19. Early warning of risks and hazards

Efficiency and productivity gains derived from the use of space applications are becoming more visible across very diverse sectors of the economy, although experiences in estimating impacts vary across countries. From agriculture to energy, and routine surveillance, institutional actors and private companies are increasingly using satellite signals and imagery in geospatial tools. Satellites can also play a key role in providing communications infrastructure rapidly to areas lacking any ground infrastructure, contributing to link rural and isolated areas with urbanised centres.

Significant improvements have been achieved in weather forecasts over the past decade, due in part to a larger international fleet of improved meteorological satellites, bringing about substantial gains in the accuracy of forecasts of large-scale weather patterns in both hemispheres. This has directly benefited early warnings of major hydrometeorological hazards (such as cyclones, thunderstorms, heavy snowfall, floods and heat waves, to name but a few). Satellite data have also made it possible to better track extreme weather events, more cost-efficiently. The Emergency Events Database (EM-DAT) maintained by the World Health Organisation provides data on countries affected by cyclones that make landfall every year. On average, between 142 and 155 countries have been hit by tropical cyclones every year since 1970. When comparing events detected by satellites and the number of disasters reported annually (i.e. the reported cyclone disasters tripled between the 1970s and 2010), there is a clear trend showing that national reporting and access to information have greatly improved in a few decades, slowly catching up with the actual unbiased observations from satellites.

In the 2011 Japanese earthquake, it took only three minutes for Japan to launch a tsunami alert, which was then upgraded to a full Pacific alert. Space technology played an important role both to alert and monitor the water-covered areas, particularly as airplanes were not able to fly over some of the affected areas. It was estimated that 90% of the damages came from the tsunami, not the earthquake. The Japanese ALOS satellite took some 400 pictures of the area, and 5 000 pictures were taken from 27 satellites from 14 countries to share with Japan. For 2 months following the disaster, the only means to communicate in tsunami devastated areas was via satellite telecommunications. Two Japanese satellites and bandwidth on board other commercial satellites were used by Japanese ministries.

Methodological notes

The most common economic measurement for any technology's value is the calculation of benefits to costs. In theory, to calculate the ratio, it is necessary to divide the benefits (e.g. improved productivity, decreased cost of operations, increased revenue and better customer satisfaction rates when applicable) by the costs of deploying the system (e.g. hardware, software, maintenance, training and so forth). However space systems are by nature multifaceted and rely often on lengthy research and development. The challenge of putting a monetary value on the technologies and services they deliver remains a complex and often subjective exercise. Monetary or financial valuation methods fall into three basic types, each with its own repertoire of associated measurement issues and none of them entirely satisfactory on its own (i.e. direct and indirect market valuation, and survey-based valuation techniques). One option is to use several of these methods in parallel to test assumptions and the resulting impacts of a given space application. A forthcoming updated version of the *OECD Handbook on Measuring the Space Economy* (2012) aims to provide a source of comparative national experiences and lessons learned, when trying to apply the different methodologies to the study of impacts.

Sources

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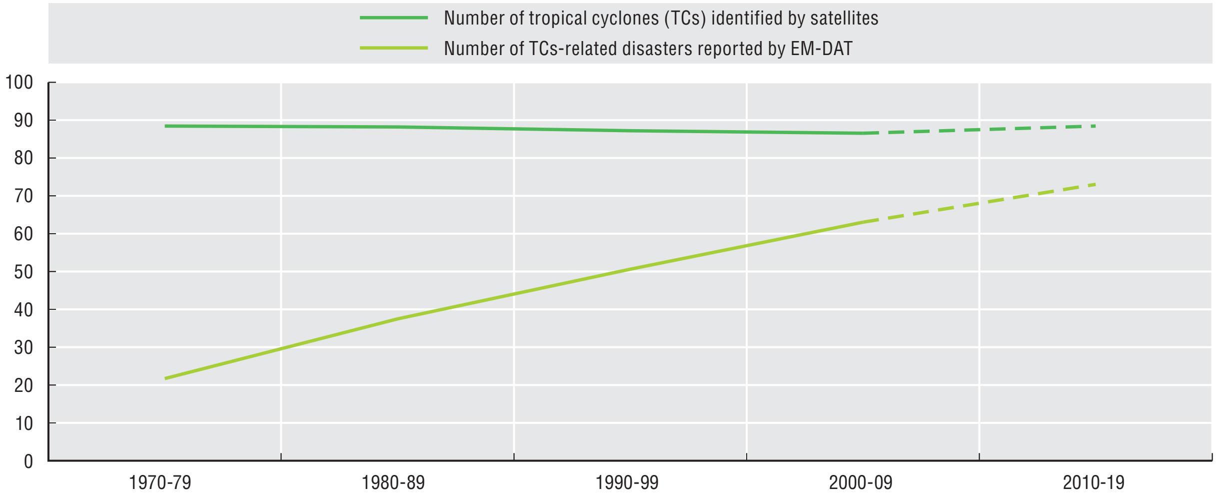
19.1. Selected economic impacts of space applications in different sectors

	Sectors	Documented impacts of selected satellite-related applications			Illustrations
		Weather	*Navigation*	*Telecom*	
Productivity/efficiency gains	Airlines industry	Yes	Yes	Yes	Efficiency gains in the air transport sector due to better weather forecasts
	Sea shipping transit-time	Yes	Yes	Yes	Efficiency gains, as a result of better weather forecasts, and navigation (GPS, satellite-based ice charts)
	Fishing industry	Yes	Yes	Yes	Efficiency gains and improved control of resources (illegal fishing), as a result of satellite navigation usage in ships and maritime zones surveillance with satellite observations
	Energy sector	Yes	TBD	Yes	Annual gains in the energy sector , as a result of better forecasting demand for electricity (improved weather forecasts and real-time information)
Cost Avoidances	Oil pollution detection	Yes	Yes	Yes	Cost avoidances/savings in terms of detecting and managing oil incidents
	Flood prevention and management	Yes	Yes	Yes	Cost avoidances/savings in terms of anticipating and managing flood events

19.2. Trend of tropical cyclones reported versus tropical cyclones detected by satellite



Source: Adapted from data from the World Health Organisation Emergency Events Database (EM-DAT).

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