

DUBAI COASTAL ZONE FORECASTING SYSTEM

USER MANUAL

April 2018



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1 Introduction

Welcome to the Dubai Coastal Zone Monitoring Programme forecasting website. This site is launched as part of the new operational forecasting system being operated and maintained by Dubai Municipality (DM). This forecasting system, under development for the past year, is a suite of coupled meteorological and ocean models and is a landmark effort by DM to provide accurate and detailed information on metocean forecasts and extreme conditions along the entire Dubai coastline. We hope you will find the site to be an informative source of wind (speed and direction), wave (height and direction), water level and current (speed and direction) forecasts. The site also provides warnings when the forecasts predict extreme conditions. These warnings are generated automatically by computer models and are not validated by forecast professionals. They are not intended for decision-making purposes.

2 Monitoring Website Homepage

2.1 Monitoring Website Concept Design

The website has been updated to use a modern web design, which will greatly improve the user experience. HQASA worked directly with DM to obtain an approved concept design which is shown in Figure 1 below. This design was used to guide website development. Page layouts, data presentation and “look and feel” were overhauled to deliver the most useful information to the user in a concise and visually appealing manner.

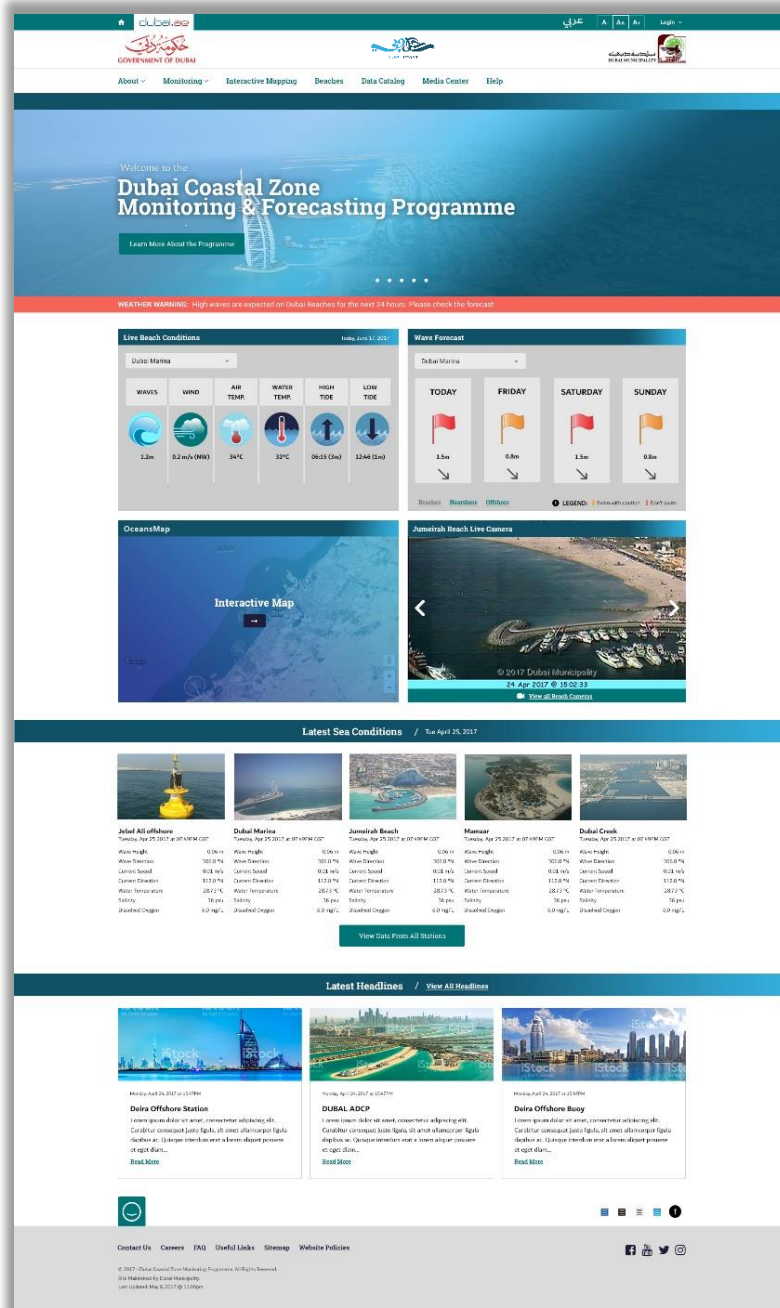


Figure 1: DM Approved monitoring website concept design home page

2.2 Header & Navigation

The website has been designed to allow the user to intuitively navigate the content and select the desired information.

The top bar provides users with:

- A home button to easily return to the homepage when desired
- A link to the Dubai.ae website
- Language controls for English and Arabic
- Accessibility controls for font size
- Login drop down (Login functionality is presented in section 2.2.1)

The title bar includes the Government of Dubai logo and Dubai Municipality logo which link to their respective websites. The navigation bar includes all the required sections of the website with navigation dropdowns.



Figure 2: Header & Navigation

2.2.1 Registration & Login

The updated monitoring website includes user login and registration capabilities. Users can log in by clicking “Log In” in the header or footer. If the user has already registered they can login using their username and password. The existing database was migrated to allow users to login.

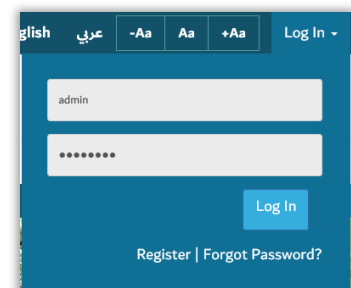


Figure 3: Login Window

If the user has forgotten their password they can click “Forgot Password” and enter their registered email to reset the password. If the user does not have login details then they must register by clicking “Register” to access the full suite of functions available on the website.

Figure 4 below shows the user registration page. The username was changed to require an email address for a new account. When registering the user can choose to receive SMS forecast alerts and forecast alert emails. The user will receive an automated email to activate their account once submitted.

The screenshot displays a registration form with the following fields and options:

- * Email:** Text input field.
- * Password:** Text input field with a visibility toggle icon.
- * Name:** Text input field.
- * Confirm Password:** Text input field with a visibility toggle icon.
- Country:** Dropdown menu with the placeholder text "Please Select a Country".
- Institution Or Company:** Text input field.
- Mobile Phone:** Text input field.
- Preferred SMS Language:** Dropdown menu.

Below the Mobile Phone field, there is a note: "Please enter full international mobile phone number and not local dialing number. Examples: +971 (55) 2222222 (UAE), +1 (401) 222-2222 (USA)." Below this note are two checkboxes:

- Yes, I would like SMS forecast alerts sent to my phone
- Yes, I would like forecast alerts sent to my email

A green "Register" button is located at the bottom right of the form.

Figure 4: Registration Page

Below is a list of the fields each user must fill out to successfully register.

Table 1: Login field requirements

| Login Form | |
|------------------------|-------------|
| Field | Requirement |
| Email | Yes |
| Name | Yes |
| Password | Yes |
| Confirm Password | Yes |
| Country | No |
| Mobile Phone | No |
| Institution or Company | No |
| Preferred SMS Language | No |

2.3 Live Beach Conditions

The live beach conditions section allows users to view observation data for the Dubai Blue Flag Beaches. This data is retrieved from observation stations. This section has been developed following the exact specifications outlined by DM. Figure 5 below shows an overview of the Live Beach conditions section as it appears on the home page.

The following Blue Flag Beaches can be selected for Live Beach Conditions:

- Dubai Marina
- Umm Suqeim 2
- Umm Suqeim 1
- Jumeirah 3
- Jumeirah 2
- Jumeirah 1
- Al Mamzar Corniche Beach
- Al Mamzar Lagoon Beach

The following data is presented:

- Wave height (m)
- Wind speed (m/s)
- Air temperature (°C)
- Water temperature (°C)
- High tide (m)
- Low tide (m)

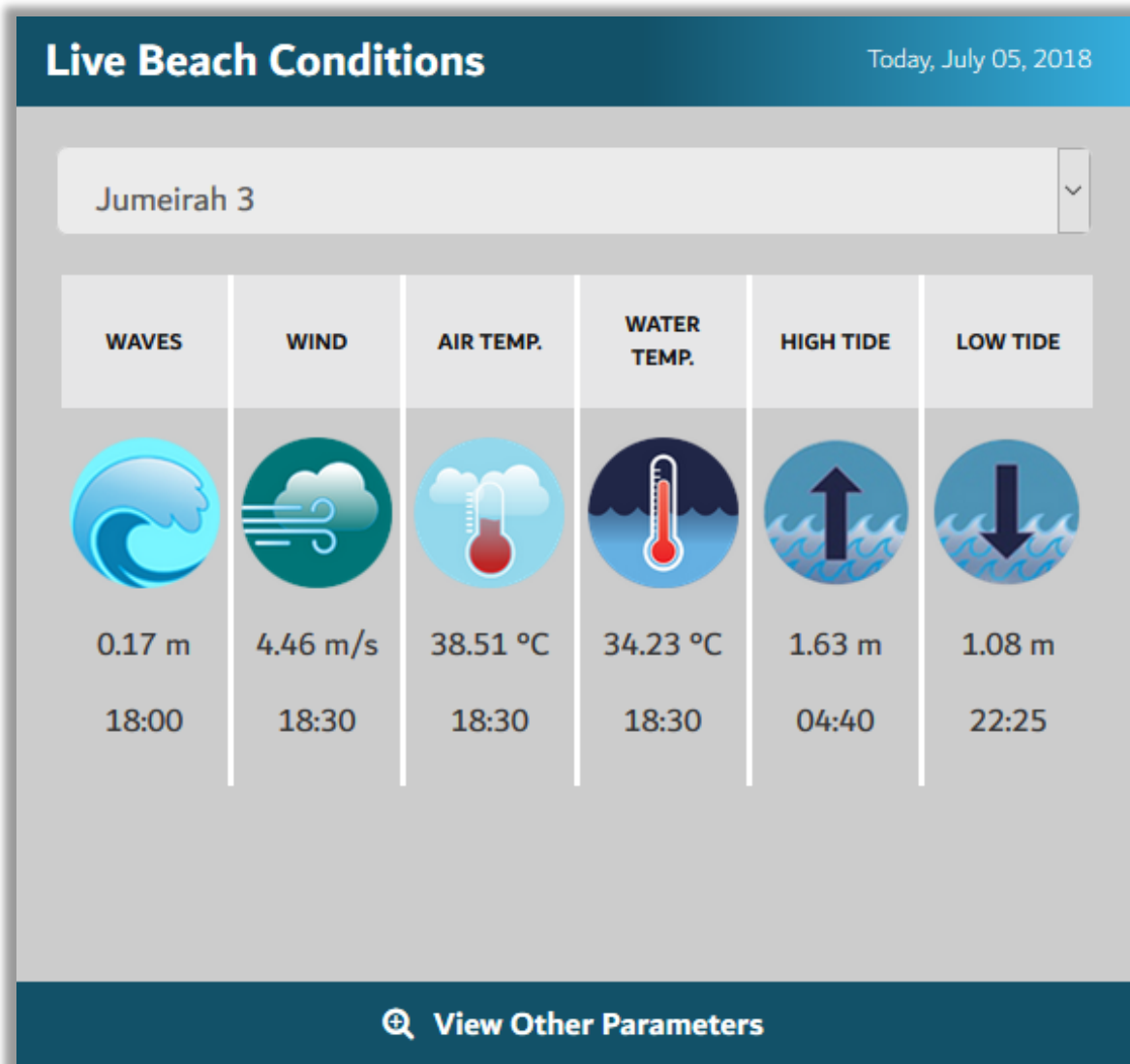


Figure 5: Live Beach Conditions Homepage Section

Features of Live Beach Conditions:

- The data listed above are displayed using DM approved icons. This layout was designed to improve ease of use and expedite visual association with each parameter.
- Data is retrieved from near real time live observation data and tide table data stored in the database. The closest station to each beach with valid data for each parameter is shown.
- High Tide and Low Tide are sourced from tide tables that were provided by DM and are valid until 12/31/2020.

-
- The user selects the desired beach from the dropdown menu to obtain live beach condition data for the closest available time.
 - The data value is displayed with the associated time stamp listed below.
 - User can link to the OceansMap interface to obtain detailed live beach conditions by clicking “View Other Parameters”
 - For clarity today’s date is displayed at the top of the section.

2.4 Wave Forecast

The Wave Forecast section allows users to view wave forecast data and wave warning information for the Dubai region. The wave forecast is provided by the HQASA operation forecast model. The wave warnings are derived from the wave forecast using a set of predefined thresholds. The wave warnings are described in section 2.4.2. The wave forecast section has been developed following the exact specifications outlined by DM. Figure 6 below shows an overview of the Wave Forecast section as it appears on the home page.

The following Blue Flag Beaches that can be select for Wave Forecast:

- Dubai Marina
- Umm Suqeim 2
- Umm Suqeim 1
- Jumeirah 3
- Jumeirah 2
- Jumeirah 1
- Al Mamzar Corniche Beach
- Al Mamzar Lagoon Beach

The following Nearshore & Offshore areas users can select for Wave Forecast:

- Palm Jumeirah
- The World
- Maritime City
- Palm Deira
- Jebel Ali Port
- Palm Jebel Ali
- Jebel Ali
- Offshore

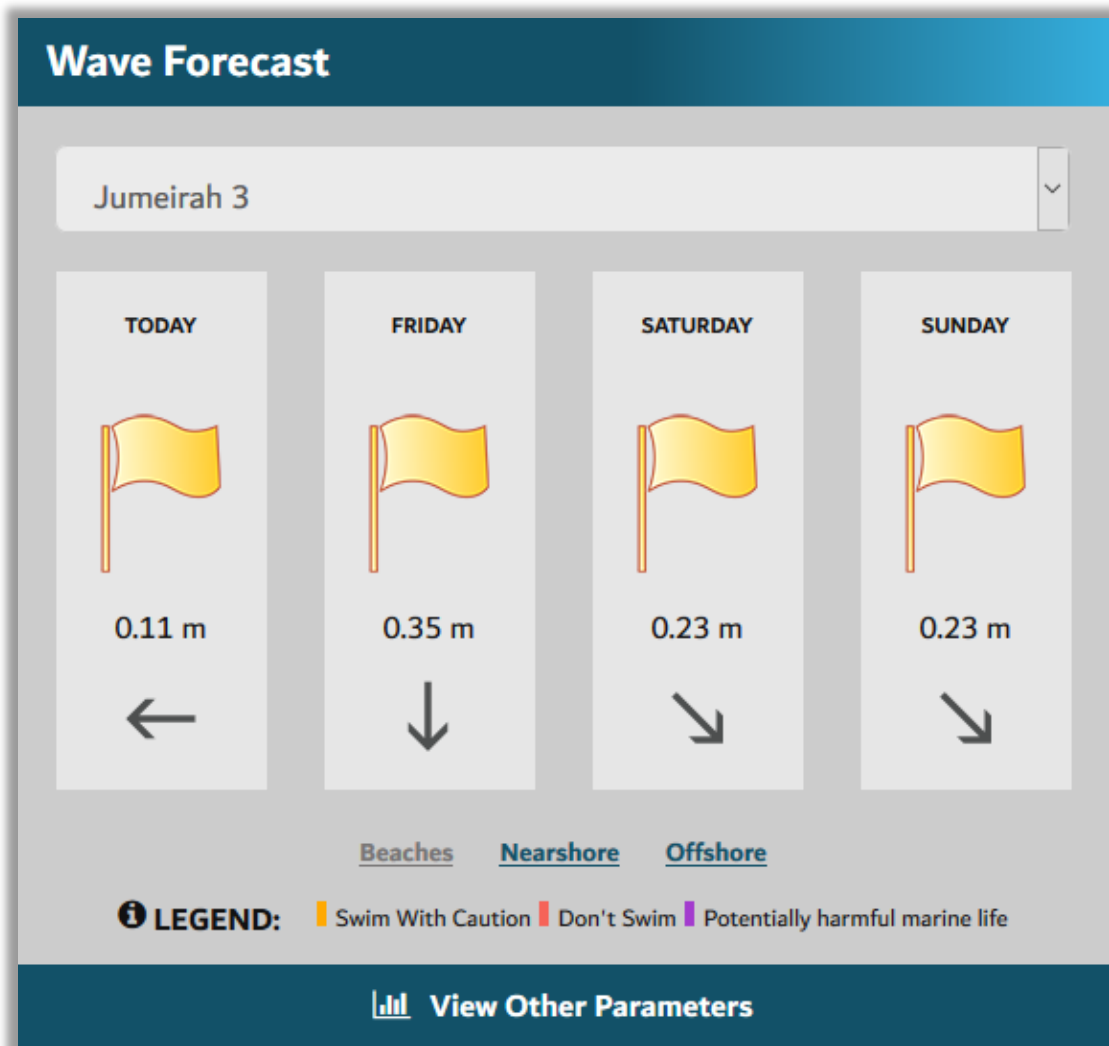


Figure 6: Wave Forecast Homepage Section

Features of Wave Forecast:

- Connects to wave forecast data that comes from the HQASA operational forecast model that is stored in the MS SQL server.
- User selects Beaches, Nearshore or Offshore from the bottom of the window.
- User selects desired region from the dropdown menu to obtain wave forecast.
- Wave forecast returns wave height and direction for each location and time based on the forecast value for that region.
- Wave height is displayed in meters and directional arrows are used to display wave direction.
- Wave forecast is updated each time the forecast model run has completed.
- Warning flags are determined by the wave warning thresholds described in section 2.4.2 below.
- This section was designed to clearly display the warning flags so users do not miss warnings.
- User can link to the OceansMap interface to obtain detailed live beach conditions by clicking “View Other Parameters”
- The legend displays an overview of the flag meanings and the info button gives a detailed description of each warning as is shown in section 2.4.2 below.

2.4.1 Wave Forecast Homepage Display

Wave Forecast Height and Direction:

- **For TODAY:** The displayed value is the maximum wave for the chosen region calculated every 3 hours from 0-24 hours. These calculated maximum wave height values include the remaining hours from the current time until hour 24 and omit hours that have already passed. *For example*, at 1330 the value displayed would be the max wave forecast for the chosen region from hours 12-24. The website shows a single value that is the latest available wave forecast maximum. This method for calculating the values

and warnings was used to ensure users see an accurate representation of future conditions for TODAY.

- **For other days:** The displayed value is the maximum wave for the chosen region calculated every 12 hours from 0-24 hours. This value is only updated when the 2nd daily forecast run is completed and the wave forecast updates.

2.4.2 Warnings

The flags displayed in the wave forecast section are colored based on the criteria outlined below. The default flag for all regions is yellow. The forecast model determines the warnings based on the thresholds shown below and sends the warning to the monitoring website interface where the flag color is updated. These warnings are also displayed in the warning regions layer in OceansMap.


The wave warning thresholds have been migrated from the existing system. These thresholds were provided by DM during the initial phases of the original project. For consistency and comparison purposes the have not been updated so HQASA can assess the performance of the updated warning system. HQASA will monitor the warnings for six months and provide recommendations on and necessary updates to the thresholds bases on the validity of the warnings.

Warning Legend:

Beach:

 Yellow: Swim with caution

 Red: Don't Swim

 Purple: Potentially harmful marine life. This option can only be active by DM admin staff and is not dependent on forecast data.

Nearshore and Offshore:

 Yellow: Moderate

 Red: Rough


Activation of Legend Colors Based on Waves:

Beach:

 Yellow: $\leq 1\text{m}$

 Red: $>1\text{m}$

Nearshore:

 Yellow: 1m to 1.6m

 Red: $>1.6\text{m}$

Offshore:

 Yellow: 1.6m to 2m

 Red: $>2\text{m}$

2.5 OceansMap (Homepage)

The OceansMap section on the homepage gives users quick access to the interactive map. This section directly links the user to the interactive map interface. When the link is clicked OceansMap automatically opens in the same browser window and user login information is seamlessly passed to OceansMap. The location of this section on the homepage tells the user that it is a key function of the website and helps entice users while promoting the interactive map. This supports user engagement and increases the probability of user retention by providing ease of access to valuable functionality. The OceansMap section on the homepage has been developed following the exact specifications outlined by DM. Figure 7 below shows an overview of the OceansMap section as it appears on the home page.



Figure 7: OceansMap Interactive Map Homepage Section

2.6 Beach Cameras

The beach cameras section allows users to quickly and easily view live camera images for the Dubai region. The camera images are populated from near real time data provided by third party camera consultant. As one of the most popular sections of the existing website it was important to give users seamless access to the camera images. If the user wishes to view high resolution images from the live cameras they can do so by clicking “View All Beach Cameras”. The camera image delivery has been updated to optimize delivery and improve latency. This section has been developed following the exact specifications outlined by DM. Figure 8 below shows an overview of the Beach Cameras section as it appears on the home page.



Figure 8: Beach Cameras Homepage Section

Beach Cameras are available from the following locations:

- Mamzar Corniche View 1
- Mamzar Corniche View 2
- Mamzar Corniche View 3
- Mamzar Lagoon View 1
- Mamzar Lagoon View 2
- Mamzar Lagoon View 3
- Mamzar Lagoon View 4
- Mamzar Lagoon View 5
- Mamzar Lagoon View 6
- Mamzar Lagoon View 7
- Deira Corniche View 1
- Jumeirah Open Beach View 1
- Jumeirah Open Beach View 2
- Jumeirah I View 1
- Jumeirah I View 2
- Jumeirah I View 3
- Jumeirah II View 1
- Jumeirah III View 1
- Jumeirah III View 2
- Jumeirah III View 3
- Jumeirah III View 4
- Jumeirah III View 5
- Jumeirah III View 6
- Jumeirah III View 7
- Umm Sequim I View 1
- Umm Sequim I View 2
- Umm Sequim I View 3
- Umm Sequim I View 4
- Umm Sequim I View 5
- Umm Sequim I View 6
- Umm Sequim II View 1
- Umm Sequim II View 2
- Madinat Jumeirah
- Dubai Marina View 1
- Dubai Marina View 2
- Dubai Marina View

When the user clicks “View All Beach Cameras” they directed to the cameras page which is shown below in image Figure 9. The cameras are presented in a gallery list and the user can click each image to see a high-resolution camera image. This page is refreshed every 5 minutes as default and gives the user the option to refresh as desired.

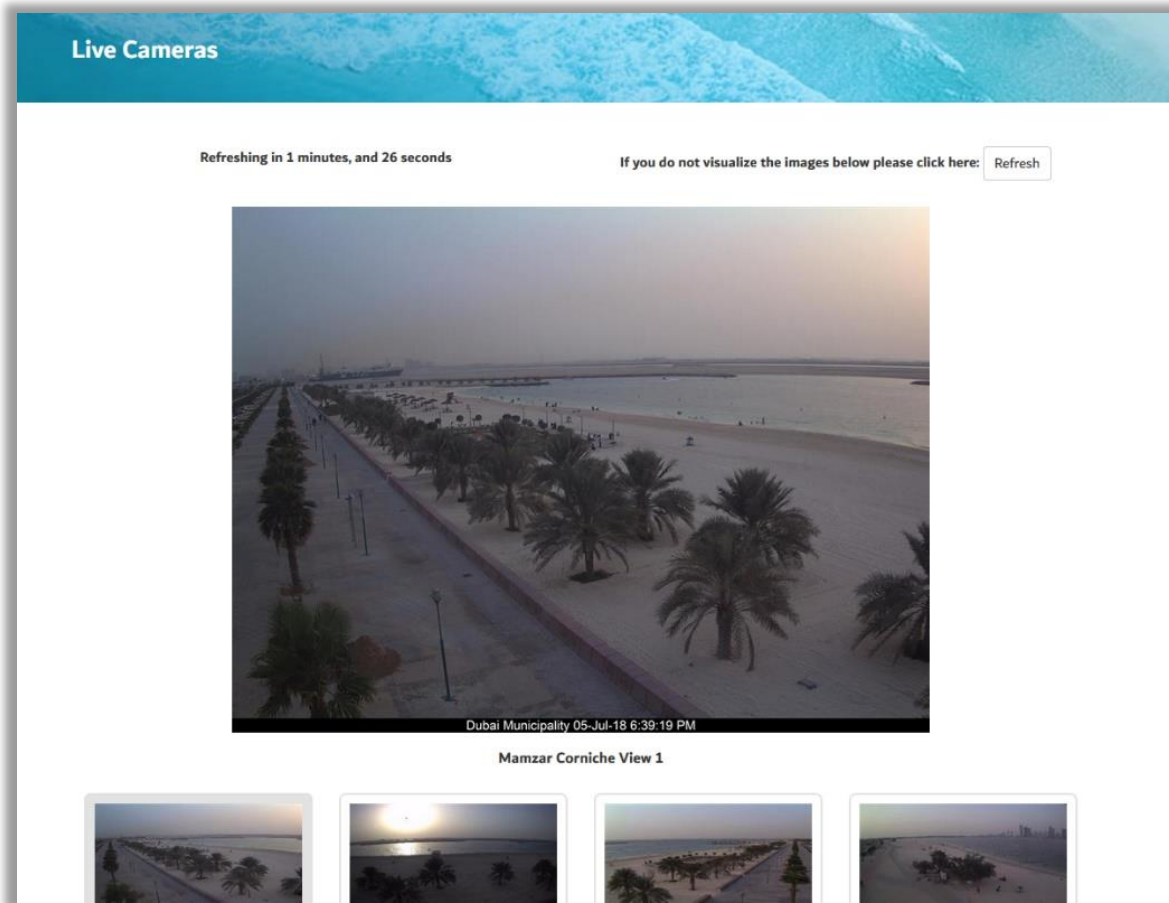


Figure 9: Beach Cameras showing all available cameras

2.7 Latest Sea Conditions

The latest sea conditions section presents near real time observation data for five regions along the Dubai coast. This data is retrieved from observation stations. This section has been developed following the exact specifications outlined by DM. Figure 10 below shows an overview of the Latest Sea Conditions section as it appears on the home page.

The regions that are presented are:

- Jebel Ali Offshore
- Dubai Marina
- Jumeirah
- Mamzar
- Dubai Creek

The following observations are presented for each station:

- Wave height (m)
- Wave direction (Degrees)
- Current speed (m/s)
- Current direction (Degrees)
- Water temperature (°C)
- Salinity (PSU)
- Dissolved Oxygen (%)

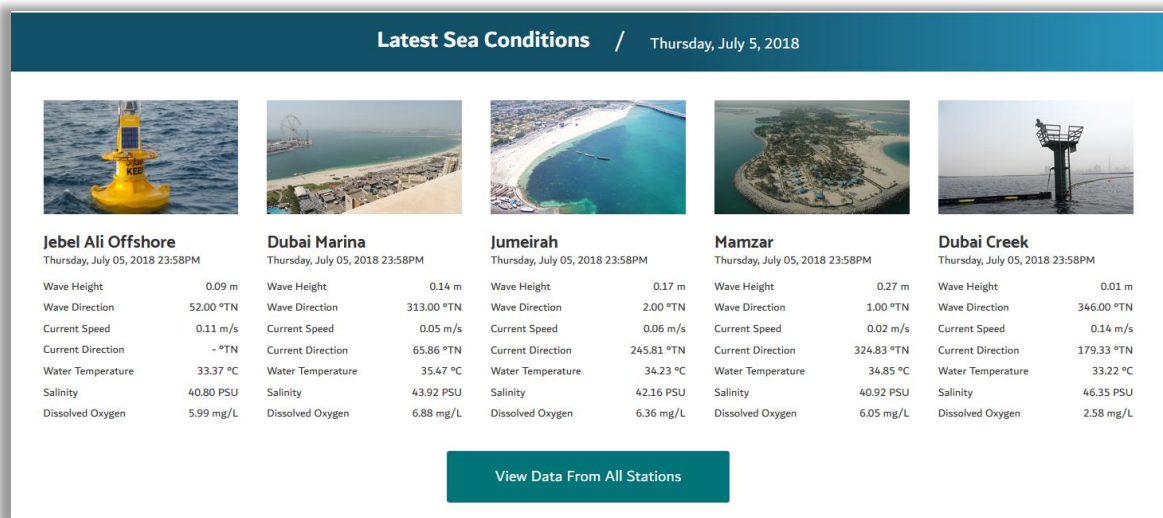


Figure 10: Latest Sea Conditions Homepage Section

Features of Live Beach Conditions:

- Data is retrieved from near real time live observation data stored in the database.
- The closest station to each region with valid data for each parameter is shown.
- The data value is displayed for the closest available time stamp.
- User can link to the OceansMap interface to obtain detailed conditions for all regions by clicking “View Data From All Stations”
- The date and time is displayed below the region name

2.8 Headlines

The headlines section on the homepage gives users a snapshot of the three most recent news stories published by DM. These stories are added to the website by DM admins through the administrator dashboard. DM staff are required to enter a news story headline title, associated content text and provide an image. Figure 11 shows an overview of how the headlines are presented on the home page. The news section presentation and workflow was designed following the layout of many of the world’s leading news providers websites.

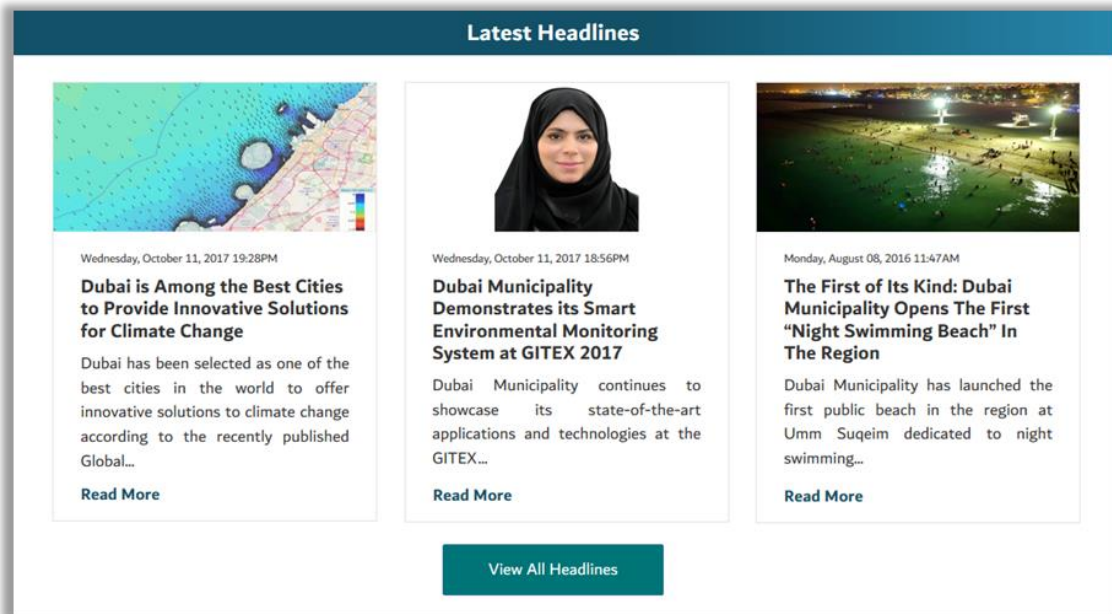


Figure 11: Headlines Homepage Section

Each story has a read more button that allows the user to navigate to a page where the full story can be read. This can be seen in Figure 12 below.

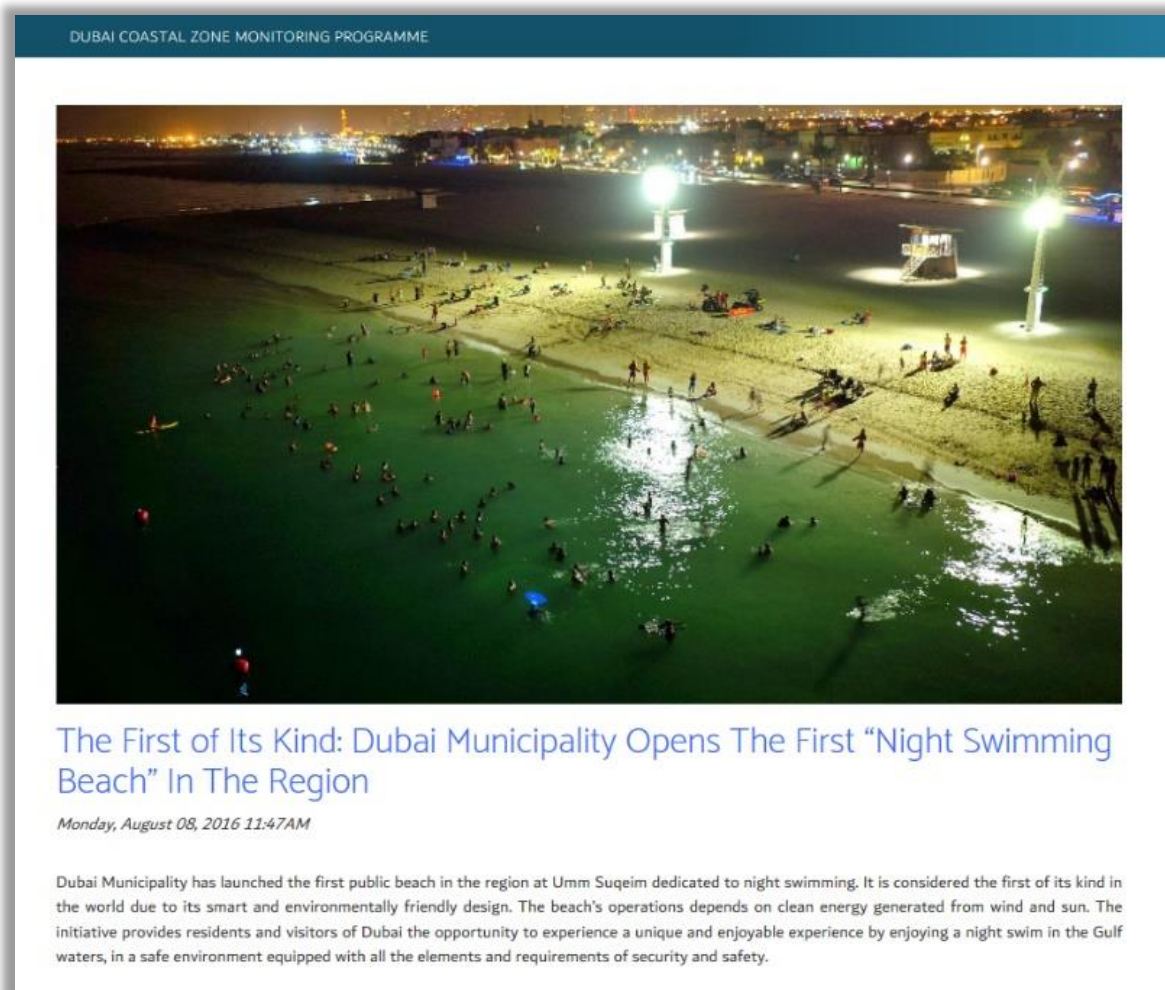


Figure 12: Specific news story page

Users can access the headlines archive by clicking “View All Headlines”. By clicking this button the user is directed to the archive page where the stories are presented in a list view. This can be seen in Figure 13 below.

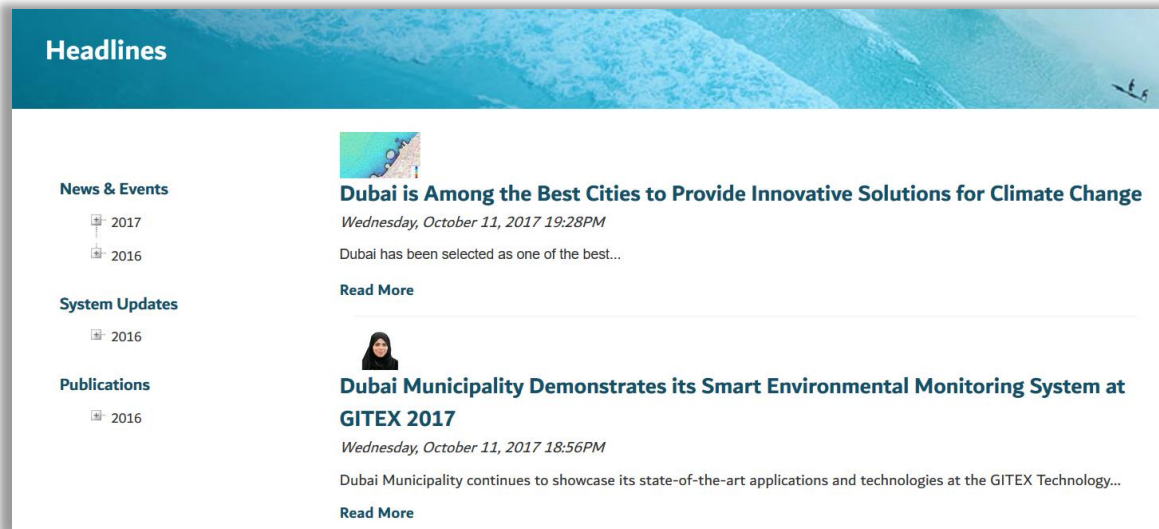


Figure 13: Headlines archive

2.9 Footer

The footer section provides access to the following items:

- Frequently Asked Questions (FAQ)
- Contact Us
- Website Policies
- Site Map
- Login
- Accessibility controls for page color

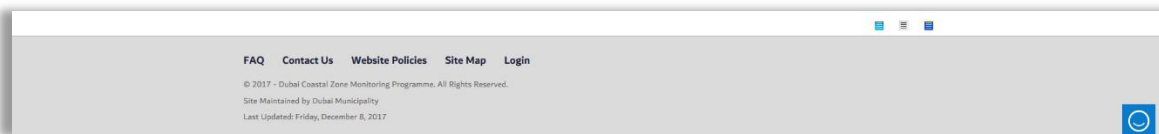


Figure 14: Footer

3 Map Navigation

3.1 Using the Mouse

- **Grab and Pan** - Position the mouse on the map, click and hold the left mouse button and drag the map.

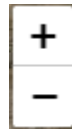


Figure 15: User navigating map with grab and pan.

- **Mouse Scroll Wheel** - with the mouse positioned over the map, rotate the scroll wheel forward to zoom in and backward to zoom out.

3.2 Zoom Tool

- In the top left-hand corner of the map: Click **+** to zoom in on the center of the map.
Click **-** to zoom out.



3.3 Changing the Basemap Layer

- In the menu on the left-hand side, choose 'Basemap'
- There are 6 Basemaps to choose from: Satellite, World Topographic, National Geographic, Light Gray, Street, and Topo.



Figure 16: A list of Basemaps that can be chosen.

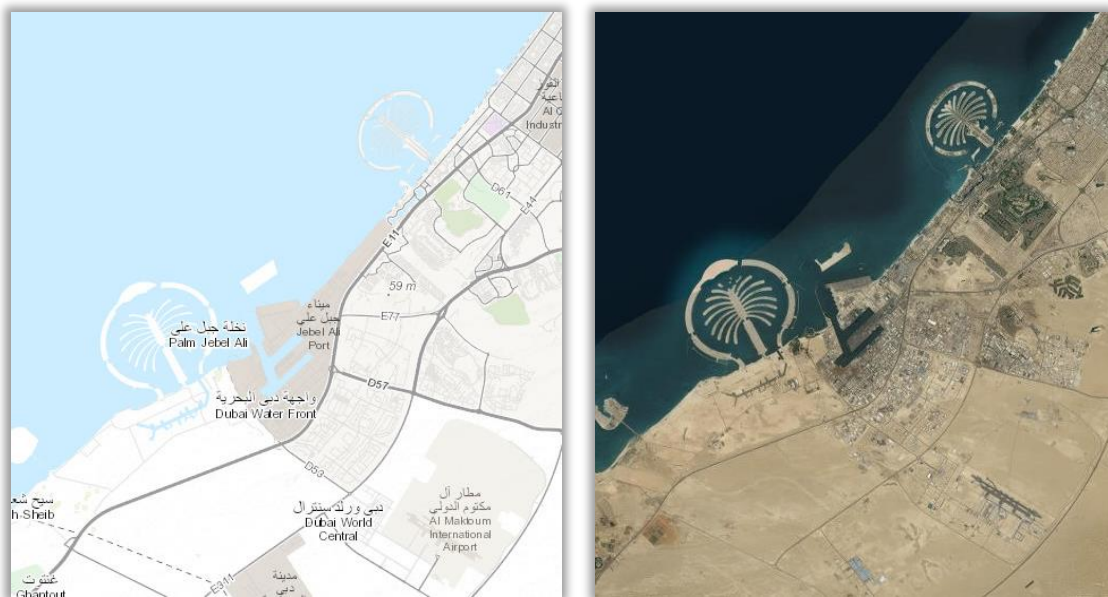


Figure 17: World Topographic (left) and Satellite (right) Basemap layers.

4 Time Slider Tool

Users with administrator privileges can access the time slider tool.

- Located at the bottom of the screen is the Time Slider. This tool is used in conjunction with the **Predicted Data** and **Oil Spill** widgets to view forecasted conditions.

- Click the play button to watch the forecast, or step through frame by frame using the step buttons. The user can also click and drag the slider itself to move forwards and backwards through the forecasted period.



Figure 18: Time slider tool.

- A dialog box appears after clicking the Time Slider calendar icon. Here, users can select a specific time period in which they want to view data.

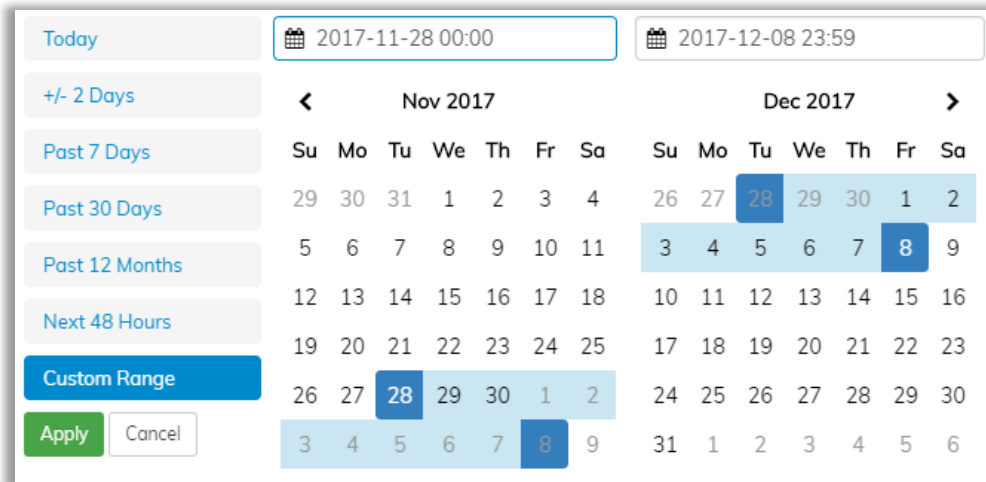



Figure 19: Time slider settings.

5 Warnings

The forecasts generated by the Dubai Municipality operational forecasting system are automatically compared to a series of predefined warning thresholds. If forecast environmental conditions exceed these thresholds then warnings are automatically posted to the Dubai Coastal Zone Monitoring Programme forecasting website. These statements will appear in the Warnings widget as well as in the map itself. Warnings are issued for one or more of the warning areas that subdivide the Dubai coastal zone; the Warnings widget will contain a table of warnings, valid for the next 24-hours, organized by coastal, nearshore, and offshore areas. Users can click on the warning area name or on the map to get warning details.

Advisories are intended to alert the public about weather conditions that may have some modest impacts or cause moderate disruptions, but that usually will cause little threat to life and property. Warnings are serious weather events that may lead to property damage and/or potentially to injuries or death. A warning indicates that the event is imminent or underway.

- In the menu on the left-hand side, click 'Warning Areas'.
- Click the information button  to view the color legend.
- For more information about a specific warning, click within the area on the map.

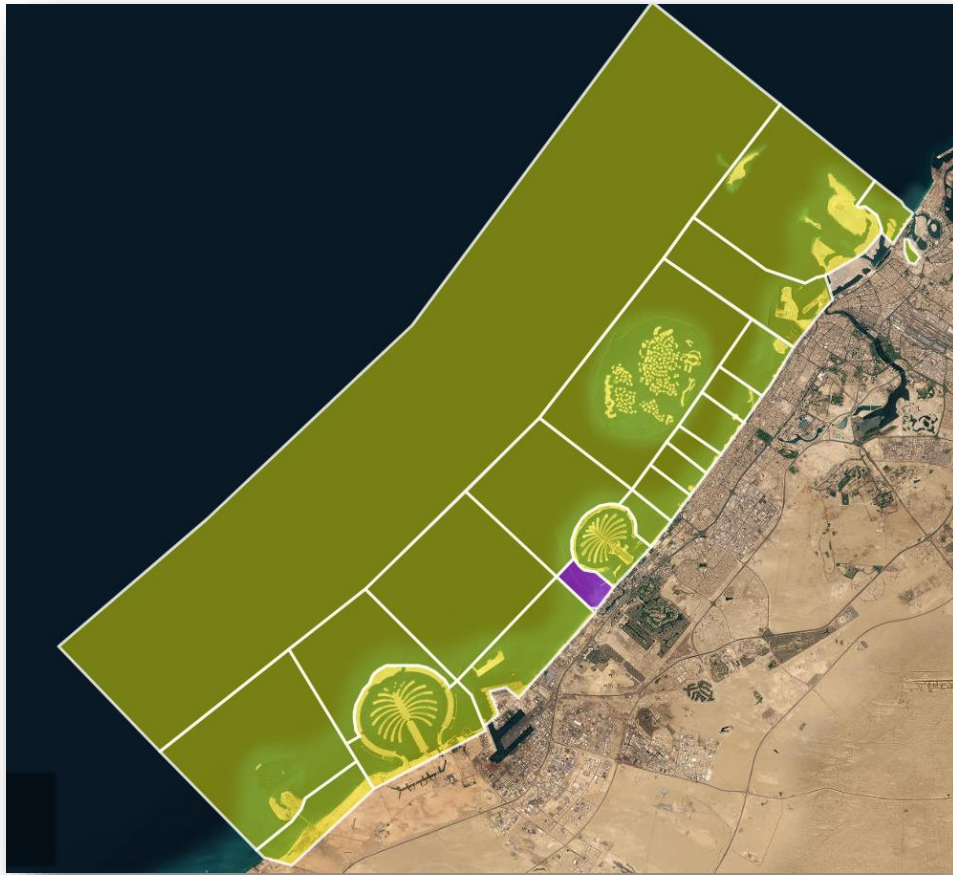


Figure 20: Warning Areas

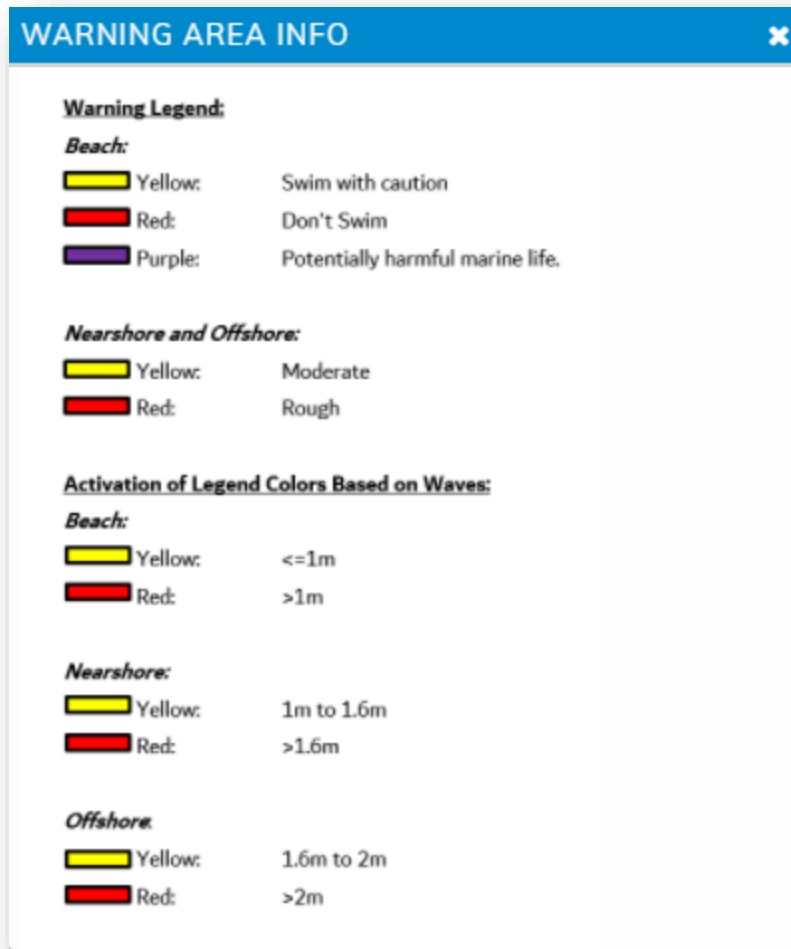


Figure 21. Warning Area color legend.

6 Cameras

Cameras are located across the Dubai coastline. These cameras can be used to assess the weather and conditions at their respective locations. By clicking on the 'Cameras' option on the left-side panel, users can see where the cameras are located.

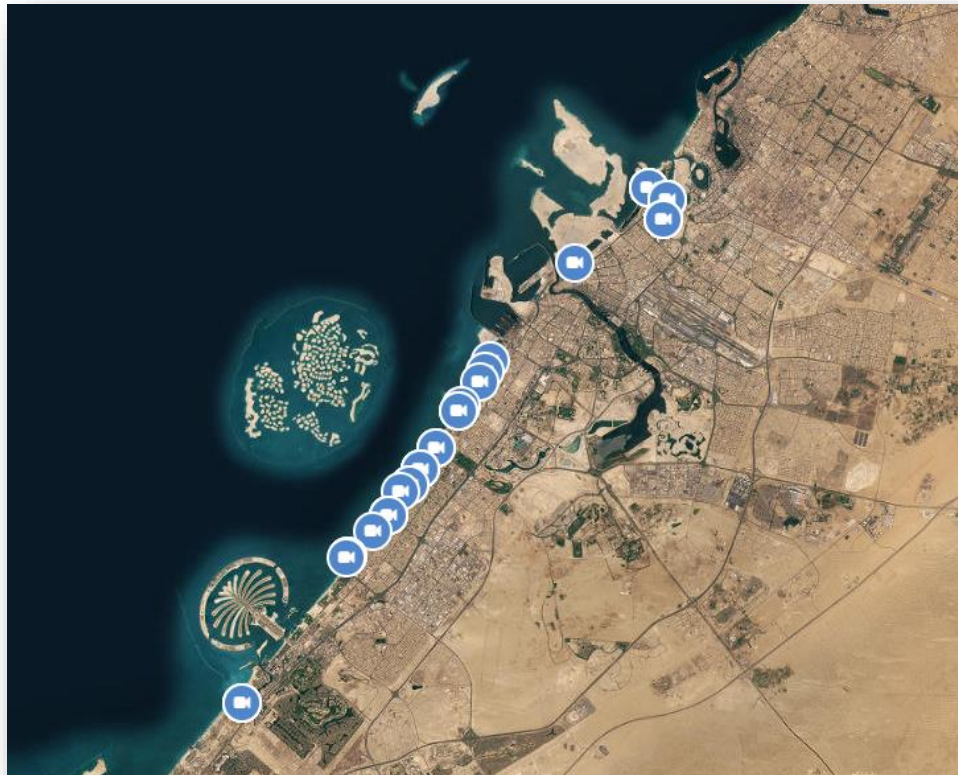


Figure 22. Camera locations across the coast of Dubai.

7 Predicted & Observed Data

7.1 Predicted Data

The Winds, Waves, Currents, Water Temperature, Salinity, and Sea Surface Height options allow users to view present-day and forecasted meteorological conditions. After selecting which layers to display, administrative users can use the Time Slider tool to view past, current, and forecasted conditions.

7.1.1 Layers

- **Winds: Dubai Winds**

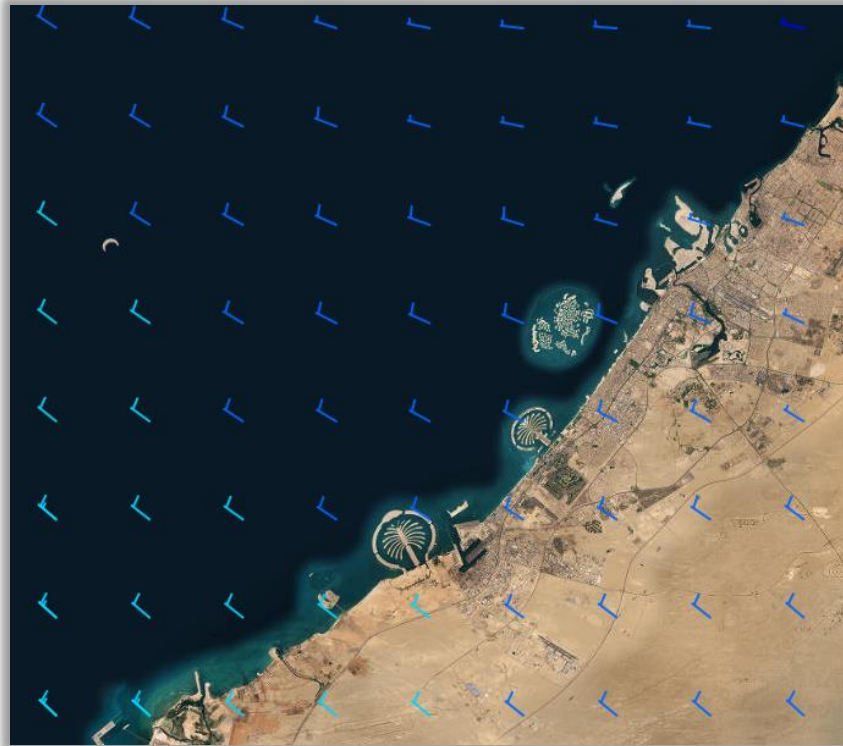


Figure 23: Dubai Winds displayed as vectors.

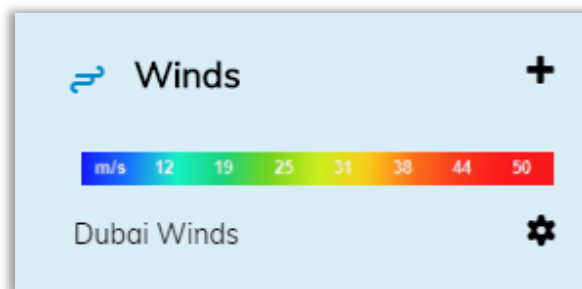


Figure 24: Scale bar for winds.

- Waves: Dubai Wave Height



Figure 25: Dubai Wave Height displayed as scalar.



Figure 26: Scale bar for waves.

- **Currents: Dubai Currents**



Figure 27: Dubai Currents displayed as streamflow.

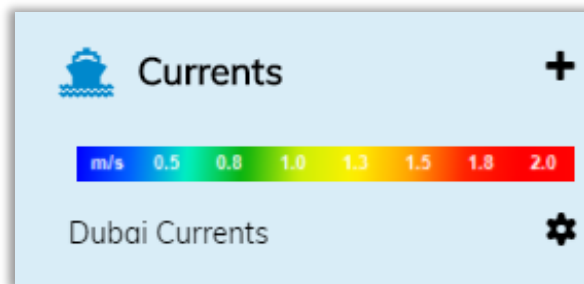


Figure 28: Scale bar for currents.

- **Water Temperature**

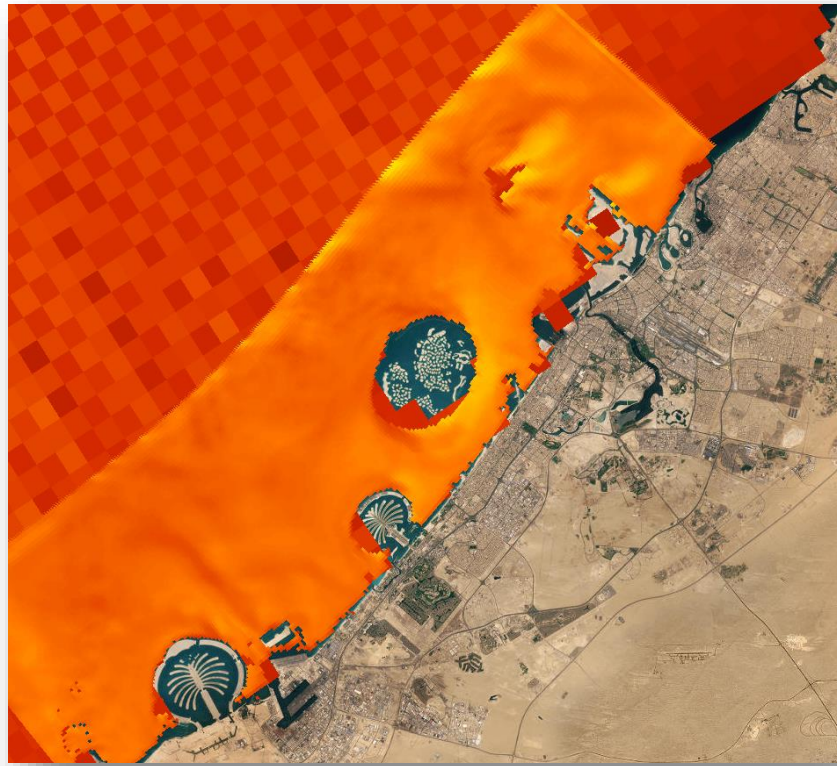


Figure 29. Water Temperature.

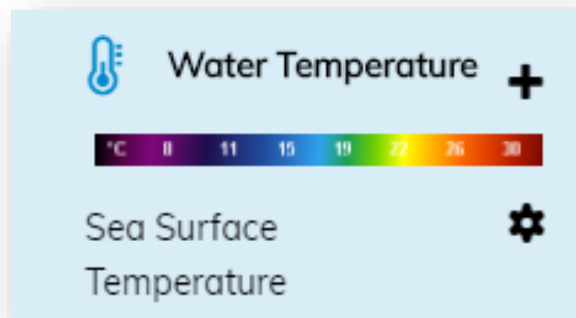


Figure 30. Scale bar for Water Temperature.

- **Salinity**



Figure 31. Salinity.

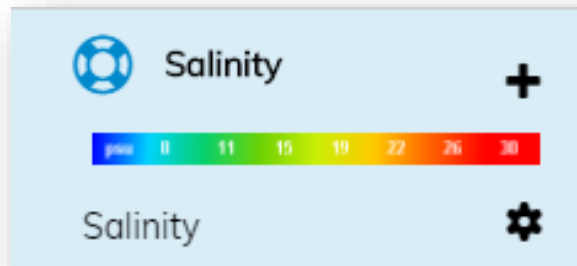


Figure 32. Scale bar for Salinity.

- **Sea Surface Height**



Figure 33. Sea Surface Height.

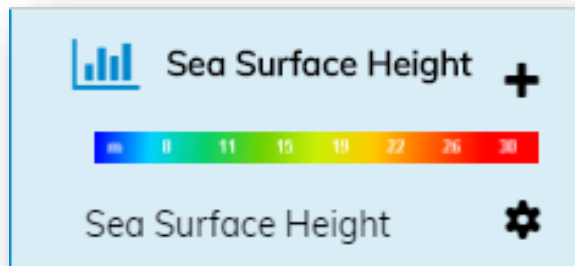



Figure 34. Scale bar for Sea Surface Height

7.1.2 Viewing Data

After forecast layers are chosen, the user is given the option to select a single location on the map or one of the labeled stations. Click on either a single location or a station anywhere on the map to view the data at that point or area. Clear your selection by clicking on the **X** located in the top-right corner of the graph.

Click the  button to print, download the graph to a PDF or PNG file, or download the data as a CSV or XLS. Hover over the graph with the mouse to view the data in detail.

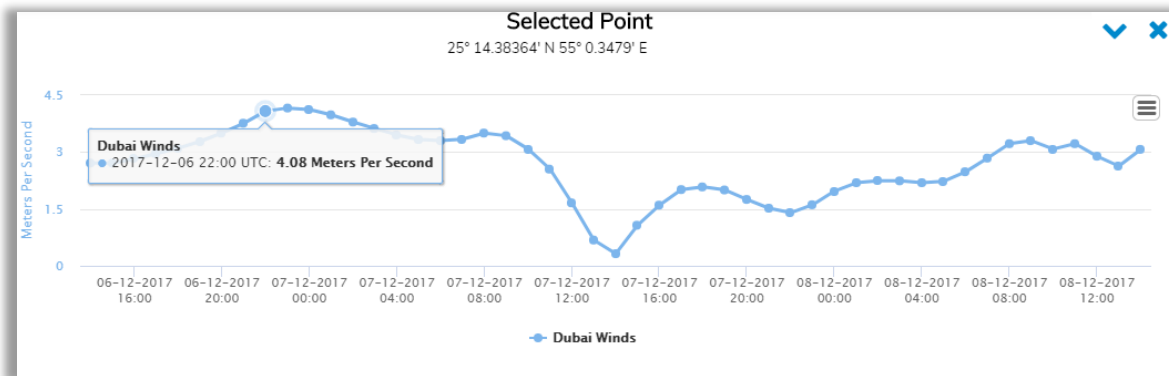


Figure 35: Viewing forecasted wind data at a Selected Point.

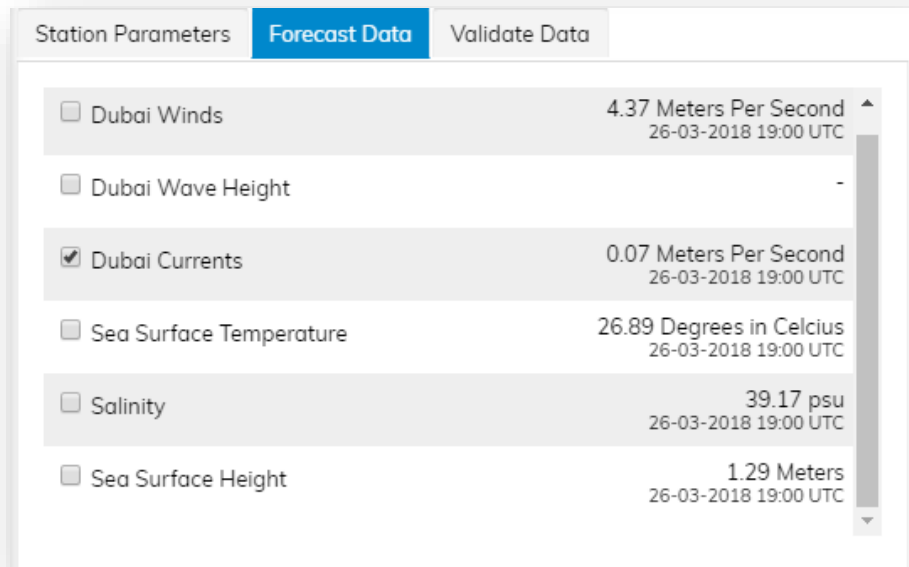



Figure 36: At any Selected Point, the user can toggle between forecasted meteorological conditions.

7.2 Observed Data

There are 21 Stations identified on the map. For each station, there is a list of Station Parameters that can be viewed on the graph. Click on the desired station and check the box for each parameter to view them on the graph. Multiple parameters can be displayed at once. Users will have the ability to view and compare more than one parameter at a time.



Figure 37: Station Parameters (left) can be chosen and viewed on the graph (right).

Choose 'Bathymetry' on the left panel to view the water depth of the region. Click the information button  to view the color legend.

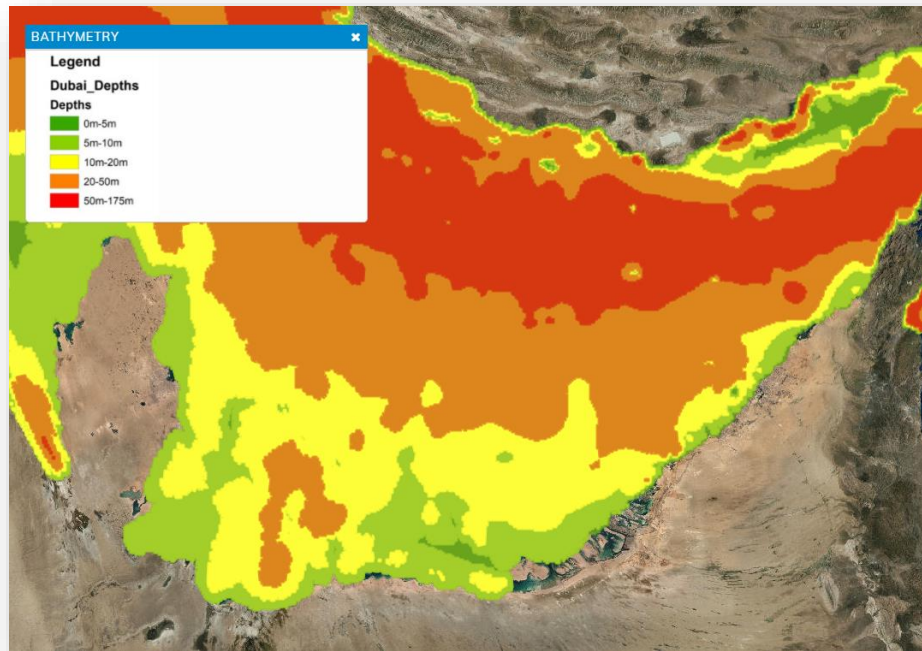


Figure 38. Bathymetry data and color legend (top left).

8 Inundation

The Inundation tool allows users to view the impacts of different types of storm intensities. By clicking the corresponding check boxes, users can toggle on or off layers displaying the result in sea level rise.

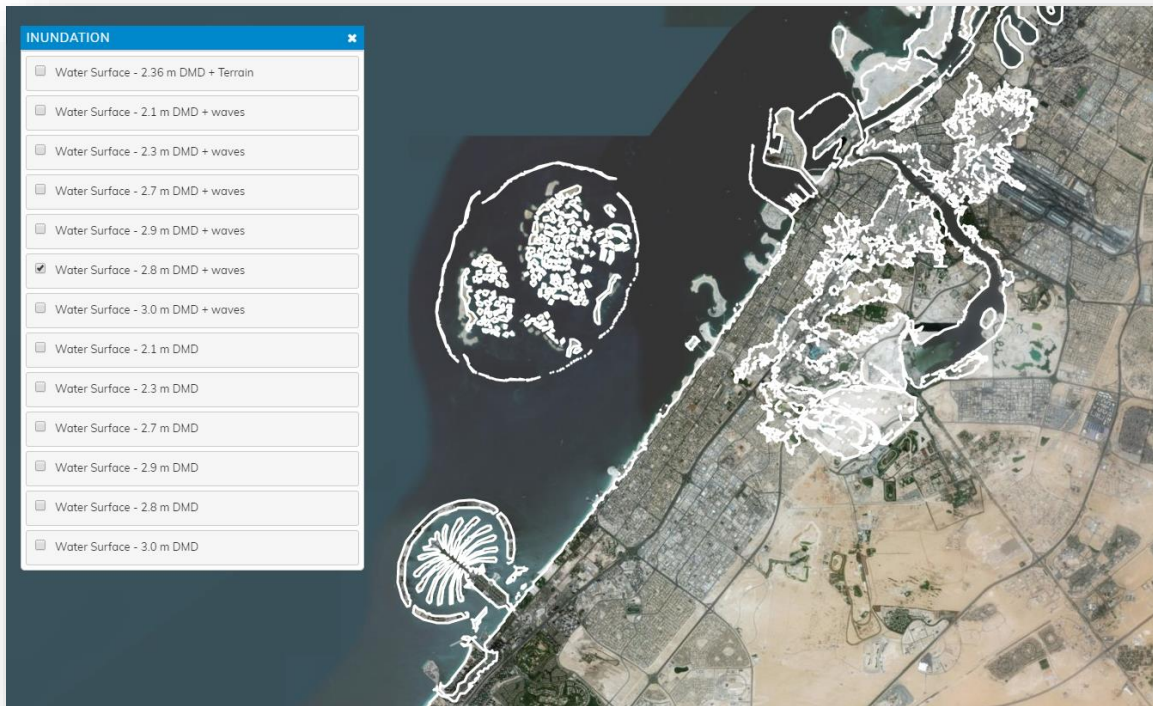


Figure 39. Screenshot of example inundation and associated check boxes (left panel).

9 OILMAP – Oil Spill modeling

Users with administrator privileges can access an operational web based oil spill prediction system through the Dubai Coastal Zone Monitoring Programme forecasting website. This web-based version of RPS' OILMAP system is automatically connected to the winds and currents forecast by the DM operational forecast system.

Users of the web-based oil spill system can generate spill predictions directly through a website with no software needed other than a web browser with the Adobe Flash Player. The user can enter information on the location and time of the spill, the oil type, and an estimate of the spill volume. The web-based system automatically accesses the latest forecast data for winds and currents and connects these to the oil spill scenario. This information is passed to the model server and the model simulates the weathering and trajectory of the spill. Results of the model include an average trajectory, estimates of oil mass, contour lines, mass balance graphs, and tabular data. Geospatial results, such as the oil mass and contours, have a temporal component and can be animated over time using the Time Slider tool.

9.1 Creating & Running a Scenario

Open the oil spill scenario panel to create a new scenario. Each scenario that has been created is stored, allowing users to load previous scenarios.

To create a new scenario, begin by choosing a name and description. Next, choose the location of the spill by clicking on a point on the map or manually entering in the coordinates. Select the oil type, spill amount, the release date and time, release duration, the units of oil (liters, gallons, etc.), and the simulation length. After all the required information has been entered, click 'Run Scenario' to run the simulation.

Figure 40: Oil Spill scenario panel.

9.2 Viewing Results

9.2.1 Fates Graph

A Fates graph is generated from the scenario illustrating the total oil released (in metric tons) that is predicted to remain floating on the water surface, entrained in the water column, reach the coastline, evaporate, and degrade.

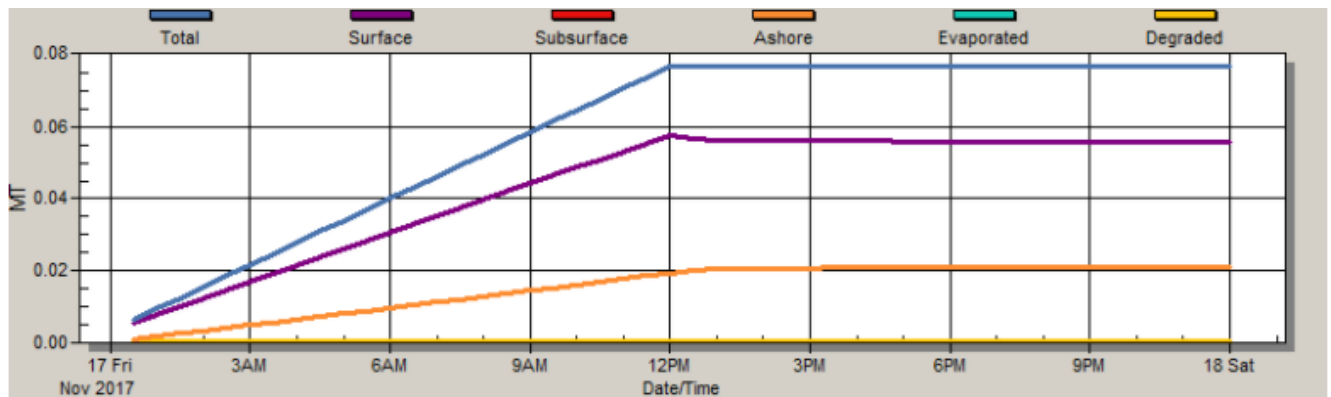
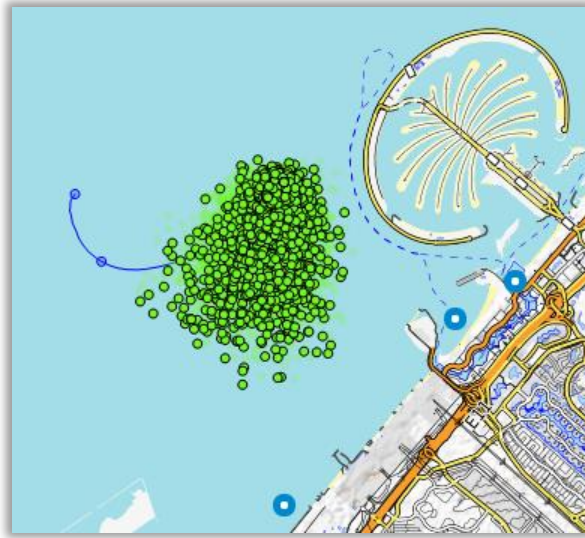


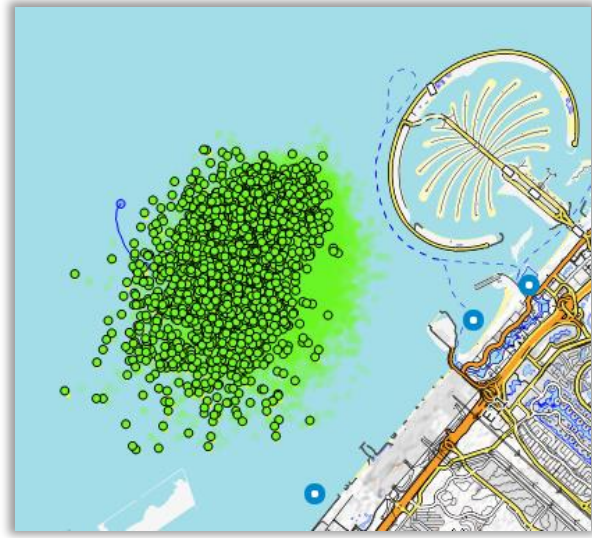
Figure 41: Fates graph generated from oil spill scenario.

9.2.2 Time Slider

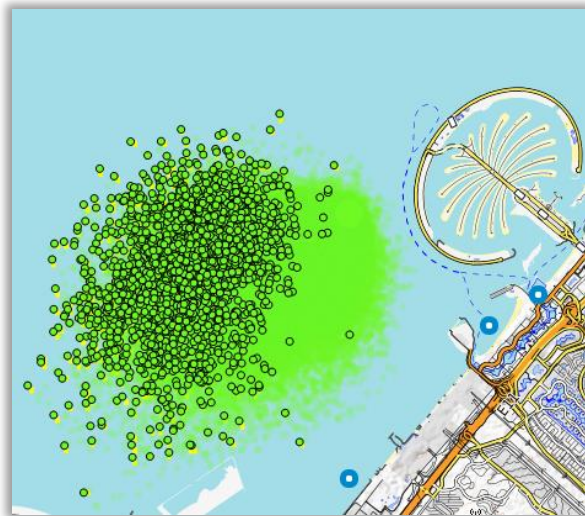
Use the Time Slider to play the simulation visualization or to step through, frame by frame. The user can also click and drag the slider itself to move forwards and backwards through the simulation.



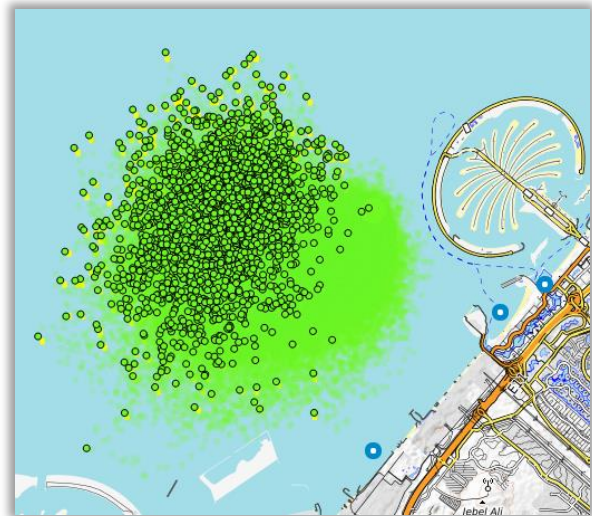
6 Hours



12 Hours



18 Hours




24 Hours

Figure 42: 24-hour oil spill simulation example.

10 Draw & Measure

Use the measurement tool in the top right-hand corner of the map to create lines or polygons. Hover

over the  icon, and select 'Create a new measurement'. Add points on the map by clicking. When finished creating a line/polygon, select 'Finish measurement' or double click when creating the last point.

If a line, the linear measurement is calculated (units in feet and miles). If a polygon, an area measurement is calculated (acres), along with a linear measurement of the perimeter. Users can also center on the defined area or delete the line/polygon by clicking the respective options in the measurement information form.

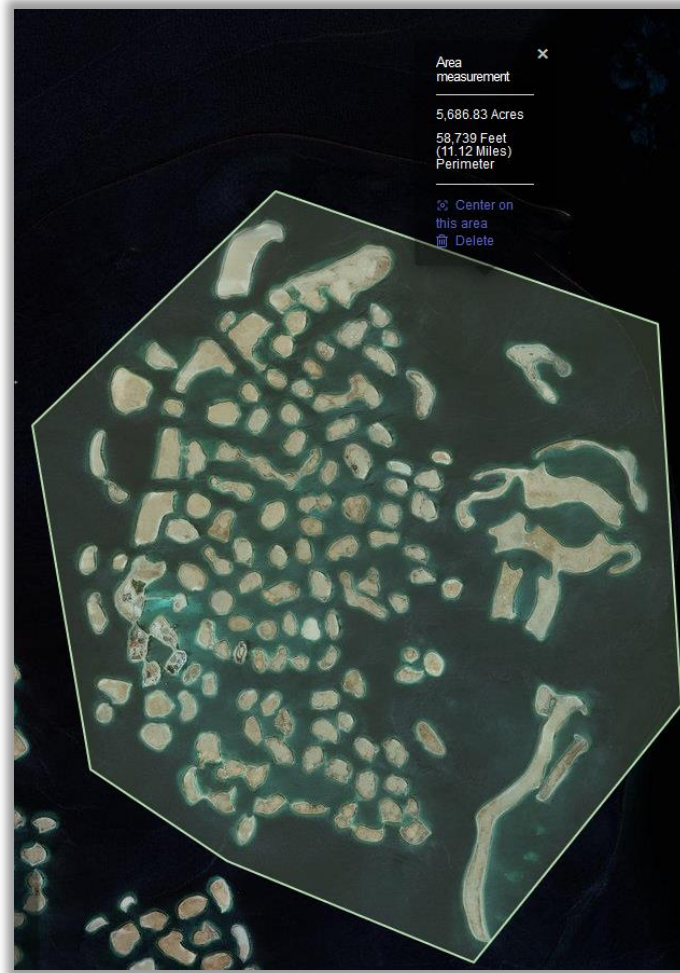


Figure 43: Use the measurement tool to determine the area of a specific region.