**MARS**

Methodology for Assessing Resilience of Seaports

**Introduction**
Seaports are critical to the UK because 95% of the supplies come by sea including more than one third of UK’s food supply, but are vulnerable to disruptions. Hence, ports and its stakeholders need to be resilient and business continuous for the sustainability of supply chains, economy and the port business. Perceived increases in climate change related risks (e.g. tidal surges) as well as heightened alertness relating to international terrorism have increased the need to help foster greater resilience amongst the UK’s ports. However, the resilience of UK ports relies on the multiple stakeholders that make up the system and their complex interdependencies. MARS is a decision support tool that will enable port stakeholders to assess and develop their contingency/business continuity plans for improved resilience.

**What is MARS?**
MARS is based on a user friendly port operations simulation model (Fig. 1) that visually simulates both wet-side and dry-side operations such as ship arrivals, pilot and tug assignment, service at terminals, train/truck arrivals and cargo storage. The tool can be used to establish consequences of a disaster such as periods of disruption, recovery times and business impacts in terms of ship throughput, tonnage of goods etc. with and without resilience plans.

---

**Figure 1** MARS user interface for Port of London
Who is MARS for?
MARS has been developed in co-operation with ports of London and Immingham so that the design meets the needs of port stakeholders and that it can address the sort of questions that they need answer in developing their contingency and business continuity plans. It is based on existing data already being collected for port operations management. MARS could be modified to suit other UK ports and currently discussions are being held with a number of major ports.

How is MARS used?
MARS is ideally used as part of port stakeholder participatory resilience planning exercises. The stakeholders discuss the impact of a particular disaster scenario and estimate the downtime of different operations/resources in the port. The user starts the port simulation by setting downtimes or specifying resources affected as input such as terminals being closed, fewer tugs/pilots available for operation, rail service disruption etc. The model currently outputs the delays and queues in operations such as ship turnaround times, rail/truck etc and if they are below tolerable limits both for the complete port system and for individual stakeholders. Using the outputs, the stakeholders then discuss and decide the recovery times of some of the operations and change the downtime inputs and repeat the simulation to see if it improves the resilience of the port.

The exercise is repeated until stakeholders are clear of their recovery time objectives and this instigates the required need for preparation and cooperation from other stakeholders during disasters. The exercise could be repeated for changes and other disaster scenarios. The key processes in the exercise are shown in Fig. 2.

What next?
We intend to make MARS available to all UK major ports.

---

For further details: Kamal Achuthan - k.achuthan@ucl.ac.uk or kamal.achuthan@dft.gsi.gov.uk