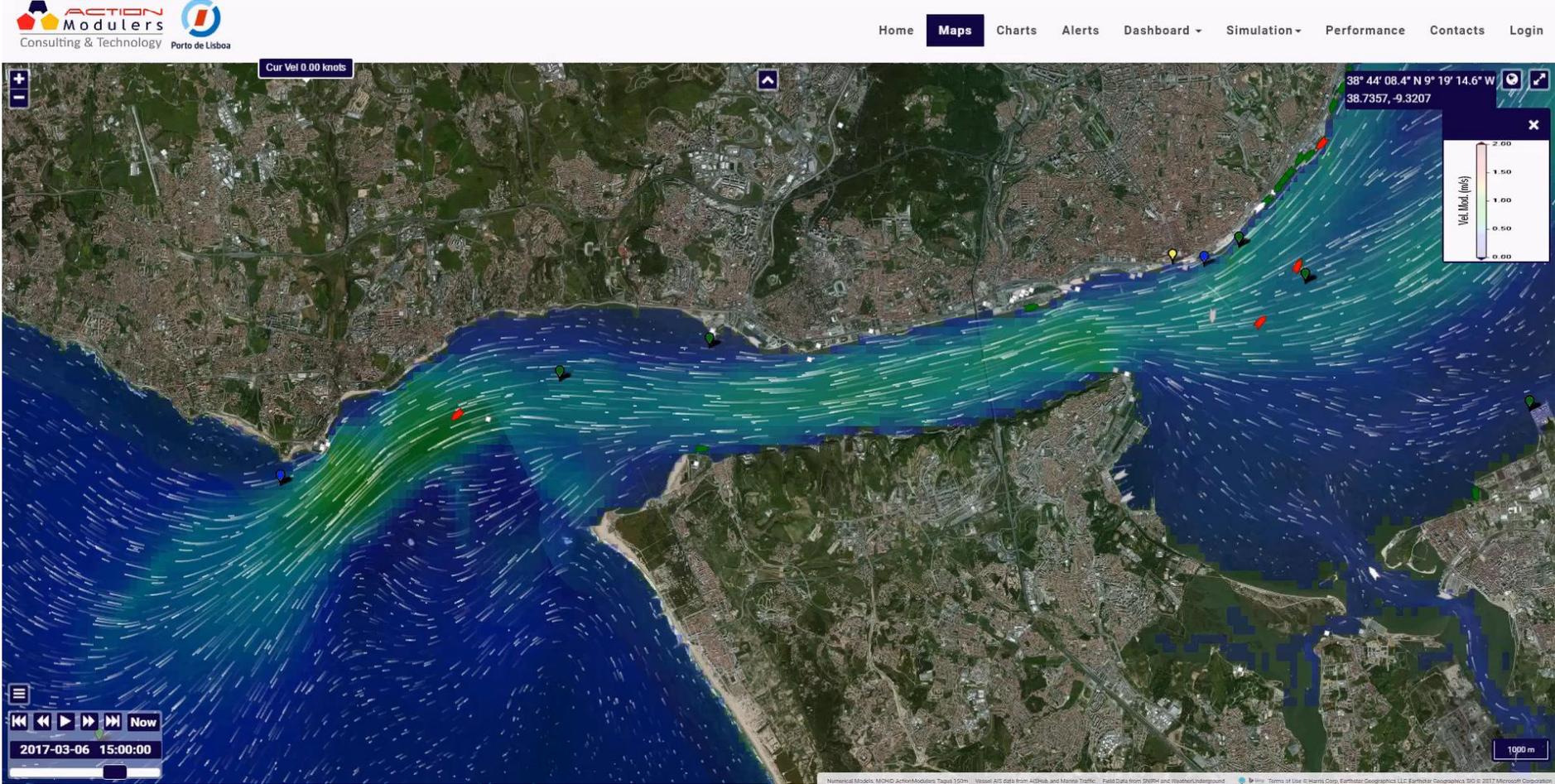
- Professional support services for companies, research institutes and universities
 - Hydrodynamics
 - Sediment transport
 - Water quality
 - Urban and industrial waste water discharges
 - Cooling water recirculation
 - Brine discharges
 - Oil spills
 - Search and rescue
 - Coastal flooding
 - Ecological modelling
 - Aquaculture
 - etc



Software for MOHID Water



Software for MOHID Water – Action Seaport



Software for MOHID Water – Action Seaport

The screenshot displays the MOHID Water Action Seaport software interface. At the top left, the logo for 'ACTION Modulers Consulting & Technology Porto de Lisboa' is visible. The top navigation bar includes links for Home, Maps, Charts, Alerts, Dashboard, Simulation, Performance, Contacts, and Login. The main area features a map of a coastal region with a grid of arrows representing water flow or currents. A vessel named 'SPIRIT' is highlighted with a red box, and a pop-up window provides details about it.

Base Layers

- Vessels
- Monitoring Stations
- Bathymetry

Operational Results

Ocean/Coastal Circulation

Operational Properties

None

Direction Overlay

As: StreamLines Vectors

Coastal Vulnerability Index

None

User Simulation Layers

For simulation layers please login first

General Options

- Tooltip on Mouse Stop

SPRIT

Heading [°]: 42
Speed [knots]: 0
Flag: N/A
Length [m]: 142
MMSI: 244850968
Vessel Type: Cargo

[GET LAST DAY POSITIONS](#)

Coordinates: 38° 44' 04.2" N 9° 09' 53.7" W
38.7345, -9.1649

Map controls: 2017-03-06 14:00:00, 500 m scale bar.

Software for MOHID Water – Action Seaport



Charts

This page shows timeseries of measured and modelled data for selected points in form of charts and tabular data.

- Measured data is represented with yellow lines in the charts
- Modelled (forecasted) data is represented with blue lines in the charts
- The vertical line in the charts indicates current date
- The tabular data shows forecasted values
- The column of the current date is highlighted in yellow

Please select a station for which data should be displayed:

Forte São Julião

Torre VTS

Mar da Palha

Tanquipor

Terminal Passageiros

Scooping Area

Forte São Julião

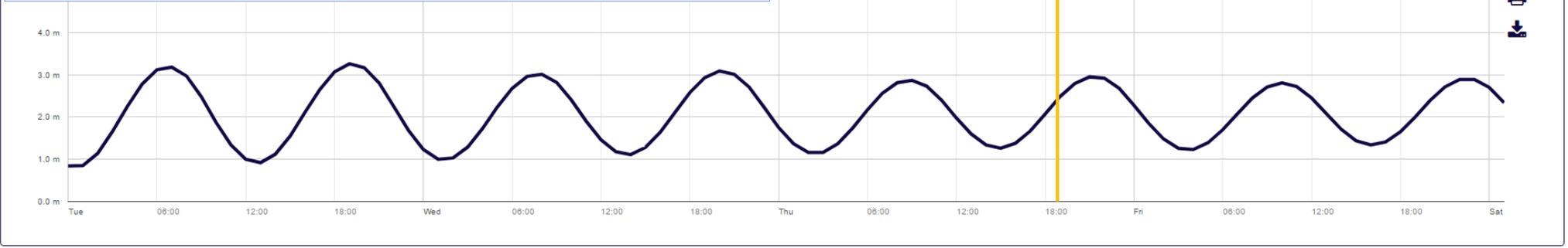
Barra Sul Bico do Pato

Boia Ondógrafo

Estação Pilotos Cascais

Meteo Aeroporto Lisboa

Meteo Alcochete

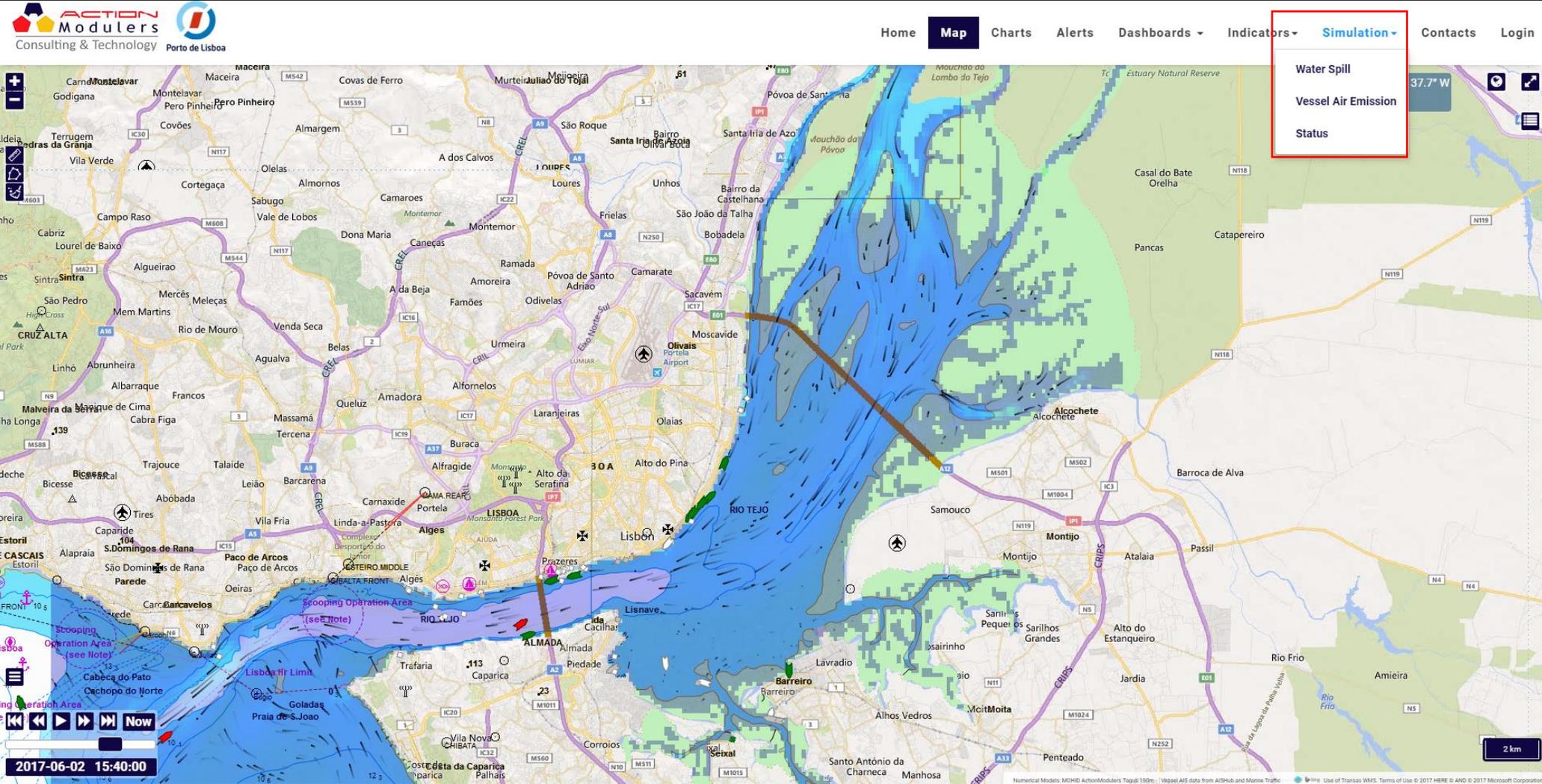


Current Velocity [knots]

Software for MOHID Water – Action Seaport

Dashboard: data sources automatically updated for wall screens

Software for MOHID Water – Action Seaport



Software for MOHID Water – Action Seaport

The screenshot shows the 'ACTION Modulers' software interface. At the top left is the logo for 'ACTION Modulers Consulting & Technology Porto de Lisboa'. A navigation menu at the top right includes 'Home', 'Map', 'Charts', 'Alerts', 'Dashboards', 'Indicators', 'Simulation', 'Contacts', and a user profile 'rodrigo.fernandes'. Below the navigation is a four-step process bar: '1. What?' (active), '2. Where?', '3. When?', and '4. Run'. The '1. What?' step contains three input fields: 'Incident Name' with the text 'test spill', 'Substance Type' with a dropdown menu set to 'Oil Spill', and 'Oil Spill Options' with a dropdown menu set to 'Medium Oils (Most Crude Oils)'. At the bottom right of the form area are 'Previous' and 'Next' buttons.

State-of-the-art, on-the-fly, and reliable water and air dispersion modelling for floating containers, inert, oil and HNS spills

Software for MOHID Water – Action Seaport



1. What? 2. Where? 3. When? 4. Run

Incident Name
test spill

Substance Type
Oil Spill
Oil Spill
HNS Spill
Human Body
Passive Tracer (e.g. Ballast waters)
Floating Object (e.g. Container)

Previous Next



Software for MOHID Water – Action Seaport



1. What? 2. Where? 3. When? 4. Run

Incident Name

Substance Type

Oil Spill Options

- Medium Oils (Most Crude Oils)
- Very Light Oils (Jet Fuels, Gasoline)
- Light Oils (Diesel, No 2 Fuel Oil, Light Crudes)
- Medium Oils (Most Crude Oils)**
- Heavy Oils (Heavy Crude Oils, No 6 Fuel Oil, Bunker C)

Previous Next

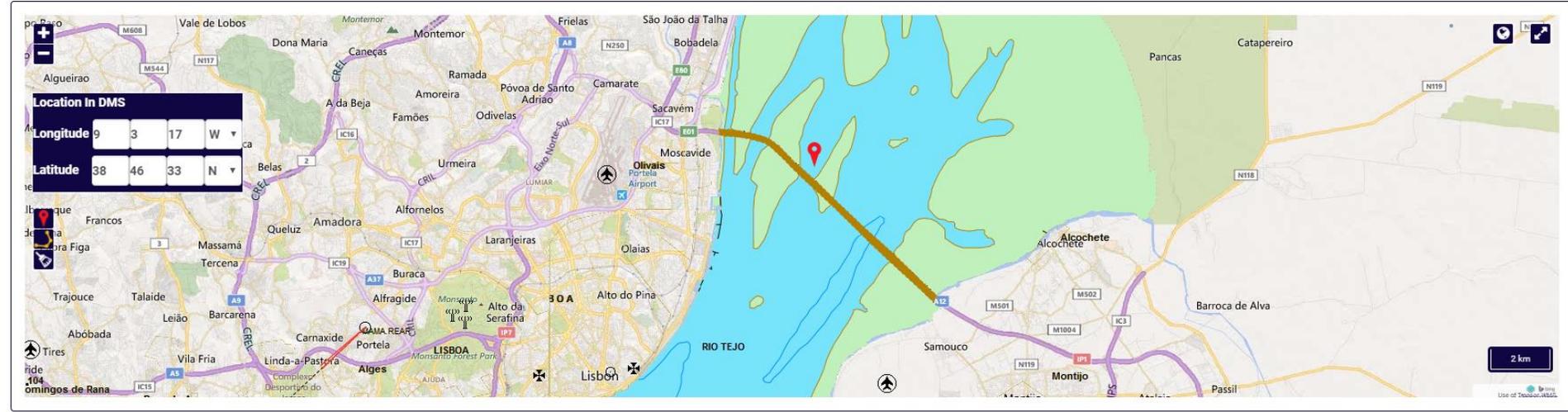


Software for MOHID Water – Action Seaport



1. What? 2. Where? 3. When? 4. Run

Pick Incident Locations Interactively



Previous Next



Software for MOHID Water – Action Seaport



1. What? 2. Where? 3. When? 4. Run

Incident Type

Continuous Instantaneous

Incident Instant/Simulation Start

2017-06-02 00:00

Simulation End

2017-06-02 06:00

Volume (m3)

100

Previous Next



Software for MOHID Water – Action Seaport



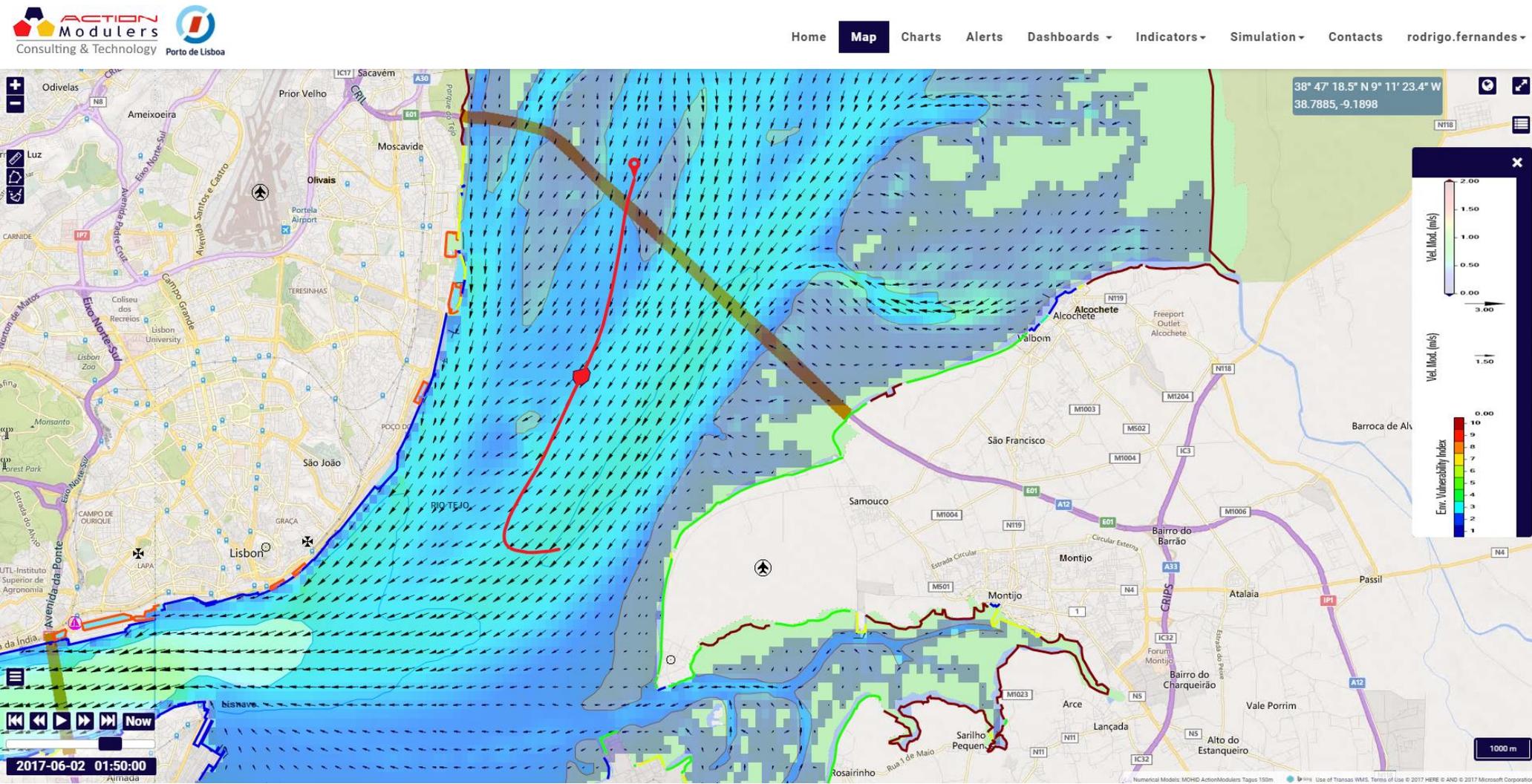
1. What? 2. Where? 3. When? 4. Run

Simulation Resume
Name : test spill
Substance : Oil Spill
Localization : -9.055 38.776
Emission Type : instantaneous
Start Date : 2017-06-02 00:00
End Date : 2017-06-02 06:00
Expected Run Duration : 3 minutes

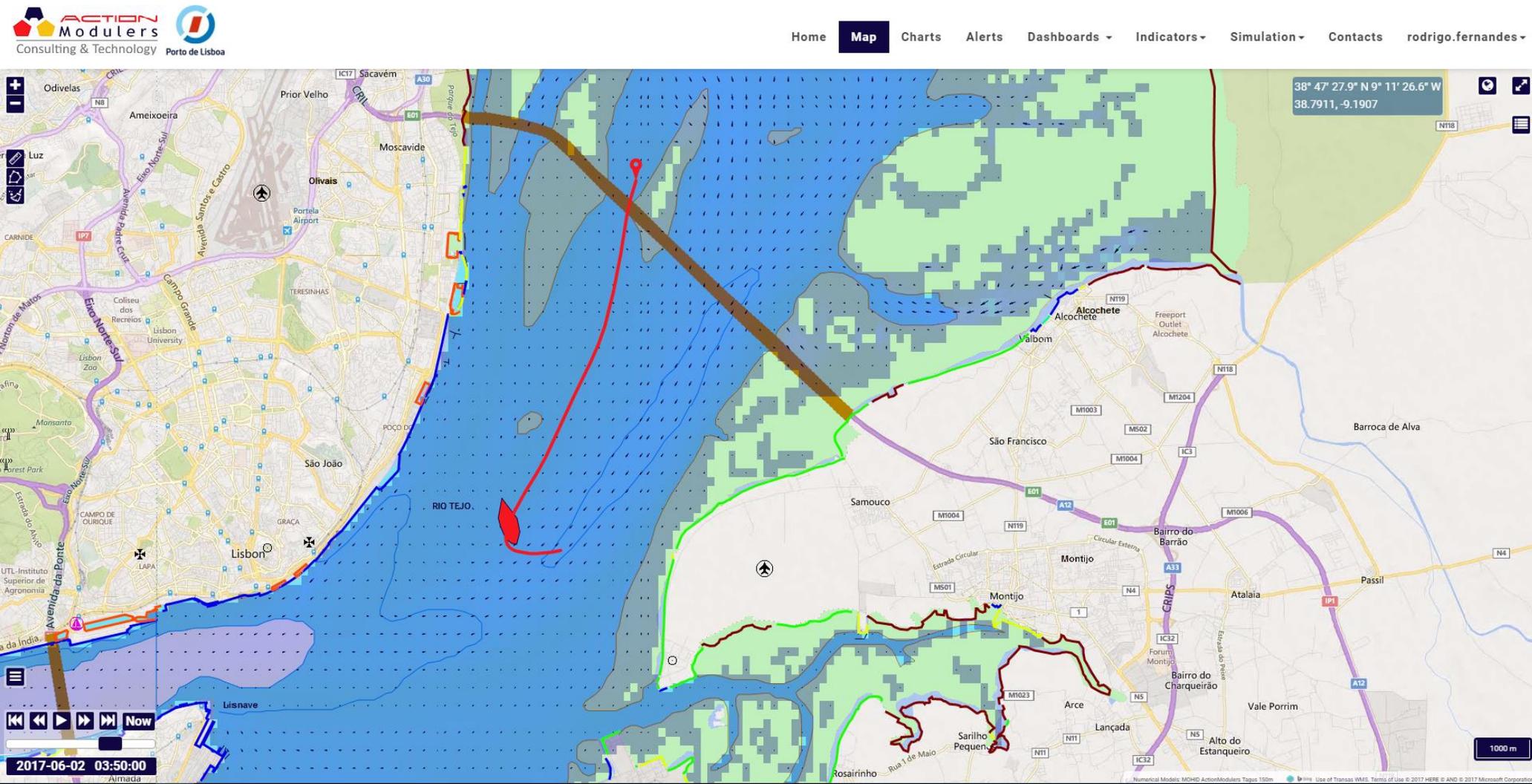
Previous Finish



Software for MOHID Water – Action Seaport



Software for MOHID Water – Action Seaport



Software for MOHID Water – Action Seaport

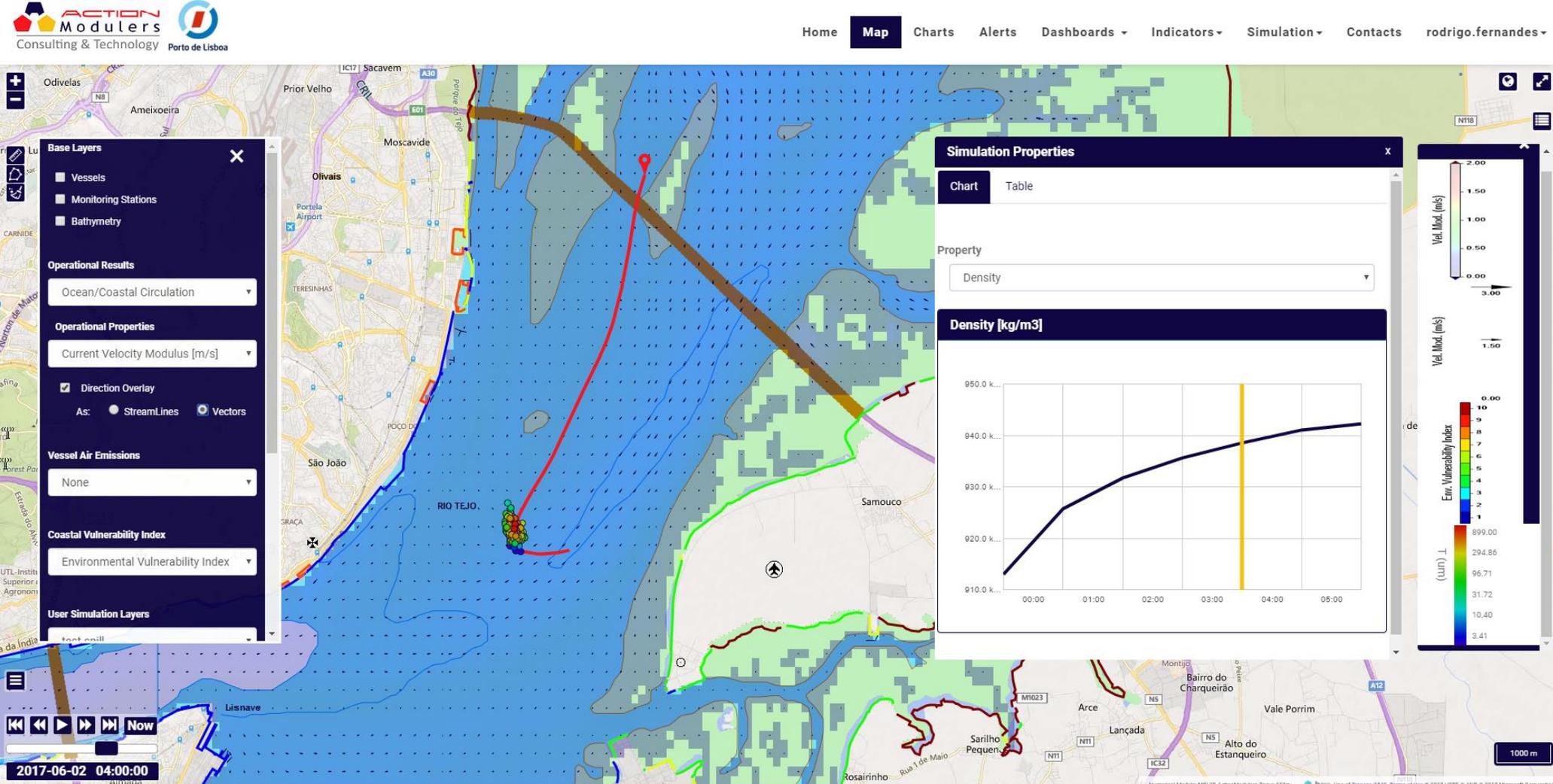
The screenshot displays the MOHID Water software interface. On the left, a map shows the coastline of Lisbon, Portugal, with the Rio Tejo river and various urban areas. A red line indicates a simulation path or boundary. The top navigation bar includes 'Home', 'Map', 'Charts', 'Alerts', 'Dashboards', 'Indicators', 'Simulation', 'Contacts', and a user profile 'rodrigo.fernandes'. The 'Simulation Properties' window is open, showing a table of data for 'Fri 02'.

Simulation Properties

Chart **Table**

	Fri 02						
Hours	0	1	2	3	4	5	6
Dens kg/m3	913	925.7	931.7	935.6	938.5	941	942.2
Visc cP	454.8	955.1	1388	1775.7	2136.7	2505.2	2699.6
Surf Area m2	17056	25121	30785	35321	39185	42550	43895
Thickkness um	4.6	2.7	2.1	1.8	1.5	1.4	1.3
Beached Vol m3	0	0	0	0	0	0	0
Mass Emuls %	0	0	0	0	0	0	0
Mass Evap %	24.39	32.48	36.28	38.77	40.62	42.22	42.97
Mass Disp %	0.03	0.07	0.12	0.16	0.2	0.24	0.26
Mass Diss %	0	0	0	0	0	0	0
Mass Sed %	0	0	0	0	0	0	0
Mass Remaining	75.58	67.45	63.60	61.07	59.18	57.54	56.77

Software for MOHID Water – Action Seaport



MOHID Water @ Bentley

- Integrate MOHID Water & MOHID Studio into Bentley's portfolio (mid-term)
- Integrate Action Seaport into Bentley's portfolio
- Integrate MOHID Water with other Bentley Products

