

Don't Break the Heart of Mother Earth

by Alan Forsberg

"Doesn't the white man know, that if he destroys the forest, there will be no more rain?
And if there is no more rain, there will be nothing to drink or to eat?"
Davi Kopenawa – Yanomami Elder

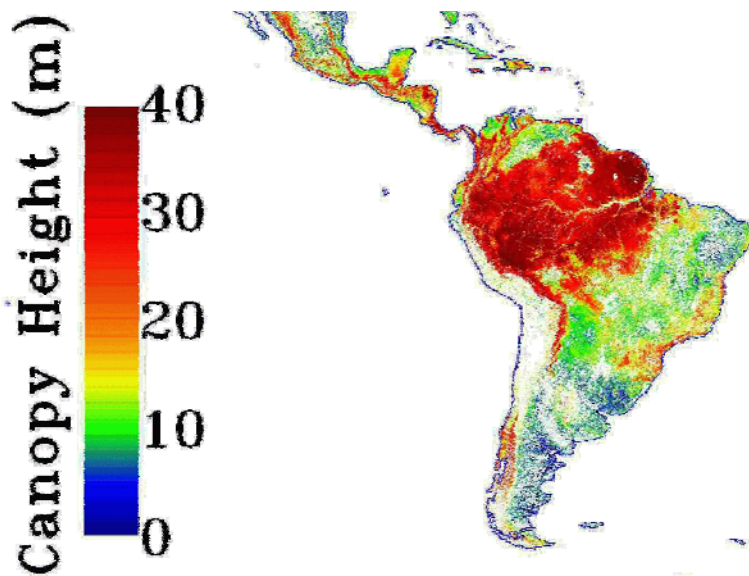
Anyone who has had to fetch a pail of water knows how heavy it can be to carry any great distance, especially uphill. It is a wonder therefore to see such huge amounts of water in lakes and glaciers so high up in the Andes. Where did all that water come from and how did it get up there?

Despite Bolivia's proximity to the Pacific Ocean, it is surprising to learn that the vast majority of water in Bolivia's climate system comes all the way from the Atlantic Ocean. That is because both the Andes Mountains and the prevailing easterly trade winds largely prevent the transfer of moisture from the West.

However the Atlantic Ocean is 3000 km. away and usually the levels of rainfall on a continent drop exponentially with increasing distance from a coast, little moisture makes it more than 1000 km. inland. So why is Bolivia not a desert?

Oddly, in equatorial South America the levels of rainfall remain the same or actually increase as you move west from the Atlantic coast. The Chapare for example is actually one of the rainiest places on the continent. So how does all that rain get here?

This can be explained by an ancient indigenous Hawaiian proverb: "Hahai no ka va i ka ulula'au" the rain follows after the forest. Now modern science is finally confirming what indigenous forest dwelling peoples have long known about the importance of forests in bringing rain.



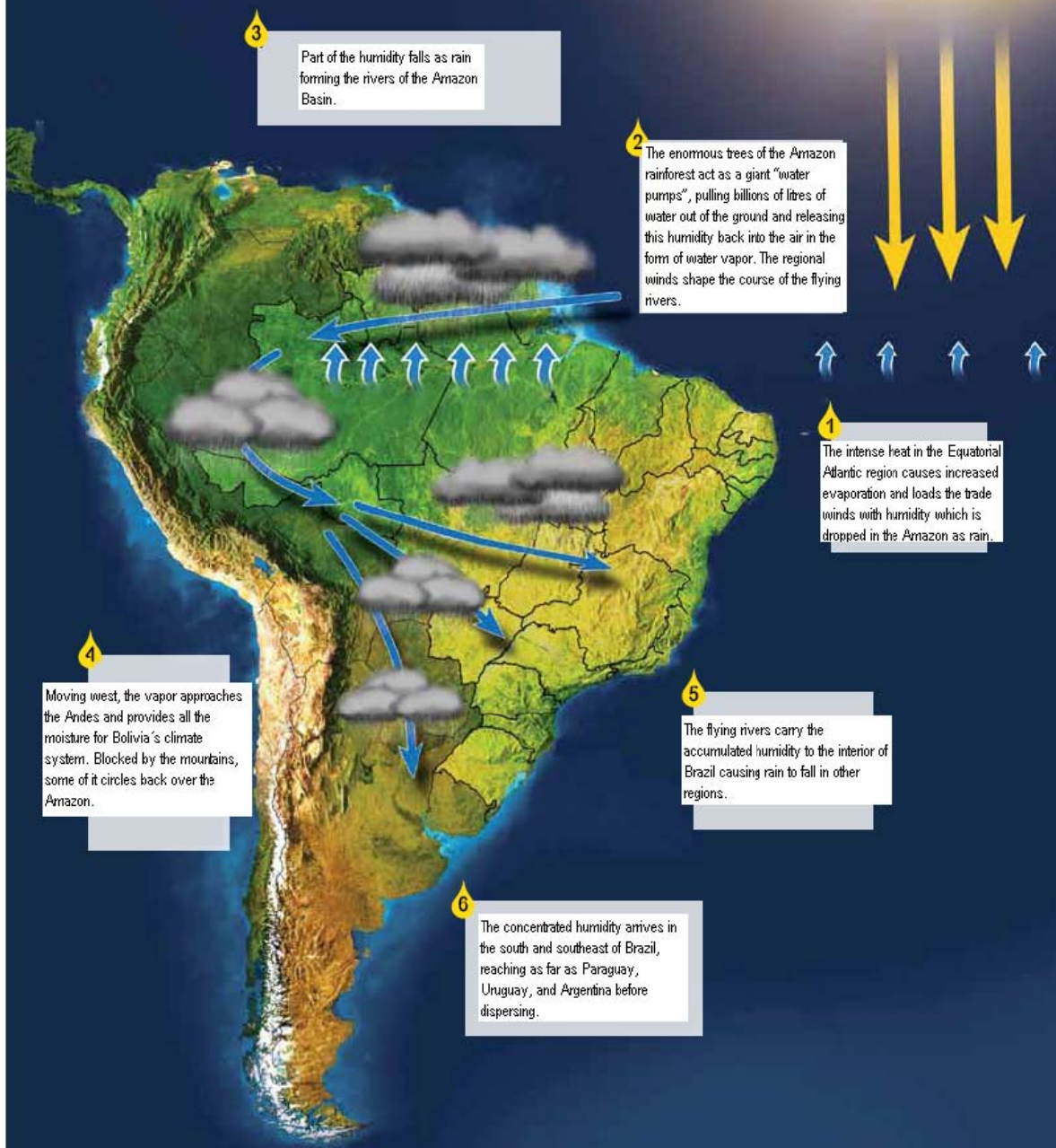
Scientists have recently discovered that a combination of "biotic moisture pumps" and "flying rivers" of the Amazon rainforest bring rains to Bolivia. Often referred to as the "lungs of the planet", the Amazon rainforest also functions as the "heart of mother earth" pumping ocean moisture into the interior of the continent and feeding the vast cardiovascular system of rivers, both terrestrial (the veins) and atmospheric (the arteries). This heart only does so because of the near-continuous forest cover from the coast to the continent's interior. In this way the forest serves as an aqueduct to the Andes and beyond.

The natural forest of the Amazon has around 600 billion trees, and each one acts as a great solar powered evaporation machine. These gigantic trees

pump groundwater from their deep roots up to their leaves where they release up to 1000 liters of water vapor into the atmosphere every day. One square meter of native forest can contain 8-10 square meters of leaves and thus produce flows of water vapor that, per unit land area, are typically more than ten times greater than pasture or cropland, and even significantly surpass that of open water.

By constantly intercepting and recycling runoff, the trees keep the water airborne where it is blown by the prevailing winds for thousands of kilometers in what are known as "flying rivers" of invisible water vapor.

O caminho dos rios voadores



Path of the Flying Rivers

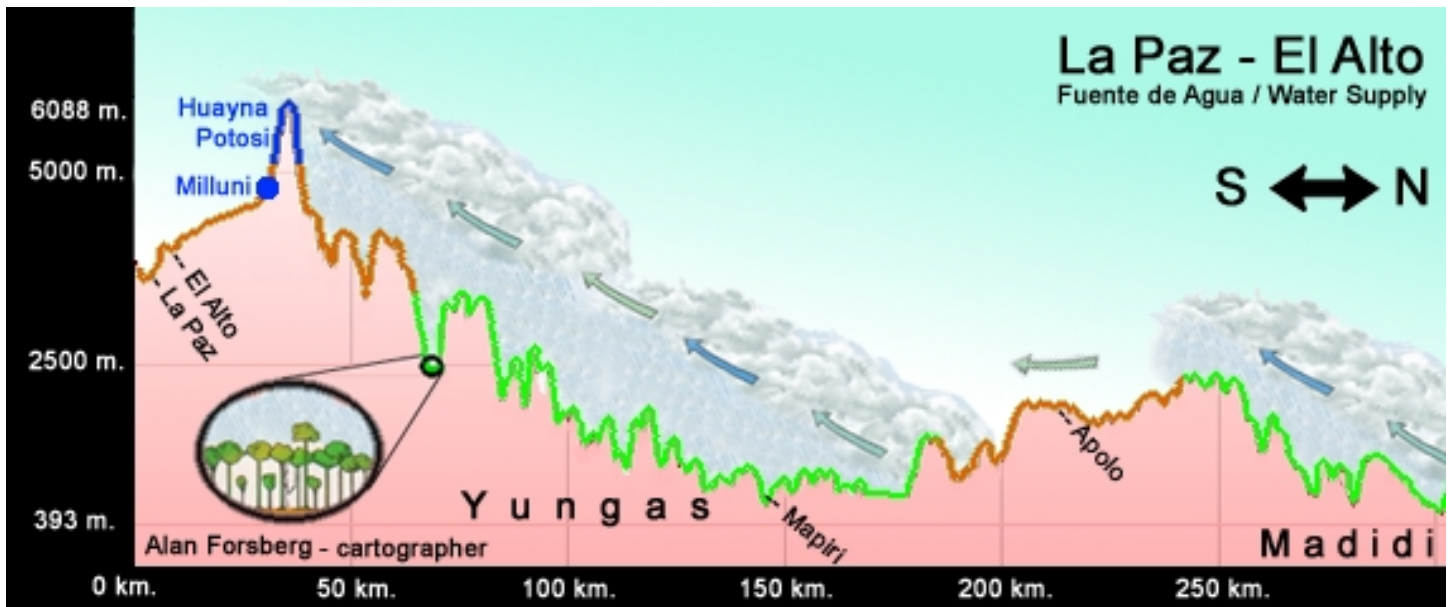
(Flying Rivers Project)

Altogether, the trees of the Amazon rainforest pump an incredible total of 20 billion tons of water (20 cubic Km.) out of the ground and into the atmosphere every day, which is more than the liquid discharge of the Amazon River itself. All of that is powered naturally by an equally amazing amount of solar energy. Calculating just what the Bolivian Amazon forest evaporates, the amount of solar energy used would be equivalent to nearly fifty times the nation's total electricity production or over fifty times the nation's total oil production.

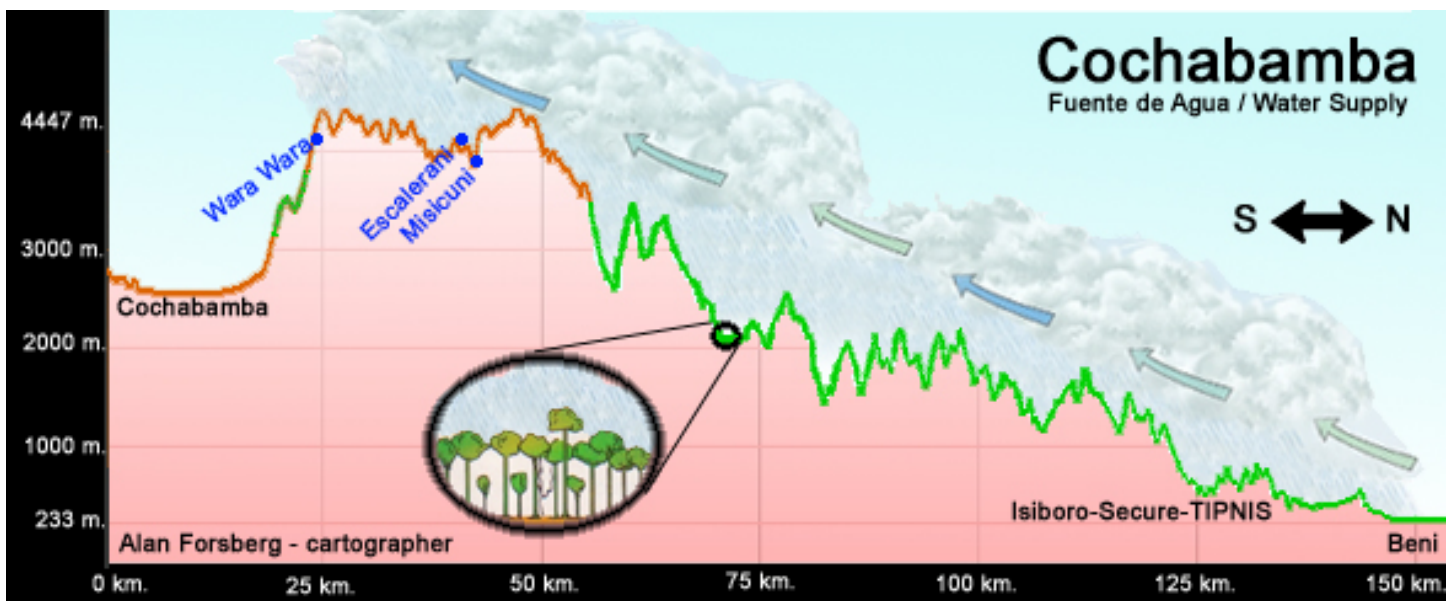
That is a lot of heavy lifting provided for free by the ecological services of the forest, a hidden value most people don't realize.

The natural forest not only pumps moisture into the atmosphere, but its abundance of indigenous plants and fungi also emit chemicals (biogenic volatile compounds and potassium salts) that seed the clouds and cause rain to fall. Thus the forest both receives and generates rain.

These widespread evaporation and precipitation processes in the forest also create low atmospheric pressure which constantly pulls in moist air from the ocean, hence the name "biotic moisture pump." But this pump only works in undisturbed natural forests. Vegetation of artificially thinned exploited forests, plantations, grasslands, and crops are unable to switch on the biotic moisture pump and maintain enough moisture optimal for life.



But the heart of mother earth doesn't just water the Amazon, it brings life giving rains to tens of millions of people well beyond the rainforest. When the flying rivers of water vapor reach the barrier of the Andes, heavy rains fall at the foot of the mountains. Trees continually intercept the runoff and, like elevators they lift and launch water high into the atmosphere thus bringing moisture all the way up to the glaciers and lakes high in the Andes.



The flying rivers also turn south and bring vital moisture to Paraguay, Northern Argentina and the center and south of Brazil, – a vibrant region that represents 70% of South America’s GDP. In this way, the heart of mother earth provides the water for most of the agriculture that feeds people in South America, and drinking water for the biggest cities on the continent.

Climate change is already expected to severely impact water availability in the Andes due to effects such as glacier/snow melting resulting from rising air temperatures. Bolivia is considered to be one of the countries most vulnerable to future reductions in water supplies with several large cities located above 2500 m that rely almost entirely on high-altitude water stocks such as glaciers and lakes to complement limited rainfall.

That is why continued deforestation in the eastern lowlands would be very unwise. The natural forest of the Amazon is needed to convey moist air to the Andes and bring rain. If it is damaged and destroyed, the flying river arteries will be severed and the heart of mother earth will be broken.

Versión en español: http://cambioclimatico-bolivia.org/index-cc.php?cod_aporte=333#333

Resources:

Flying Rivers Project

<http://riosvoadores.com.br/english/>

<http://riosvoadores.com.br/english/the-flying-rivers-phenomenon/>

Amazons Invisible Flying Rivers

<https://www.youtube.com/watch?v=lv7AUoheeQs>

<https://www.youtube.com/watch?v=iTOFgviRthY>

<https://www.youtube.com/watch?v=teeXse6pk7k>

Which Came First - The Rain or the Rainforest?

<https://youtu.be/Y3OWgb0Bv-A>

Douglas Sheil - Do forests attract rain?

<https://www.youtube.com/watch?v=WBkOos12Xzs>

Antonio Donato Nobre:

The magic of the Amazon: A river that flows invisibly all around us

https://www.ted.com/talks/antonio_donato_nobre_the_magic_of_the_amazon_a_river_that_flows_invisibly_all_around_us?language=en

The Future Climate of Amazonia Report

http://www.ccst.inpe.br/wp-content/uploads/2014/11/The_Future_Climate_of_Amazonia_Report.pdf

How forests attract rain: an examination of a new hypothesis

Sheil, D.; Murdiyarso, D.

2009, BioScience 59(4): 341-347

<http://bioscience.oxfordjournals.org/content/59/4/341.full.pdf+html>

Biotic pump of atmospheric moisture as driver of the hydrological cycle on land

A. M. Makarieva and V. G. Gorshkov

Petersburg Nuclear Physics Institute, Gatchina, St. Petersburg, Russia

<http://www.hydrol-earth-syst-sci.net/11/1013/2007/hess-11-1013-2007.html>

Why Does Air Passage over Forest Yield More Rain? Examining the Coupling between Rainfall, Pressure, and Atmospheric Moisture Content*

A. M. Makarieva et al.

Journal of Hydrometeorology, Volume 15, Issue 1 (February 2014)

<http://journals.ametsoc.org/doi/abs/10.1175/JHM-D-12-0190.1>

Observations of increased tropical rainfall preceded by air passage over forests

D. V. Spracklen et al., Nature 489, 282–285 (13 September 2012)

<http://www.nature.com/nature/journal/v489/n7415/full/nature11390.html>

NASA Map Sees Earth's Trees in a New Light

<http://www.jpl.nasa.gov/news/news.php?release=2012-044>