

Feature

Will the Nicaragua Canal connect or divide?

A century after the opening of the Panama Canal, a second inter-oceanic passage is set to be built in Central America, this time in Nicaragua. The ambitious and astronomically expensive project promises to bring economic opportunity to a poor country but it also carries risks to its tropical ecosystems. Will the new waterway ultimately link two oceans or divide a continent? Michael Gross investigates.

In August 1914, the first ship passed through the newly completed Panama Canal, even though the world was too busy with other events at the time to take much notice or celebrate. People responsible for the works must have breathed a sigh of relief at the successful completion of a building project that seemed to attract disaster and scandal for decades and killed 28,000 workers in 33 years.

Originally started by a French company trying to emulate the success of the Suez Canal, the project collapsed in 1889, triggering a major financial scandal, and was then taken over by the US in 1902, who retained authority over it after completion in 1914. In accordance with the Torrijos–Carter agreement, the US handed over the canal to Panama at the end of 1999.

In the century of its existence, the Panama Canal has proven more popular than anybody could have expected, as humanity became ever more addicted to global trade and ever larger container ships crossed the oceans. By now, ships of the 'Panamax' size (294.3 metres long, 32.3 metres wide, carrying 4,600 standard 20-foot containers), designed to fit through the existing locks of the Panama Canal, are dwarfed by new generations of even more gigantic ocean vessels.

As global trade seems to yearn for even more carrying capacity, Panama is currently expanding its canal at a cost of around \$5 billion, adding a larger lock at each end and widening the passage to allow ships with a capacity of up to 12,000 standard containers to pass. As the people of Panama officially own the canal, this expansion was decided by a binding referendum held in 2006. Panama's president Juan Carlos Varela recently confirmed

that the project is now scheduled for completion at the beginning of 2016. Plans for further expansions with a possible fourth set of locks are currently being evaluated.

But what if the gods of the global markets want even bigger capacities than that? It now looks like they are going to get their wishes granted a bit further north, in Nicaragua. The Hong Kong Nicaragua Canal Development Company (HKND) founded and led by the Chinese entrepreneur Wang Jing signed the necessary contracts with Nicaragua's president Daniel Ortega in June 2013. In July 2014, the route of the canal was officially presented, and building work is set to start in December, with completion scheduled for 2019. A second crossing is set to become reality, but will it bring wealth to Nicaragua, one of the poorest countries of the Americas, or endanger its natural riches?

Crunching the numbers

With a length of 278 kilometres, the route across Nicaragua is much longer than that of the Panama Canal, although 105 kilometres of the route go across Lake Nicaragua. An artificial lake with 395 square kilometres surface area will be created as a reservoir to ensure water provision for the canal. Fringe benefits will include two ports, an airport, a free trade zone, and a tourism centre. Around 50,000 workers will be needed on the construction sites, and the company claims that overall it will create 200,000 jobs for the duration of the project.

With a width between 230 and 520 metres, the new canal will accommodate ships several times larger than the Panamax class, and still larger than what the Panama Canal will be able to accommodate in 2016 with its new locks. Traffic forecasts are of 5,100 ships per year, which will take just over 30 hours to make the passage. For the traffic between the East and West Coast of the US, the route is abbreviated by 800 kilometres (500 miles), saving roughly one day.



Piled up: Globalised trade has driven up both the size and the number of container ships crossing the oceans to the extent that by now many are too large to fit through the existing locks of the Panama Canal. The image shows a ship of the Panamax format, the Providence Bay, crossing the Panama Canal. (Photo: Biberbaer/Wikicommons.)



Cutting across: The official route for the Nicaragua Canal, as revealed by HKND in July, cuts across Lake Nicaragua but stays clear of the river San Juan, which already connects the lake to the Caribbean but also defines the frontier between Nicaragua and Costa Rica. Using the river might have been cheaper, but also even more controversial for environmental and political reasons. (Adapted from Wikicommons.)

So much for the projections from HKND, which seem to have convinced the Nicaraguan government sufficiently, as it waded through the project without too much scrutiny or debate. Some criticism is heard from the neighbours, however. Panama's president went on record saying that the investment of \$40 billion could not be justified, seeing that the current expansion of the Panama Canal with a third set of locks, possibly to be followed by a fourth set soon afterwards, is much less costly. But then again, as the holder of a lucrative monopoly, his nation does have a vested interest in the matter.

Costa Rica has formally asked the Nicaraguan government to deliver a detailed report into the expected environmental impact before starting with any physical work. Specifically, Costa Ricans are worried over changes to water sheds and rivers, but their exceptionally rich biodiversity, which also is an important factor for tourism in the country, might also take a knock if the large-scale project next door were handled badly.

Habitats divided

So far, the developers have not released anything that could count

as a formal environmental impact study, but scientists with an interest in the area have expressed a whole range of concerns. Axel Meyer, an ichthyologist from the University of Konstanz, Germany, has argued that changes to the lakes and rivers are of concern both for the local fish populations, which he studies for their remarkably rapid speciation, and for the wider hydrology of the area.

The passage through Lake Nicaragua is more difficult than it looks at first glance. While the lake is very large in surface area, it is quite shallow with typical depths between 10 and 15 metres. Thus, a trough of nearly 28 metres depth running through the lake would have to be dug out and kept clear over time, which would cause major disturbance of the lake environment.

Moreover, the use of inland waterways for international shipping routes carries the inevitable risk of introducing invasive species, which, as Meyer has stated in a comment co-authored with Jorge Huete-Pérez, who was at that time president of the Nicaraguan Academy of Sciences (Nature (2014) 506, 287–289), “can

have catastrophic results” for the ecology of the local freshwater biotopes. Pollution and salt import are also concerns, as Lake Nicaragua serves as a major reservoir for drinking water.

Then, on the Caribbean coast, the route passes through relatively healthy tropical forest biotopes, which would be fragmented and, as ecologist Stuart Pimm points out, invaded by people, as the developed land becomes more accessible. This division is bound to affect both biodiversity and vulnerable species, including the harpy eagle (*Harpia harpyja*), the Baird's tapir (*Tapirus bairdii*), the spider monkey (*Ateles geoffroyi*), as well as Mesoamerica's iconic top predator, the jaguar (*Panthera onca*). The wildlife organisation Panthera is currently working to establish a Panamerican wildlife corridor for the jaguar and other species ranging from Colombia through to the southern US. A second gigantic canal cutting across the continent would make this endeavour more difficult.

“The canal certainly makes it more difficult to maintain corridors and connectivity for jaguars and other wildlife. Like any large infrastructure project, there are immediate impacts of human activity, and direct loss of habitat. In this case, both the activity and the habitat losses will be immense,” comments Howard Quigley, Executive Director of Jaguar Programs for Panthera (www.panthera.org), a global wild cat conservation organisation.

The size of the development rules out wildlife bridges or tunnels, but jaguars and tapirs are known to be good swimmers, so planning could help them cross that way. “You have to provide access through [the canal], and minimize the “resistance” of passage,” Quigley explains. “For example, you want unbroken forest right up to the edge of the canal, and easy-access points for animals to enter the water and swim across. And, the closer the forest edges are to each other, the more likely birds are to fly between the edges.”

The forests in the East of Nicaragua are also home to indigenous populations, who may face relocation and fragmentation of their homeland. The question as to whether proper consultation has

been given and consent obtained is also under debate.

Impact assessment

Conversely, columnist Freddy Franco has argued in the Nicaraguan newspaper *El Nuevo Diario* that the canal, rather than destroying his country's natural wealth, offers a unique opportunity to save it from destruction. The canal, Franco argues, will need freshwater, and that depends on functioning forests, lakes and rivers, so if HKND wants to operate the canal successfully for 50 or 100 years, it will be in its best interest to save forests and protect waterways. Specifically, Franco claims that some areas of Caribbean forests could be restored and that Lake Nicaragua, currently at risk from pollution, might actually be saved thanks to the attention it will receive as part of the gigantic project.

Whether the scientists' fears or Franco's more optimistic prognosis will come to be realised is hard to establish as no detailed impact assessment independent of the developers has been carried out. HKND have kept their cards close to their chest and are only now (mid-October) preparing to release details of environmental data and planned expropriations.

An independent assessment by the Humboldt Centre in Managua is also due to be published. It focuses on the likely impact on water supplies, land use, vulnerable species, and autonomous indigenous communities and will come to the overall conclusion that the project should not go ahead.

Critics say that the Nicaraguan government appears to have swallowed HKND's proposals without too much scrutiny. After a long silence, the country's president Daniel Ortega recently defended the project arguing that the canal project is "the only way in which Nicaragua can confront the issue of poverty." Ortega admitted that he had doubts about the project initially, and critics have quoted him saying in 2007 that he would not sacrifice Lake Nicaragua to a canal project "for all the gold in the world." He now argues that the lake is already polluted and at risk, given that the country can't afford water treatment plants that would be needed to save it from further pollution. He also reiterated



Moody cat: The tropical forests of Mesoamerica are home to a rich biodiversity, featuring a number of vulnerable species, including the iconic jaguar, which holds a special place in the myths and traditions of indigenous people. Collateral damage caused by the development of the Nicaragua Canal and associated infrastructure projects would diminish and fragment the habitats of these species. (Photo: Steve Winter/Panthera.)

the claim made by HKND that the chosen route is not the cheapest one but the environmentally least destructive option.

However, the Nicaraguan Academy of Sciences and its current vice-president, Jorge Huete-Pérez, remain highly sceptical of the project. The academy is organising an international workshop to identify scientific and technical questions associated with the canal development, to be held in Managua on November 10 and 11, which will focus on broadly defining major scientific and technical questions associated with this mega-project.

Huete-Pérez commented: "Because of the serious environmental and social impacts from this canal, I personally would hope that the government would consider ceasing all activity related to the construction of the Canal and its subprojects (all mega-projects) until the HKND studies are completed, reviewed and publicly debated. I would also hope for an independent study to be performed because of the conflict of interest of the company. But I am afraid that there is no time for an independent study, given the government pressure to start the construction this December."

Critics of the project are also concerned that the Nicaraguan government has failed to impose any

scientific, legal or political checks and balances to the operations of the Chinese company. As Huete-Pérez puts it: "In my opinion, the canal concession was passed without an appropriate scientific evaluation and based on an outdated and absurd concept of economic development which is not sustainable. This generous concession included granting the Chinese company vast areas of territory, freely selected by them and exempting them from taxes and any environmental obligations."

Given the shortage of independent evaluation, it is at the moment unclear whether a canal could at all be built in a sustainable way with limited environmental impact. If possible, such a positive outcome would of course depend on the developers doing the right things, which would also require them to consult with scientists more widely than they appear to have done so far. After all, nobody wants to repeat a disastrous construction project like the Panama Canal was, and anybody investing \$40 billion in an infrastructure project should do their best to make sure it really connects people rather than just slicing up their land.

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