Tsunami damage to ports: Cataloguing damage to create fragility functions from the 2011 Tohoku event

These datasets are provided in courtesy of the Asian School of the Environment, Nanyang Technological University and Earth Observatory of Singapore. You may use the data freely with acknowledgement.

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Database description:

The database provides a comprehensive inventory of port structures and their associated damage in the 2011 Great East Japan tsunami. The database is available through an unrestricted data repository (DR-NTU) hosted by Nanyang Technological University (https://doi.org/10.21979/N9/OTZMT1). Using the "Tree" view in the data repository, users are able to view subfolders of the database.

The database is stored as an attribute table and is available in the formats of shapefiles (.shp) and spreadsheet (.csv). The attribute table consists of several parameters for each digitised port structure. The structures are delineated in ArcMap 10.5 (Fig. A). A summary of the parameters included in the database is presented in Table A. In the "Shapefile" subfolder, the dataset is separated into their port locations, namely Hachinohe, Kuji, Ishinomaki, Sendai, Soma and Onahama. Each item in the folder is stored as items of a polygon vector layer (.zip), in the Japanese Geodetic Datum 2000 (JGD2000 Transverse Mercator) coordinate system. The data can be viewed and analysed in any Geographic Information Systems (GIS) applications. In the "CSV" subfolder, the dataset is organised in three ways – (i) all data, (ii) according to port locations and (iii) according to industries. Each item in the folder is stored as a comma-separated values (.csv) file and is compatible with Microsoft Excel, R programs and other statistical software.
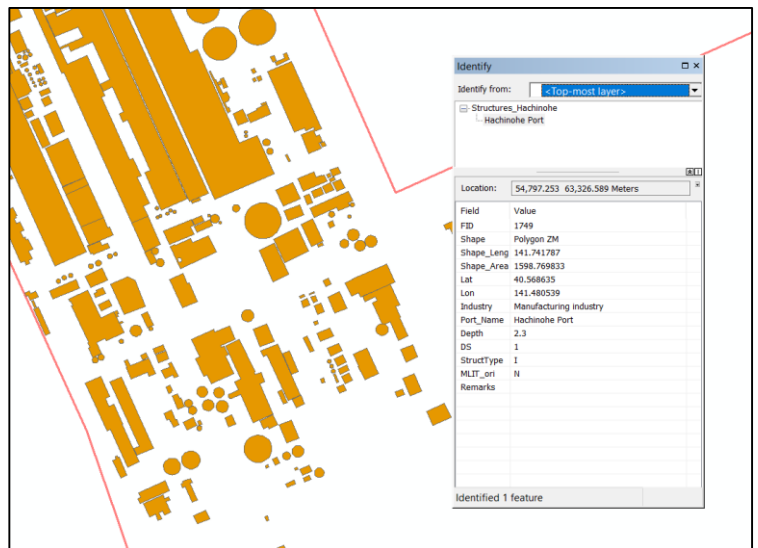
Figure A. Detailed information is recorded for each port structure in ArcMap. An example of port structure outlines in ArcMap.
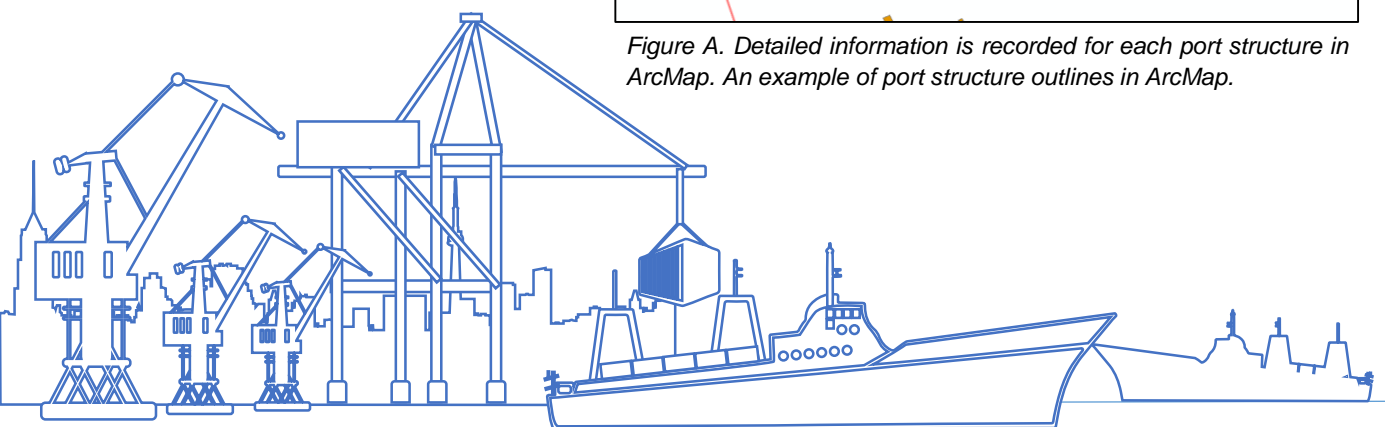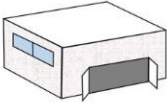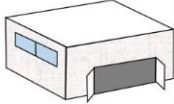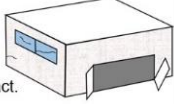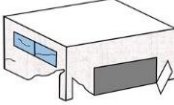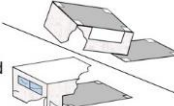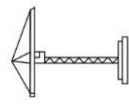
Table A. Summary of parameters found in dataset

Label	Parameter	Details
Lat	Latitude	Latitude of port structure (decimal degrees)
Lon	Longitude	Longitude of port structure (decimal degrees)
Industry	Type of port industry	Refer to paper
Port_Name	Name of port	Name of port which the structure was found
Depth	Inundation depth	Maximum inundation depth (in metres)
DS	Damage state	Refer to Table B
StructType	Type of port structure	**"B"** refers to Building, **"I"** refers to Infrastructure
MLIT_ori	Original MLIT database structure outline	Structure polygon outline originally from MLIT database. "Y" refers to original MLIT outline, "N" refers to structure outline delineated in this work.
Remarks	Remarks	

Table B. Damage state description for buildings and non-buildings port infrastructure

Damage State	Damage Description	
	Buildings (B)	Infrastructure (I)
DS 0	• Little to no water penetration. • Non-structural components (windows and door) and roof remain intact. *Serviceability:* Ready for immediate use	• No floodwater impacts on infrastructure. *Serviceability:* Ready for immediate use
DS 1	• Water penetration. • Non-structural components and roof remain intact. *Serviceability:* Ready for immediate use but requires interior restoration, such as drying of floors and walls, repainting, repairs to plumbing and electric systems.	• No visible damage from outside of infrastructure. *Serviceability:* Ready for immediate use. No obvious repair to infrastructure in the intermediate period after the tsunami.
DS 2	• Non-structural components and/or roof have sustained damage. • Structural components are intact. *Serviceability:* Obvious repair works in the intermediate period after the tsunami. Operational only after repairs.	• Some damage to infrastructure, while foundation or base remains intact. *Serviceability:* Some form of repair to infrastructure in the intermediate period after the tsunami. Operational only after repairs.
DS 3	• Structural components (columns and beams) have sustained damage, or rackings have buckled and folded. *Serviceability:* Not repairable. Replacement or removal of building in the intermediate period after the tsunami.	• Foundation or base of infrastructure has folded or buckled. *Serviceability:* Not repairable. Removal or replacement of infrastructure in the intermediate period after the tsunami.
DS 4	• Total structural failure. • Building has either overturned or slid from original position. *Serviceability:* Not operational.	• Infrastructure has overturned or slid from original position. *Serviceability:* Not operational.