



## Mapping the Darién Gap

### [MUSIC PLAYING]

SPEAKER 1: Among endangered tropical forests, this one is unique. This forest sits in the middle of the longest road on Earth, the Pan-American Highway, which runs from the tip of Alaska to Tierra Del Fuego, Chile. The forest is called the "Darién Gap" because it is the only interruption in the highway. Within this region lies Darién National Park. Throughout history, Darién's rough terrain has shielded it from the outside world.

But today, as tendrils of development spread from the road, pressures mount from illegal loggers to migrant ranchers that are pushing deeper into the gap, slashing and burning to create pasture land. This threatened forest is home to wildlife and Indigenous people who have lived here for thousands of years.

[MAN SPEAKING SPANISH] My name is Carlos Doviaza. I'm an Emera of the region of Darién. I'm part of what is known as the Indigenous geographic information system which involves everything that is mapping with drones.

SPEAKER 1: The maps being produced, with support of scientists of the Rainforest Foundation, are powerful tools for Indigenous communities. They use them to get legal titles for their land, to create sustainable land-use plans, and to monitor their forests as outside pressures close in on the gap.

[MAN SPEAKING SPANISH] When I see those types of threats to our own villages, our territories, not having a collective legal title makes us powerless to the threats that we face. There's not government support... But there are Indigenous communities that fight for that territory so that this will change.

SPEAKER 1: At the northern end of the Pan-American Highway, in the town of Yaviza, asphalt gives away to water. Carlos Doviaza, a trained drone pilot, leads a mapping team to the Indigenous community of Aruza, a half day's journey upriver.

[MAN SPEAKING SPANISH] What is this for? It takes pictures -

SPEAKER 1: Carlos works with the Rainforest Foundation. He brings new mapping tools to the Indigenous communities fighting to protect their home.

[MAN SPEAKING SPANISH] Some mapping work from the ground has been done in the past but we're missing the aerial perspective in high resolution.

SPEAKER 1: Drone mapping has other benefits. It is faster than mapping on foot and less expensive than buying high-resolution satellite imagery.

TOM BEWICK: My name is Tom Bewick. I am a regional director for The Rainforest Foundation. Our approach to conservation is a human-rights-based approach, where we work with Indigenous communities that inhabit the rain forest. We empower them technologically so that they're able to use new technologies that are coming out, satellite data, cellular phones, until drones themselves.

SPEAKER 1: Carlos's primary goal in Aruza is to accurately map community boundaries, the first step to apply for legal titles.

TOM BEWICK: There's lack of political will to give them territory security-- the use of the drones and the technologies to map out their territory, and then use that in Panama City and in political circles to push for their land titles.

SPEAKER 1: Another goal of today's flights is to map natural resources, vital for long-term planning.

TOM BEWICK: Indigenous land use is usually planned collectively by consensus. So the entire community makes decisions about how the entire collective territory is used.

[MAN SPEAKING SPANISH] People sit down and think: Let's see... We want to make sure that we have clean, pure water, a forest that gives us oxygen to breath, with many animals for us to hunt... We want to have agricultural plots...

TOM BEWICK: Land-use planning facilitates traditional use of resources, such as hunting, medicinal plants, logging for houses, to make boats, fires. But all this is done in a way that is sustainable and keeps the forest intact.

SPEAKER 1: A healthy forest, pure water, and agricultural land are essential for the community.

TOM BEWICK: We're going to set some missions-- six flights and cover about 1,200 hectares. We need to get those going today to get them processed by tomorrow night to show the community. And we're up against, right now, time. And time became more urgent as this storm is rolling in. We program the flight with GPS coordinates. Then we launch the drone, and you start the flight manually and basically, just get it up in the air. Once it's at a certain safe altitude, say 100 meters, you can switch it into auto-mode, which is kind of robot mode. And then it knows what to do because you've already programmed it.

SPEAKER 1: When the computer program takes over, the drone flies along parallel lines covering the area, snapping pictures in route.

TOM BEWICK: Basically, you're making a photo mosaic. Then we stitch the photos into one giant image, which can be up to between 100 and 500 photos in one image.

SPEAKER 1: The result is a map that helps the community see, at a glance, the big picture of their territory in striking detail. The map also gives them a way to monitor changes to the forest.

[MAN SPEAKING SPANISH] With these high resolution images... we can quantify what we currently have... but it will be excellent to have the images for 2016, 2017, and so on... to monitor the changes...

TOM BEWICK: It really helps facilitate them to make decisions about how to use their land and also about environmental threats. If there is an invasion or illegal logging, that will come out with these images.

[MAN SPEAKING SPANISH] – This is a deforested area...

SPEAKER 1: In fact, today's mission has revealed something troubling--

[MEN SPEAKING SPANISH] The community told us about this area...

- Yes!

– There are invaders here

SPEAKER 1: --a possible incursion.

[MEN SPEAKING SPANISH] – Look, it’s amazing Carlos!

Come here Eliseo...

Great quality image!

SPEAKER 1: To confirm their suspicions and document what they have seen from the air,

[MAN SPEAKING SPANISH] Where are we headed to?

SPEAKER 1: the team heads to the site of the potential incursion.

[MEN SPEAKING SPANISH] Here is the place, where you see all this disturbance

This is the point!

**[MUSIC PLAYING]**

SPEAKER 1: At the site, they carefully document what appears to be a land grab by migrant ranchers. Next, they record geographic coordinates of landmarks to align the aerial images.

[MAN SPEAKING SPANISH] We search for control points... a point that can be seen and identified from the sky... It can be a tree, a river... or a point that includes enough land to get the geographic coordinates of the image in.

SPEAKER 1: A map of the land incursion will be presented to law enforcement.

TOM BEWICK: The map is evidence they can bring to the authorities to halt this activity and hopefully remove that threat from their territory.

[MAN SPEAKING SPANISH] Based on the information that you provided to us...

SPEAKER 1: Carlos and his team present the maps that they've made to the community. From the air, Carlos reveals the scale of the new incursion, a picture that the authorities will have a hard time ignoring.

[MAN SPEAKING SPANISH] This technology is not only to catch the incursions in our territory. It also gives us the tools to design long term plans to preserve all this for our children... Thank you! Be proud!

SPEAKER 1: With his work completed in Aruza, Carlos heads deeper into the gap to continue mapping.

TOM BEWICK: This transfer of technology and capacity building of Indigenous communities on an international level would help protect tens of millions of hectares of rain forest throughout the world on a multidimensional scale and see trends over years.

[MAN SPEAKING SPANISH] We, the Indigenous people, are the stewards of the rainforest. Now we fly the drones and we ourselves handle the information. This is part of a revolution!

Six indigenous communities in the mapping program received legal land titles in 2016 and 2017. As of 2017, Aruza’s land title was still pending.

**[MUSIC PLAYING]**