

Nuking The Panama Canal

By David K. McDonnell (© 2005 and 2019) (posted at www.clandonnell.net)

Today we will examine an environmental problem which might cause a serious economic problem. We will also examine two possible solutions, one of which is currently being studied by locals in Panama and financiers in London, and the other of which was seriously considered by the U.S. government a few decades ago. The story will tie together a bit of science, history, engineering, economics, and sociology. It will end with the question, only part facetiously, “Should we re-dig the Panama Canal using nuclear weapons?”

First, the canal:



The French tried, and failed, to build a canal through Panama in the late 19th Century. The French design was a “sea-level” canal, which meant, essentially, a straight shot between the Atlantic and Pacific Oceans. This has some surface logic, since we might presume that neither ocean is on a higher elevation than the other. (Obviously, if one ocean were higher than the other, then the creation of a sea-level canal might create giant white-water rapids.)

A mountain in the middle of Panama posed a problem to the French. A sea-level canal required blowing up the mountain, so that the canal could run through where the mountain used to be. Eventually, the French project ran out of money¹.

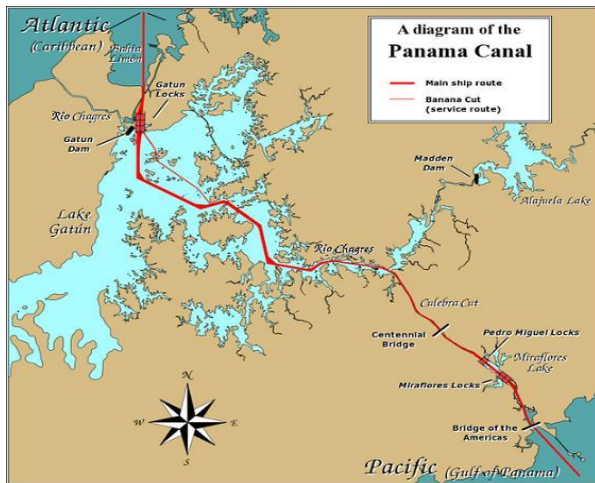


The Americans abandoned the sea-level canal and instead built a lake and a series of locks. The lake, Gatun Lake, is 85 feet above sea level. Ships entering the canal from, say, the Atlantic side, go through a series of locks and are ultimately raised to the level of the lake. After traversing the lake, the ships go through another series of locks and are ultimately lowered to the level of the Pacific Ocean.

The Panama Canal² was completed in 1914, and this lock process has worked pretty well for nearly 100 years. Americans ran the canal until 1980. After a 20 year transition period, Panama

¹ <http://czbrats.com/Builders/FRCanal/failure.htm>

took complete control in 2000. The transition has been a smooth one and the canal operates today as efficiently as it ever has.



You might want to take a look at Smithsonian Magazine's March 2004 article, [A Man, A Plan, A Canal: Panama Rises](#)³, for additional background.

² <https://www.history.com/topics/landmarks/panama-canal>

³ <https://www.canopytower.com/a-man-a-plan-a-canal/>

Next, the problem:

A single ship traversing the Panama Canal requires the consumption of **52 million gallons of fresh water!**

As a ship enters the lock system, fresh water is drained from Gatun Lake into the locks to raise the level of the ship. Conversely, as the ship leaves Gatun Lake, more water is drained into the locks to lower the level of the ship. 26 million gallons are consumed to raise the ship, and 26 gallons are consumed to lower the ship. When finished, the fresh water is flushed away into the sea. Over 13,000 ships pass through the canal annually, and this adds up to a lot of fresh water flushed out annually.

Until recently, this wasn't a problem. The dense, Central American rainforests produced plenty of rainwater to refill Gatun Lake as needed.



But during the last few decades, half of the surrounding watershed forest has been lost to logging and slash-and-burn agriculture.

This formula is more complicated than “less rainforest means less rain”. Rather, the intense rain during the rainy season used to soak into the ground, and feed into watershed streams and then Gatun Lake. But deforested slopes cannot

absorb heavy rain⁴. Intense rainy-season rain turns into flood water and quickly runs out to sea. Forested slopes produce useful and steady streams of water; deforested slopes produce useless surges of water.

Without the water from the rainforest, **the Panama Canal would be the largest ditch in the world.**

The ecological/economic solution:

What's needed is the reforestation of the rainforest, which of course costs money – more money than the government of Panama has at its disposal.

Enter a London insurance company, which, among other things, insures larger transporters against the losses which would be incurred if the canal were closed. The London company is

⁴ <https://www.nytimes.com/2005/05/26/health/a-green-future-for-the-canal.html>

trying to put together a bond deal in which it would underwrite 25 year bonds. The proceeds of the bonds would be used for replanting the deforested areas. The purchasers of the bonds would be the largest canal users, such as Wal-Mart and Asian automakers. A portion of the future canal fees would then be used to repay the bonds over a 25 year period. The proposal is explained in an April edition of *The Economist*⁵.

This makes sense to me. I've long believed that we will not adequately protect the environment until we can internalize the cost of environmental damage. The problem is one of "externalities"⁶ - the economic impacts made when those who make a decision do not bear the costs of the decision. These externalities are not factored in as part of the cost of a business venture.

Take for example the decision making process of a Panamanian land owner. He will consider the comparative yield of forested and deforested land, the comparative costs in harvesting, and the cost to deforest the land, and make his decision accordingly. The "externality" here is the long range impact his deforestation might have on the canal.

Or take, for example, the factory owner whose manufacturing process includes the production of toxic emissions. The owner makes decisions based upon his costs – plant, equipment, materials, labor, etc. – but the social and environmental costs of the toxic emissions is not part of the factory owner's direct costs and thus does not enter into his decision making process.

Externalities, if they are dealt with at all are dealt with in the form of governmental regulations. The government might regulate toxic emissions, and the factory owner's costs would then include the cost of compliance. This works to an extent, but is also dependent upon the relative political power of those affected.

But if ecological services could be valued in the marketplace, then preservation would not be dependent upon government regulation. If the value of the rainforest water to the operations of the Panama Canal can be measured, then the users of the canal can be induced to pay the owners of rainforest land. If rainforest landowners are paid not to deforest, then they no longer have the financial incentive to clear-and-burn.

This concept has been used in other contexts with some success. I think I will retain this article in *The Economist* and pursue this again in a future Café.

The nuclear solution:

There is an alternative solution. It goes back to the original French design of a sea-level canal. No locks would be required, and thus no need for millions of gallons of fresh water. Nearly 50

⁵ <https://www.economist.com/science-and-technology/2005/04/21/are-you-being-served>

⁶ <https://www.investopedia.com/terms/e/externality.asp>

years ago, engineers solved (or at least thought they solved) all of the issues relating to a sea-level canal. (See *The Panama Canal Review*⁷, June 7, 1957.)

There remains the question of how would one clear a path through the mountains which divide the two oceans.

Alas, 21st Century America has something at its disposal that wasn't available to 19th Century France - **a vast arsenal of nuclear weapons.**

It would be a relatively easy task to bury a few nukes deep under the Panamanian mountains, and detonate the nukes from afar. Voila! The mountains would be gone, and salt water would flow freely between the Atlantic and Pacific Oceans.



Some of you may think that this is preposterous. But it was actually considered, quite seriously, by the United States government in the 1950s and 1960s.

During the Cold War, the U.S. developed its nuclear weapons arsenal at a staggering cost. In the process, someone got the brilliant idea of developing peaceful uses of nuclear explosions. This became known as Project Plowshare⁸.

(Remember Isaiah 2:4: “*And they will have to beat their swords into plowshares and their spears into pruning shears; nation shall not lift up sword against nation, neither shall they learn war any more.*” Thinking Biblically, the project designers thought that “plowshare” would be an appropriate moniker for the project. I would have preferred “Project Pruning Shear”.

Plowshare intended to demonstrate how nuclear weapons could be used to build canals, cut mountain passes for roads, build dams by collapsing canyon walls into valleys, blast harbors, and the like.

Some of these did not get beyond the idea stage, but the Atomic Energy Commission and some private companies actually tried using a nuclear explosion to extract natural gas near Farmington, New Mexico. The natural gas was trapped under layers of hard rock and it was difficult to drill through the rock. The AEC set off an underground nuclear charge in 1967 hoping to crack the rock and permit the gas to be extracted.

⁷ <http://czbrats.com/Articles/sealevel.htm>

⁸ https://en.wikipedia.org/wiki/Project_Plowshare

The test was not a success since it didn't produce as much gas as was expected. Furthermore, gas customers declined to buy the radioactive gas. (Picky, picky.)

In the 1960s, Project Plowshare looked at several possible sea-level canals⁹. Sites were examined in Mexico, Panama, and elsewhere in Central America. The shortest of these routes would have required over 100 nuclear explosions. The longer routes would have required over 250.

As far as I can tell, Project Plowshare didn't project how much fallout would be generated by these explosions, and how many decades (of centuries) it would take before the canal would be safe to use.

Anyway, I'm sure that it would work.

All of this leaves us with at least three options:

Slash-and-burn in Panama and let the canal run out of water. When the canal runs dry, ships will have to go around South America. This wouldn't be catastrophic, although it may become a bit more expensive to buy a Toyota on the east coast.

OR

Stop the deforesting in Panama and replant the previously deforested areas. This should provide the canal with sufficient fresh water and provide a variety of additional environmental benefits. The costs should be paid by the users of the canal (who are the users of the fresh water). This still might make it more expensive to buy a Toyota on the east coast.

OR

Nuke the canal.



⁹ <https://www.wisegeek.com/what-is-project-plowshare.htm#didyouknowout>