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# **Liner shipping disruption management in practice: Generating recovery plans for vessels and cargo**

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## **Abstract**

In large liner shipping networks, several hundred container vessels operate 24/7, following planned routes and timetables. These networks constantly face unexpected disruptions of varying magnitude. Among the most common reasons are bad weather, port congestions, labour strikes or equipment breakdowns at ports or on vessels. Disruptions may result in delayed vessels, temporarily disabled vessels, reduced port productivity, and port closures. Due to the cargo-driven connectivity of liner shipping networks, even a single delayed vessel can create ripple effects that affect multiple other vessels.

Resolving disruptions is a trade-off between minimizing operational vessel costs and port call costs on one side, and minimizing the impact on cargo, such as delays and re-routings, on the other side. One difficulty of finding a good trade-off arises from the fact that cargo related costs are largely not tangible or directly quantifiable, such as lost reputation and customer churn. Incomplete information during the planning of recovery plans adds another challenge: ports may reject a revised vessel schedule if no berthing window is available, resulting in multiple iterations of recovery planning.

We present a model and solution method that generates a set of recovery plans for the decision maker. We present preliminary results for test cases that were developed together with our industrial collaborator Maersk.

**Keywords: Container liner shipping, disruption management, vessel and cargo recovery planning**