Informing Post-Disaster Restoration through Modeling Interdependent Agriculture and Transportation Networks Dataset

Dataset available at: https://doi.org/10.5281/zenodo.5818072

(This dataset supports report **Informing Post-Disaster Restoration through Modeling Interdependent Agriculture and Transportation Networks**)

This U.S. Department of Transportation-funded dataset is preserved in the Zenodo Repository (https://zenodo.org/), and is available at https://doi.org/10.5281/zenodo.5818072

The related final report **Informing Post-Disaster Restoration through Modeling Interdependent Agriculture and Transportation Networks**, is available from the National Transportation Library's Digital Repository at https://rosap.ntl.bts.gov/view/dot/61007.

Metadata from the Zenodo Repository record:

Title: Informing Post-Disaster Restoration through Modeling Interdependent Agriculture and Transportation Networks

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Description: The U.S. multimodal transportation network is extensively used to transport agricultural inputs and outputs. Disruptions to the transportation network can therefore cause severe and cascading operational and economic damage to the food and agriculture sector. These disruptions are magnified due to the food and agriculture sector's interdependency with other critical infrastructure sectors, dependence on time-sensitive operations, and positioning within rural communities. This research investigates (i) how multimodal transportation should be used when a disruption has occurred and (ii) how to coordinate restoration activities across interdependent transportation and agriculture systems. We present a mixed integer linear programming model that seeks to maximize the expected yield for a set of rice farms throughout the state of Arkansas under scenarios where the amount and timeliness of fertilizer delivery are affected by a disrupted transportation network. We validate the model using real data for a case study in Arkansas. This dataset includes the location and acreage of rice farms in Arkansas, fertilizer demand, and a multimodal transportation network comprised of road, rail, and waterway networks. For this dataset, we created disruption scenarios for different transportation modes with different severity, location, and duration. Using these data, we ran extensive computational experiments to deduce operational and restoration insights on the interdependence and resiliency of transportation and agriculture systems. The findings demonstrate the need for coordination, systems thinking, and understanding of how transportation impacts other interdependent infrastructures. Additionally, the model may help to establish a methodology for planning in the agricultural sector.

Publication Date: December 1, 2021

DOI: 10.5281/zenodo.5818072

Keywords: Food and Agriculture, Multimodal Transportation; Independency; Disruption; Restoration; Optimization

Communities: Maritime Transportation Research and Education Center

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Recommended citation:
Nurre Pinkley, Sarah G., Sullivan, Kelly M., Runkle, Benjamin R. K., Bui, Hieu T., Khatamov, Jakhongir, Camp, Janey, Turner, Katherine, & Laning, Nicholas. (2021). Informing Post-Disaster Restoration through Modeling Interdependent Agriculture and Transportation Networks. Zenodo. https://doi.org/10.5281/zenodo.5818072

Dataset description:
This dataset contains 1 file collection described below.

MarTREC – Code and Data.zip:

- MarTREC – Code and Data Folder
  - MarTREC Manual – Code and Data.pdf
  - Solution Files Folder
    - Restoration Folder
      - worse_case.csv
      - restore4R_5R.csv
      - restore2R_3R.csv
      - restore1R.csv
      - restoration_summary.csv
    - Entities Folder
      - entities_summary.csv
      - Raw CSV Results Folder
        - This folder contains 150 .csv files.
    - Disruptions Folder
      - disruptions_summary.csv
      - Raw CSV Results Folder
        - This folder contains 852 .csv files.
  - Data Folder
    - yield_perContainer.csv
    - supply_node.csv
    - risk_level_3.geojson
    - risk_level_2.geojson
    - risk_level_1.geojson
    - demand_nodes.csv
    - arcs.csv
    - affected_water_arcs.csv
    - affected_land_arcs.csv
    - Flood Data Folder
      - Flood_Data_2019.shx
      - Flood_Data_2019.shp
      - Flood_Data_2019.sbx
      - Flood_Data_2019.sbn
      - Flood_Data_2019.prj
      - Flood_Data_2019.dbf
      - Flood_Data_2019.cpg

        - Flood_Data_2018.shx
        - Flood_Data_2018.shp
        - Flood_Data_2018.sbx
        - Flood_Data_2018.sbn
        - Flood_Data_2018.prj
        - Flood_Data_2018.dbf
        - Flood_Data_2018.cpg
        - Flood_Data_2017.shx
        - Flood_Data_2017.shp
        - Flood_Data_2017.sbx
        - Flood_Data_2017.sbn
        - Flood_Data_2017.prj
        - Flood_Data_2017.dbf
        - Flood_Data_2017.cpg
        - Flood_Data_2016.shx
        - Flood_Data_2016.shx.xml
        - Flood_Data_2016.shp
        - Flood_Data_2016.sbx
        - Flood_Data_2016.sbn
        - Flood_Data_2016.prj
        - Flood_Data_2016.dbf
        - Flood_Data_2016.cpg
        - Flood_Data_2011.shx
        - Flood_Data_2011.shp
        - Flood_Data_2011.sbx
        - Flood_Data_2011.sbn
        - Flood_Data_2011.prj
        - Flood_Data_2011.dbf
        - Flood_Data_2011.cpg
    - Code Folder
        - visualization_funcs.py
        - util.py
        - submit_himem72_batch.slurm
        - params_with_restoration_budgets.json
        - optimization_model_batch.py
        - my_model.py
        - extracting_result.py
        - default_params.json
        - compare_map.inpynb

File Type Descriptions:

- The .pdf file format is an Adobe Acrobat Portable Document Format (PDF) file and can be opened with the Adobe Acrobat software.
- The .csv, Comma Separated Value, file is a simple format that is designed for a database table and supported by many applications. The .csv file is often used for moving tabular

data between two different computer programs, due to its open format. The most common software used to open .csv files are Microsoft Excel and RecordEditor, (for more information on .csv files and software, please visit https://www.file-extensions.org/csv-file-extension).

- The geojson file extension is associated with GeoJSON a file format used to encoding a variety of geographic data structures. It is used by various GIS (geographic information system) tools and APIs, like Leaflet, OpenLayers etc. The geojson file is stored in simple text file format and it is viewable in any text editor (for more information on .geojson files and software, please visit https://www.file-extensions.org/geojson-file-extension).
- The shp file extension is used for ESRI Shape format, a popular geospatial vector data format for geographic information systems software. A shapefile stores non-topological geometry and attribute information for the spatial features in a data set. A shapefile consists of a set of 3 mandatory files, along with several optional files. Each file in the set shares the shapefile name with a different extension. The main file .shp stores the geometry and must always have an index file shx. A dBASE file dbf stores all the attributes of the shapes in the main file. Additionally, a projection file prj stores the projection information (for more information on .shp files and software, please visit https://www.file-extensions.org/shp-file-extension).
- A .shx file contains compiled shape data (building blocks, fonts) in form of the machine language compiled version of an shp file. The file type is associated with AutoCAD , a CAD development platform, developed and sold by Autodesk, Inc (for more information on .shx files and software, please visit https://www.file-extensions.org/shx-file-extension).
- The sbx file extension is associated with the ArcView GIS application used to view and edit GIS data. The .sbx file contains spatial index for read-write shape used to fast access to shape files (for more information on .sbx files and software, please visit https://www.file-extensions.org/sbx-file-extension-arcview-spatial-index-for-read-write-shape-file).
- The sbn file extension is mainly associated with ArcView / ArcGIS geography software from ESRI. The sbn file contains binary spatial indexes, which are used only by ESRI software. The format is not documented, and is not implemented by other vendors (for more information on .sbn files and software, please visit https://www.file-extensions.org/sbn-file-extension).
- The prj file extension is traditionally used for files that contain projects. Projects contain settings, positions of saved windows, development notes and other raw data that won't be present in the final file (for more information on .prj files and software, please visit https://www.file-extensions.org/prj-file-extension).
- The dbf file extension is traditionally used for database file by many database applications. The original program, which used the DBF file extension for its database, was dBAse. A major legacy of dBase is its dbf file format, which has been adopted in a number of other applications. For example, the shapefile format developed by ESRI for spatial data in a geographic information system uses .dbf files to store feature attribute data (for more information on .dbf files and software, please visit https://www.file-extensions.org/dbf-file-extension).
- The cpg file extension is associated with the ArcGIS, a geographic information system for Microsoft Windows operating system, developed by Esri. The cpg file stores

codepage for identifying a characterset (for more information on .cpg files and software, please visit https://www.file-extensions.org/cpg-file-extension-arcgis-codepage).

- The .xml file type is commonly used for files written in Extensible Markup Language (XML). XML is a human-readable, machine-understandable, general syntax for describing hierarchical data, applicable to a wide range of applications (for more information on .xml files and software, please visit https://www.file-extensions.org/xml-file-extension)
- The .py file extension is commonly used for files containing source code written in Python programming language. Python is a dynamic object-oriented programming language that can be used for many kinds of software development (for more information on .py files and software, please visit https://www.file-extensions.org/py-file-extension).
- File extension json is associated to JavaScript Object Notation file format, a lightweight, text-based, language-independent data interchange format. JSON defines a small set of formatting rules for the portable representation of structured data. It is used by various applications as alternative option to XML file format. The data in a json file are stored in simple text file format and the content is viewable in any simple text editor (for more information on .json files and software, please visit https://www.file-extensions.org/json-file-extension).

National Transportation Library (NTL) Curation Note:
As this dataset is preserved in a repository outside U.S. DOT control, as allowed by the U.S. DOT's Public Access Plan (https://ntl.bts.gov/public-access) Section 7.4.2 Data, the NTL staff has performed ***NO*** additional curation actions on this dataset. NTL staff last accessed this dataset at https://doi.org/10.5281/zenodo.5818072 on 2022-04-06. If, in the future, you have trouble accessing this dataset at the host repository, please email NTLDataCurator@dot.gov describing your problem. NTL staff will do its best to assist you at that time.