

Delivering the Right Humanitarian Resources Before Disaster Strikes



ESUPS is a humanitarian logistics and preparedness project hosted by Welthungerhilfe and funded by USAID. ESUPS advocates for increased collaboration and pooling resources in humanitarian logistics. One tool to facilitate that is their STOCKHOLM platform, which provides a visual representation and analysis of pre-positioned stock.

Industry: Humanitarian Relief

Location: Global

Use Cases: Inventory Optimization, Logistics, Routing

Website: www.esups.org

Results

- Significant improvement from Excel-based work to a streamlined platform for presenting data
- ESUPS' STOCKHOLM platform supports humanitarian logistics experts in their day-to-day decision-making, ensuring that relief items are stored in the right places and quantities and ready to be deployed.

With their interactive platform, ESUPS helps ensure that humanitarian aid is ready to be deployed when and where it's needed most.

When disaster strikes, a country's response can only be as effective as its collective logistics strategy. Even if the right resources are in stock, they won't do much good if they're inaccessible by the people who need them most.

Because the humanitarian industry is often characterized by complex coordination requirements, even the most well-intentioned support can fail to reach its target.

ESUPS (Emergency Supply Pre-Positioning Strategy) is a humanitarian logistics and preparedness project hosted by Welthungerhilfe that aims to reduce gaps and overlaps in emergency preparedness, while improving coordination among humanitarian actors so aid can be allocated more efficiently.

In their work to improve the pre-positioning of humanitarian aid, ESUPS uses mathematical optimization to ensure that the appropriate relief items (such as blankets, tents, clothes, hygiene kits,

sleeping mats, and kitchen items) are stored in the right places and in the right quantities, before a disaster hits.

To further their mission, they collaborated with Penn State University and MIT to design a linear model that could identify the optimal allocation of available stock, as well as the impact of moving that stock. With Gurobi's solver, ESUPS can help humanitarian actors find the best solutions that minimize both the time and costs associated with moving items.

Filling Gaps and Eliminating Redundancies

According to Florent Chané, Project Manager at ESUPS, research shows that roughly 60-80% of all disaster response costs are related to logistics, including stock prepositioning and deployment. This highlights a major opportunity to improve operational cost efficiency.

"The purpose of our project is to bring all the different actors in the humanitarian industry together to talk about how they

"We need to get the right [humanitarian aid items] to the right locations, and in the right quantities."

Florent Chané

Project Manager, ESUPS



Earthquake in Haiti. Grossmann/Welthungerhilfe

“ We turned to Gurobi because we knew their tool was very powerful.”

Florent Chané

Project Manager, ESUPS



Distribution of relief items in Kenya. Dickerhof/Welthungerhilfe

can pre-position stock in a more efficient way, because nobody knows who has what, or where,” explains Chané. “We also need to analyze the available stock and see if the right items are in the right locations, and in the right quantities. So Penn State developed a mathematical model for us that has since been turned into a code, which we are now working on with our developers at Tonkin + Taylor in New Zealand.”

To illustrate the importance of optimal resource allocation, Chané cited the real-world example of Kathmandu, where 90% of Nepal's disaster relief stock is located—despite the fact that Kathmandu is only the 31st most affected place in the country.

When massive floods hit the western side of Nepal, as they do almost every year, all of that stock is tied up in the capital city, and it can take days or more before it reaches the impacted areas. On the other hand, when Kathmandu was struck by a 7.8-magnitude earthquake in 2015, part of Nepal's prepositioned stock was suddenly buried.

When other countries try to offer aid, as many EU member states are now doing in the aftermath of Turkey and Syria's 2023 earthquake, their responses are often disjointed and inefficient because they don't know what each country is supplying, or what the receiving country already has available.

ESUPS hope that their new stock mapping and analysis tool, STOCKHOLM, will bring greater clarity and collaboration to the international humanitarian community.

Gurobi Provides Clarity for Better Decisions

“The tricky part of this project was turning our mathematical model into something that is accessible and easy to use,” says Chané. “And that's why we turned to Gurobi, because we knew their tool was very powerful.”

The result of their efforts is an interactive tool that allows users to enter their stock data and search the available stock in other countries—filtering by location, agency, item type, and more.

“We take the number of people affected, the actual and required stock, and the distance between that stock and the impacted area. We then run the Gurobi algorithm, which essentially answers our optimization problem, or the question of where stock should be placed. Then finally, our output is pushed live in STOCKHOLM,” explains Athena Listin C. Anto, Head of Data Management and Analysis at ESUPS.

The system also tells users how much stock they should have in a particular location, as well as where there might be too much stock that could be relocated. Users can also get an idea of how much time and money they could save by implementing the system's recommendations.

“Before Gurobi, we were running all these models on a very long and complex Excel spreadsheet. We'd have to share that with partners, and no matter how much we tried to make it pretty and user-friendly, it was still just too much. But now with Gurobi, we

have something that is so condensed and very easy to read,” says Chané.

The ESUPS team hopes that STOCKHOLM will not only make the deployment of humanitarian aid more efficient, but also empower the individuals and organizations within the affected countries to take charge of their disaster response efforts.

“The people who are directly impacted can't become resilient if they're always dependent on the international community,” explains Chané. “But if you give them the tools to enter their own data, complete their own analysis, and make their own decisions, then they can control their logistics, and in turn, their response to disaster.”

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