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Satellite images show the inundation of 160 000 km^2 of land in northwestern Pakistan, where the worst flooding in a century has killed at least 1 600 people, left two million homeless and affected 15 to 20 million

Did You Know?

Africa is the lightning centre of the world (UNEP 2008).

Environmental Hotspot Alert

Thematic Focus: Resource Efficiency, Environmental Governance, and Ecosystem Management

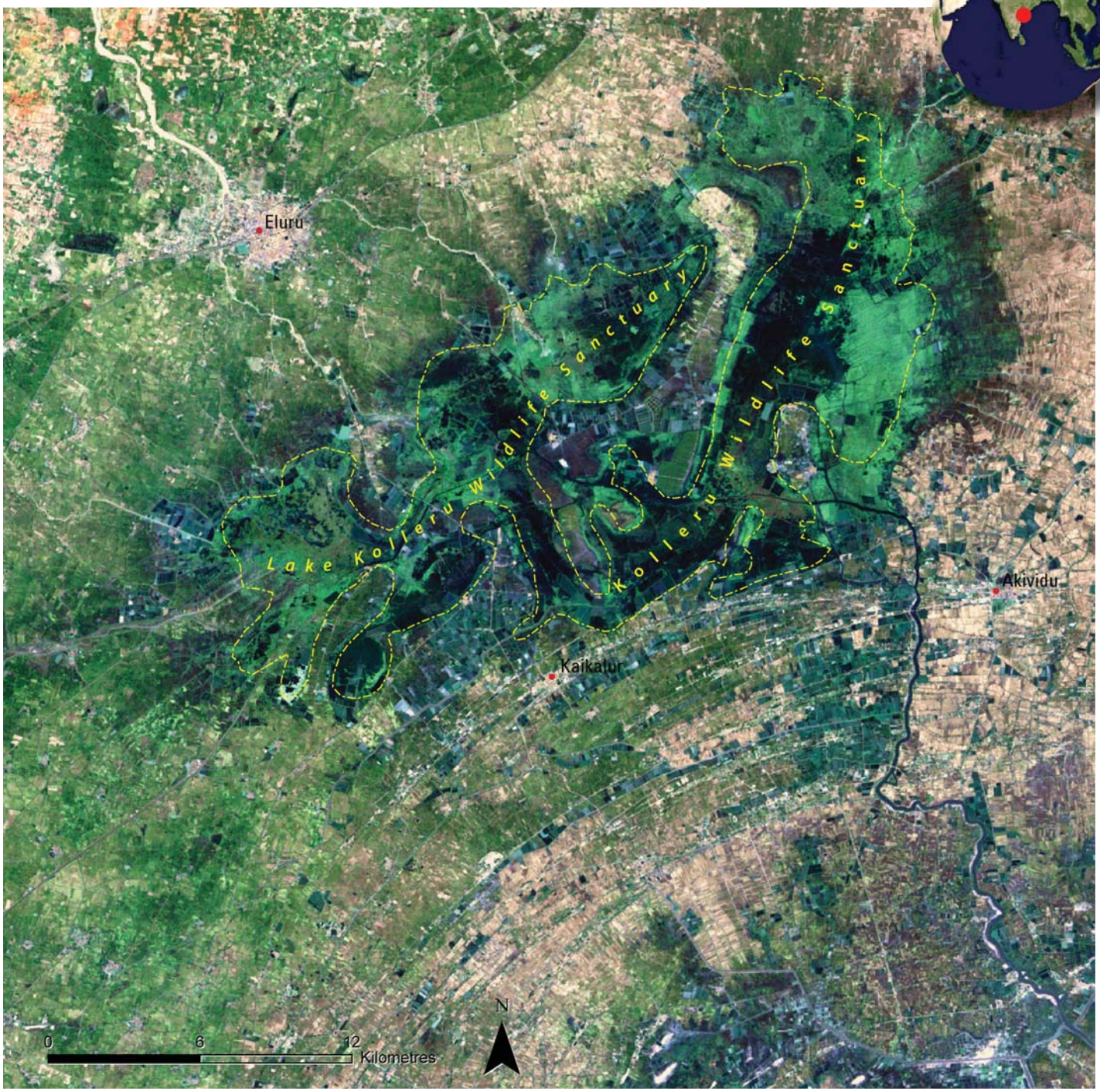
Carp Aquaculture Overwhelms Lake Kolleru Andhra Pradesh, India

Why is this issue important?

Lake Kolleru Wildlife Sanctuary, a vast shallow wetland habitat, is the sole Ramsar- designated wetland in Andhra Pradesh, India (Ramsar 2002, FAO 2006). It serves as a natural flood-balancing reservoir between the deltas of the Krishna and Godavari Rivers (Nagabhatla and others 2009) and is a source of water for domestic use and irrigation for the local population (Venot and others 2008).

In 1990, the principal land use and livelihood around the lake was paddy agriculture (Figures 1 and 3a) (Rao and others 2004). Kolleru also traditionally supported a substantial fishery (Ramsar 2002). In the 1990s, commercial aquaculture rapidly expanded in and around Lake Kolleru. A unique, semi-intensive system described as "Kolleru carp culture" developed, and by 2002, was producing 90 per cent of the state's 600 000 metric tonnes of carp (Ramakrishna 2007).

Figure 1: Satellite imagery shows Lake Kolleru surrounded by paddy rice and some aquaculture in 1990.



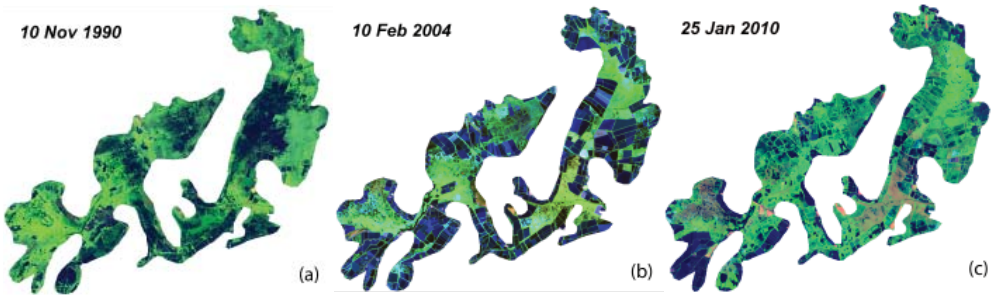
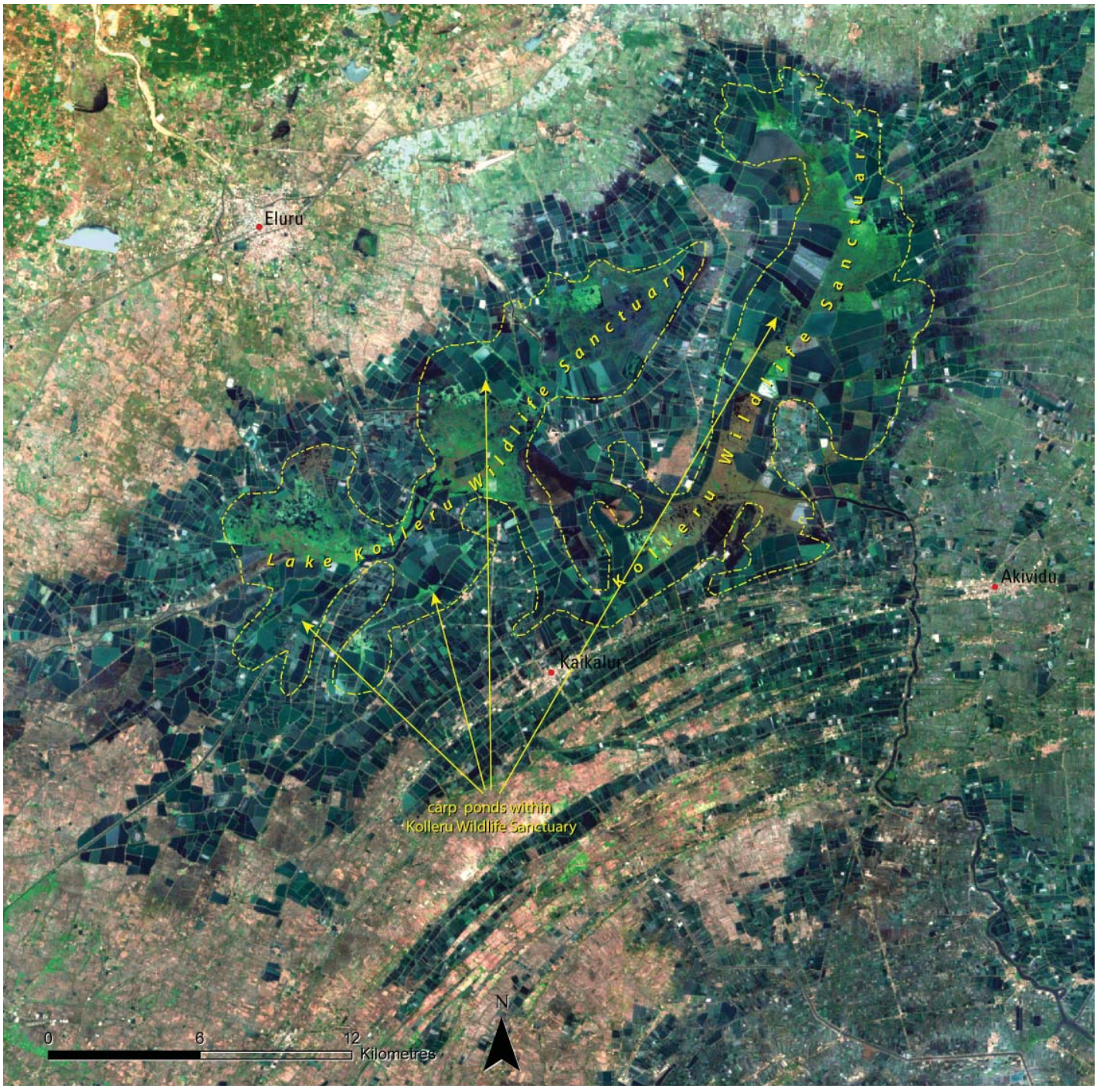


Figure 3a-3c: Landsat images clipped to the boundary of the wildlife sanctuary show the aquaculture encroachment (rectangular blue areas) peaking around 2004.

By 2004, the lake had over 1 000 fish ponds covering more than 40 per cent of the lake, (Figures 2 and 3b) while the remaining surface was either covered by dense weeds or paddy-rice cultivation (Rao and others 2008). A growing population and increasingly intense land use in the area surrounding the lake led to the rise in polluting inputs, including industrial effluents, pesticides and fertilisers from aquaculture, and agriculture and domestic sewage (Venot and others 2008, Adhikari and others 2009).

The Andhra Pradesh government mandated a program to improve the lake's condition, ordering unauthorized fish ponds to be demolished (Ramakrishna 2007). Many of the carp aquaculture enclosures located within the protected area (defined by an elevation contour line 1.5 m above mean sea level) were

Figure 2: Carp aquaculture ponds within the wildlife sanctuary peaked around 2004.



breached in 2005 and 2006 using explosives (Rao and others 2008).

What are the findings and implications?

While the government programme reduced the intensity of aquaculture within the protected area, some ponds remain (Figures 3c, 4, and 5) and there are signs that illegal ponds are returning to the lake. Where ponds were breached, in many cases much of the enclosure remains and continues to alter the hydrological and ecological functions of these areas (Rao and others 2008). In addition, the surrounding area between the Godavari and Krishna deltas is seeing continued expansion and intensity of aquaculture (Figure 4). Water quality continues to be threatened as industry, agriculture, and aquaculture activity discharges large amounts of major nutrients, trace metals, and pesticides into the lake (Adhikari and others 2009).

Figure 5: High resolution satellite data from late 2009 shows the intensity and proximity of ongoing aquaculture to the sanctuary.

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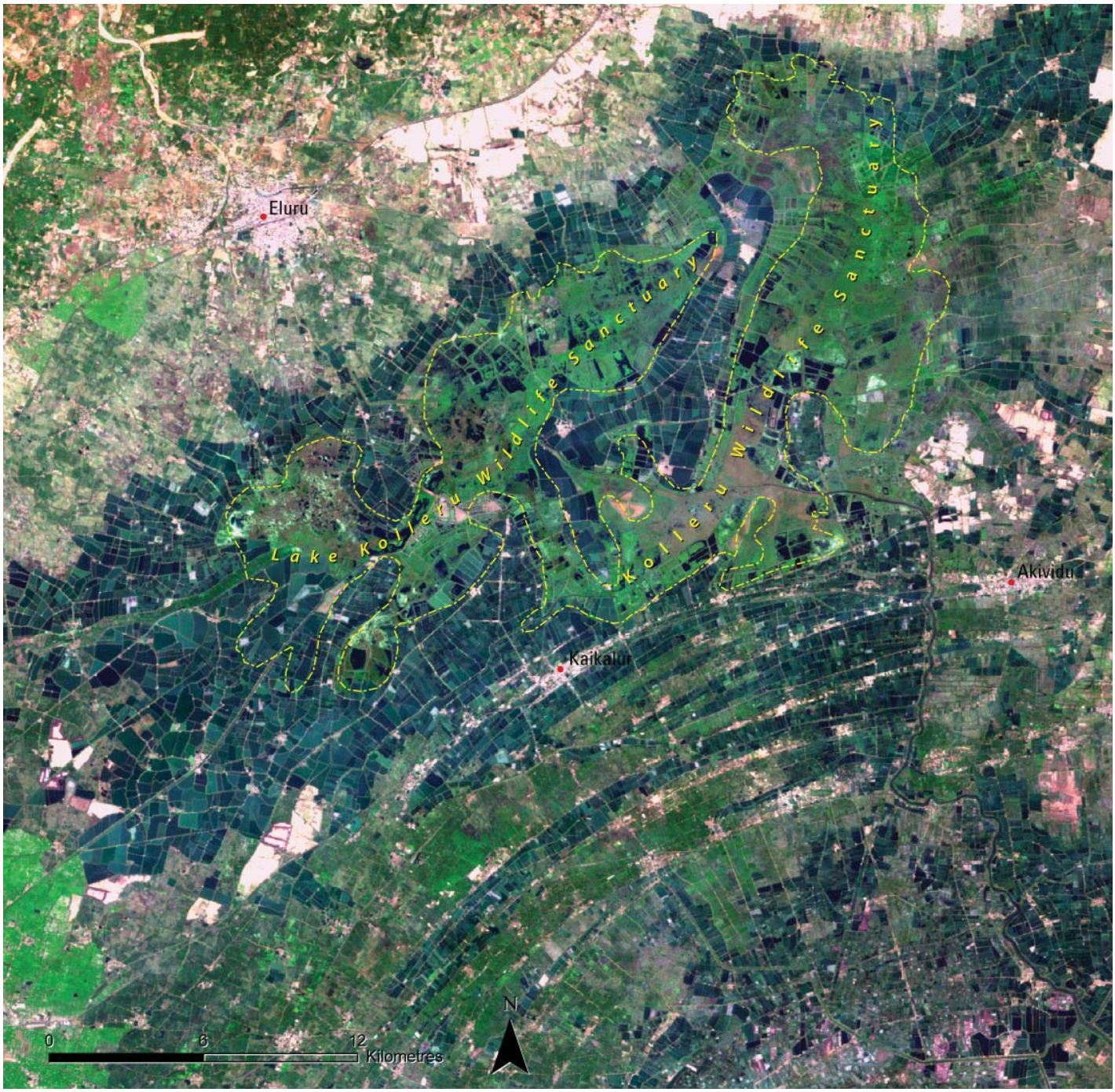
Figure 4: High resolution satellite data from late 2009 shows the intensity and proximity of ongoing aquaculture to the sanctuary.



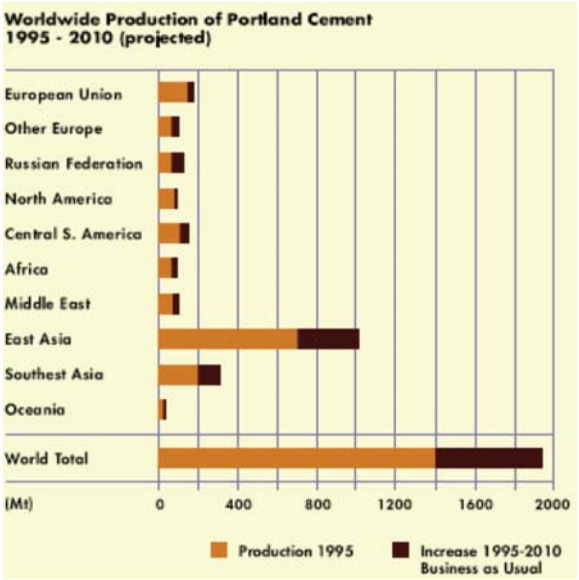
Greening Cement Production has a Big Role to Play in Reducing Greenhouse Gas Emissions

Why is this issue important?

Next to water, concrete is the second-most consumed substance on earth; on average, each person uses nearly three tonnes a year. Portland cement, the major component of concrete, is used to bind the materials that make up concrete. The concrete industry uses about 1.6 billion tonnes of portland cement and produces some 12 billion tonnes of concrete a year.

The industry has a large ecological footprint: it uses significant amounts of natural resources such as limestone and sand, and depending on the variety and process, requires 60-130 kg of fuel oil and 110 kWh of electricity to produce each tonne of cement. In addition, the cement industry is second only to power generation in the production of CO_2. Producing one tonne of portland cement releases one tonne of CO_2 to the atmosphere and the cement industry accounts for 7-8 per cent of the planet's human-produced CO_2 emissions. Half of it comes from producing clinker, 40 per cent from burning fuel and 10 per cent from electricity use and transportation (Mahasenan and others 2003, WBCSD 2005).

Although cement making has become more efficient and the amount of greenhouse gas the industry emits has declined, further reductions will be difficult since processing limestone produces CO_2 and demand is increasing—within the next 30 years, worldwide demand for concrete is expected to double. Thus, it is critical that ways are found to reduce the concrete industry's environmental impact, especially its large contribution to global warming.



Source: EcoSmart™ Foundation Inc. (n.d.)

What are the findings and implications?

Much recent research has been conducted to investigate the potential for reducing greenhouse gas (GHG) emissions from the cement industry. Most of it has focused on using alternative materials to replace the maximum amount of cement used in concrete production, which would create a more sustainable process and product. Some of the most commonly used alternatives are waste products from industrial processes, such as fly ash, a by-product of coal-fired power plants; cement-kiln dust; volcanic ash; ground, granulated blast-furnace slag; rice-husk ash; and silica fume. Studies have shown that when blended in the right proportion and activated properly, using supplementary cementing materials can reduce emissions, energy use and resource consumption while still producing cement with robust strength and performance. In addition, there is the environmental benefit of waste reduction (Shah and others 2004).

The addition of such alternative materials to concrete often gives the product other benefits: they are recyclable, durable and need less maintenance and the product is often more economical and has reduced permeability and increased strength.

Another promising technique to reduce the industry's GHG emissions involves capturing the CO_2 used in the cement-making process to make other products, such as carbonates, bicarbonates, solids and liquids that capture the CO_2 molecule. One example is sending the CO_2 emissions through seawater to create a carbonate material that can be used to create concrete, thereby securing the gas permanently inside the building material (Biello 2007). Emerging technologies that reduce the environmental impact of cement production have a significant role to play in mitigating climate change; more policy and market incentives to support research and development of supplementary cementing materials and carbon capture and storage in concrete are needed.

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Near Real-Time Environmental Event Alert

Thematic Focus: Disasters and Conflicts and Environmental Governance

Pakistan's Flood of the Century is a Global Disaster

Why is this issue important?

Northwestern Pakistan experienced its worst flooding in a century in late-July and early-August 2010. Unusually heavy monsoon rains led the Indus River to inundate areas far beyond its banks affecting the densely populated Punjab and other regions. More than 1 600 people have died, 2 million are homeless, and from 15 to 20 million people are affected (UN 2010). The floodwaters destroyed large parts of the infrastructure and crops in Pakistan's breadbasket.

The issue is a significant environmental disaster, since the area is primarily based on an agrarian economy. Some 6 879 655 ha of agricultural land has been submerged. In the Punjab alone, almost 404 685 ha of cotton-growing land was affected. The flood-affected lands could lose their crop and livestock producing capacity, with severe long-term impacts on both the environment and livelihoods. In addition, the floods will force more people to move to already crowded urban areas.

Figure 1: The districts affected by the Indus flooding. The flood wave initiated by the heavy rains can be tracked by river gauges as it perpetuates downstream (Source: OCHA 2010).

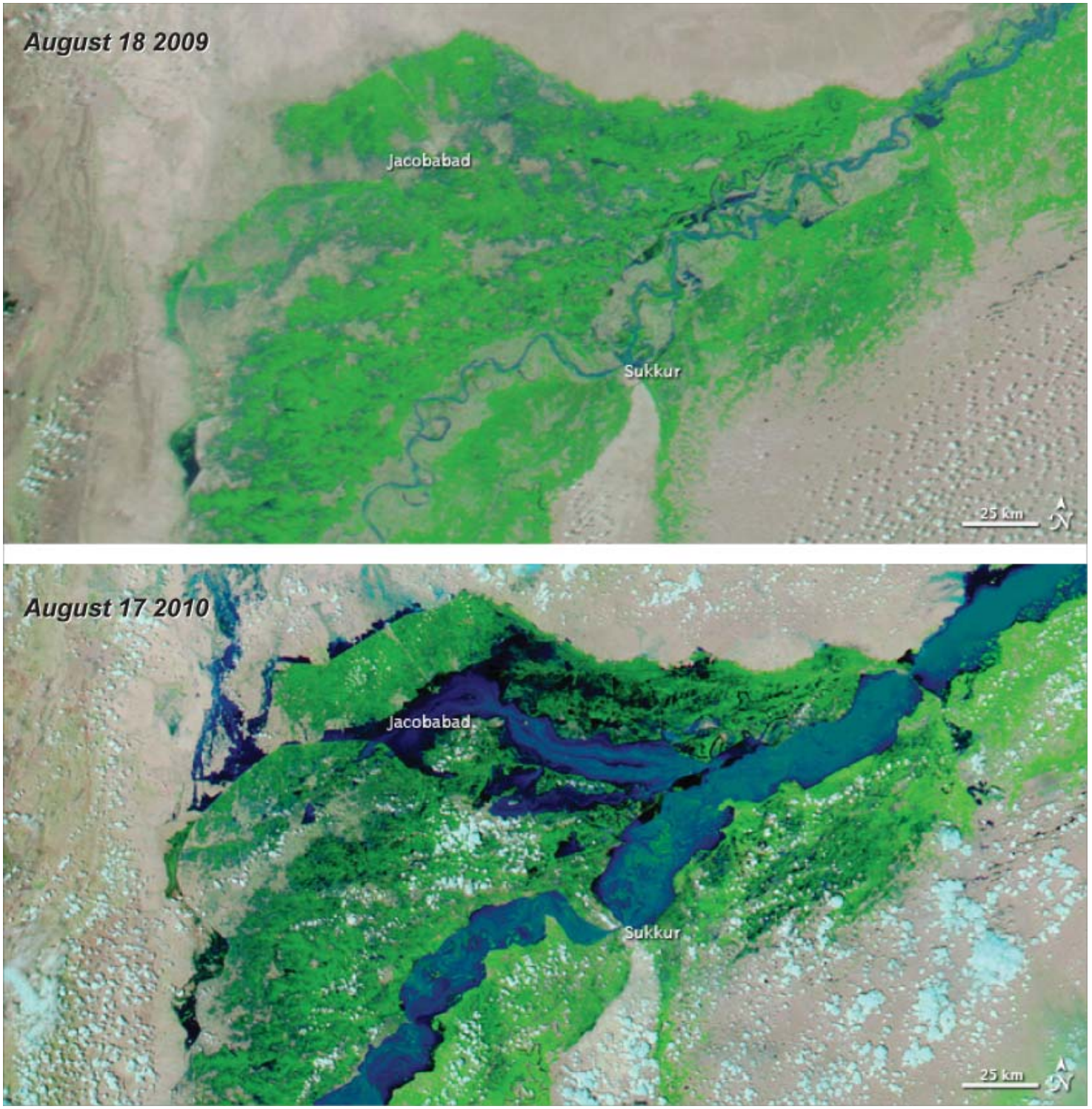

Figure 2: Satellite imagery (MODIS Terra) showing the extent of the flooded area in the worst affected area around the city of Sukkur (bottom, acquired 17 August 2010) in comparison to the river water one year earlier (top, acquired 18 August 2009). Note that clouds appear as turquoise-white (Source: NASA 2010).

What are the findings and implications?

The unusually high monsoon rains responsible for the flooding are part of an anomalous weather pattern across Asia causing floods and landslides in China and North Korea and heavy rains in Indonesia. Figure 3 shows the difference in rainfall from the regional average, illustrating the enhanced Asian Monsoon originating over the Indian Ocean. High summer temperatures on the Eurasian continent that suck in colder, moist air from the ocean, fuel the monsoon. Not surprisingly, the heavy rains coincide with a heat wave in Russia.

By mid-August, 160 000 km^2 of land was inundated, an area larger than more than half the world's countries, and the number of people needing shelter, food and emergency care exceeded the combined numbers affected by the Indian Ocean tsunami (2004), the Kashmir earthquake (2005), Cyclone Nargis (2008), and the Haiti earthquake (2010) (UN 2010).

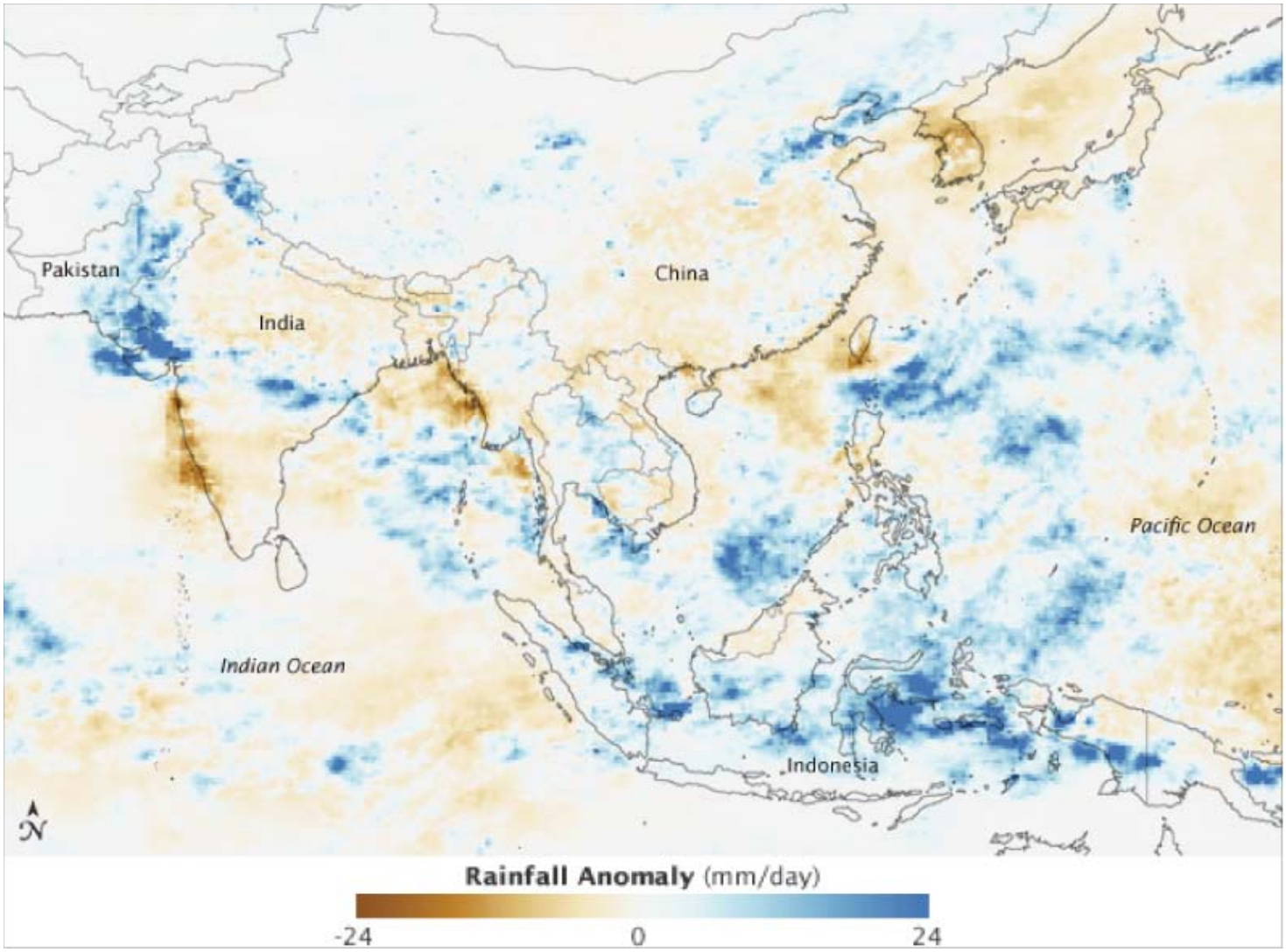

Figure 3: Rainfall patterns in Southeast Asia showing the rates of divergence from the average rates in the period 1-9 August 2010. Pakistan and Indonesia experienced especially high rainfall rates over the week (Source: NASA 2010).

In 2009, the Food and Agriculture Organization of the United Nations (FAO), the World Food Programme (WFP), and the National Disaster Management Authority (NDMA) conducted a pilot project to strengthen response to riverine floods and hill torrents in the Rajanpur (Punjab) (FAO 2009). This newest disaster, however, overwhelmed domestic, NGO and UN response capacities. With the potential impacts of climate change on flooding patterns, the crisis points to the need for renewed and up-scaled disaster preparedness.

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A child sleeps on a bed surrounded by floodwater in his home in Khwas Koorona Village, Pakistan. An estimated 2.5 million of the province's 3.5 million residents have been affected by the disaster (Source: UNICEF 2010 via Flickr).

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Did You Know

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