



# Robust transport networks support agrifood systems' resilience

Transport infrastructure and logistics play a fundamental role in ensuring physical access to food. Agrifood systems are supported by transport networks across the rural–urban continuum, and how they respond to shocks will depend on the connectivity within the networks. In cases of regional weather anomalies and yield losses, for example, food supply chains may need to rely on alternative pathways to maintain their core functions.

Route redundancy can ensure that alternative routes are available to mitigate the impact of an adverse event on transport efficiency by preventing or limiting increases in travel time with its consequent impacts on food costs. However, an analysis on the resilience of food transport networks in 90 countries, with a total population of 7 billion people in 2017, finds that closure of critical links can be incredibly costly.

Indeed, for countries like Bangladesh, Brazil, the Democratic Republic of the Congo, Nigeria, the Philippines, the Russian Federation, Senegal and the Sudan, simulated travel time for food diverted from a disrupted route increases by, on average, 30 percent, increasing the costs of food. For some, like the Philippines and the Sudan, the impact of critical link closures is felt nationally, not just locally.

## Flood simulations expose the fragility of current food delivery networks

A simulation of the impact of localized 1-in-10-year flooding events in Mozambique, Nigeria and Pakistan is used to capture the effect of potential disruptions of food transport networks for crops in the three countries. The simulation reveals the loss of network connectivity when links become impassable (Figure 1), either because the link is damaged (e.g. a washed-away bridge) or because access to that link is reduced (e.g. an access road to a main road or bridge is damaged or submerged).

Such events have a major impact on the local population served by the affected transport of goods. In addition, there can be a national impact when the ability of the transport network to efficiently transport goods is reduced. Table 1 shows the results in terms of increased transport time for the ten most consumed crops for each country.



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### KEY MESSAGES

- ▶ Robust transport networks underpin agrifood systems' resilience and ensure physical access to food at the local level.
- ▶ When critical transport route links are impassable, the detours food takes can substantially affect accessibility and increase food loss.
- ▶ Developing or improving infrastructure and services, such as roads, transport and (cold) storage, is key to enhancing agrifood systems' resilience.

TABLE 1. Percent increase in transport time for the ten most consumed crops

	Local impact*	National impact
<b>Mozambique</b>	103%	1.25%
<b>Nigeria</b>	108%	4.7%
<b>Pakistan</b>	32%	1.2%

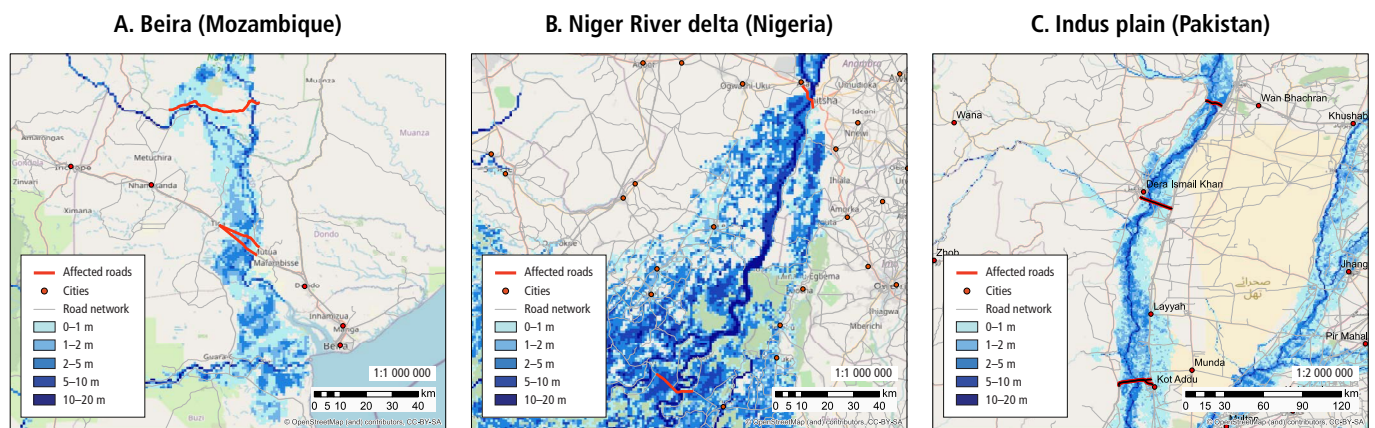
Note: \* Around the city of Beira, Mozambique, in the Niger River delta in Nigeria and the Indus plain in Pakistan.

Source: Nelson, A., de By, R., Girgin, S., Brussel, M., Ohuru, R., Thomas, T. & Venus, V. (forthcoming). *The resilience of domestic transport networks in the context of food security – A multicountry analysis*. Background paper for *The State of Food and Agriculture 2021*. FAO Agricultural Development Economics Technical Study No. 14. Rome, FAO

## Delays in transport contribute to food loss

Such increases in transport time can also damage the quality of the crops if they are exposed to high temperatures and/or humidity for a longer time while being transported in non-refrigerated trucks. In Nigeria, vegetables and fruits have the greatest detour lengths (around 500 km) and added transport time (around six hours) as percentages of their usual route journey.

FIGURE 1. Flood scenarios affecting critical transport infrastructure



Source: Nelson, A., de By, R., Girgin, S., Brussel, M., Ohuru, R., Thomas, T. & Venus, V. (forthcoming). *The resilience of domestic transport networks in the context of food security – A multi-country analysis*. Background paper for *The State of Food and Agriculture 2021*. FAO Agricultural Development Economics Technical Study No. 14. Rome, FAO.

In Mozambique, all ten crops have substantial detour lengths (from 200 to 400 km), with sweet potatoes the most affected (increases of 374 percent in length and 400 percent in transport time). The overall impact in Pakistan is much lower compared to the other two countries, likely due to the smaller geographic area studied. The largest detours in Pakistan are for staples such as rice, wheat and potatoes, though pulses/beans and fruit are also affected.

### Detours may also affect scores of populations

Estimates of tonnage that is diverted and the population affected vary by crop. For example, 96 percent of all trips delivering cassava to Asaba, Nigeria use the two impassable transport links, which means that 1.2 million people are directly affected. On the other hand, sorghum and wheat are hardly impacted at all. In the Beira region of Mozambique, the damaged network links are critical for potato transport, affecting over 400 000 people. Fruits and maize show similarly high numbers of people affected. In Pakistan, even a localised flood event can have a substantial impact as over 50 percent of all products delivered are affected.

### Robust transport networks are a pillar of building resilient agrifood systems

The analysis highlights the importance of robust transport networks in supporting agrifood system resilience. Enhancing resilience requires improved basic infrastructure and services, such as roads, transport or storage facilities, in cities, towns and surrounding rural areas. Other physical infrastructure (e.g. ports and international railway systems) is also crucial for ensuring international trade connectivity.

Guaranteeing connectivity also involves managing the risks that can disrupt it. Disasters and crises can significantly affect infrastructure and services in agriculture and food supply chains. It is thus important to assess, protect and risk-proof connectivity and to plan, design and develop new risk-sensitive and climate-resilient infrastructure. Development of cold chain logistics should also be an essential element to reduce food loss and improve market access for food commodities.

