# How Much Do We Need from the PLHINO; How Much Does the PLHINO Need from Us?

by Manuel Romero Lozano, LaRouche Youth Movement

*This article was translated from Spanish.*

If you look up and observe the Moon, imagine how impressive was the effort to get there: aerospace development, new materials, new telecommunications, but most important of all, the determination to achieve the impossible. What might appear to the simple or mediocre mind as an impossibility, to the creative and far-sighted mind is a possibility that must be attempted. If we properly communicate this, we can give the population a sense of power, a real sense of greatness. By the same token, at a moment in which we are facing a world economic crisis whose magnitude is driving us into a new Dark Age, it is necessary for us to think "big," to think in terms of great infrastructure projects that will develop our physical-productive capacities, while at the same time challenging our imagination and our creative powers.

Whether or not Mexico will survive as a nation-state over the coming years, in the midst of ongoing world financial disintegration, is a direct function of whether or not we carry out one of the most important hydro-agricultural infrastructure projects, with the greatest short- and medium-term economic impact for Mexico: The Northwest Hydraulic Plan (PLHINO).

It is a vast plan, not as dramatic perhaps as going to the Moon, but given the productive mobilization its construction implies, it is equivalent to a Mexican TVA, or Tennessee Valley Authority. The TVA was a vast water, energy, and agricultural project in the southeastern United States, through which the government of Franklin Delano Roosevelt succeeded in pulling the United States out of the hell of the Great Depression of the 1930s. By its very size, the PLHINO challenges our technical and engineering capabilities, our imagination, and our vision.

GNU Free Documentation License

*Each dam in the PLHINO project will require concrete, steel, gravel, sand, water, and a lot of both skilled and unskilled labor. Shown: a panoramic, photo of the El Cajón dam, in the state of Nayarit, Mexico.*

The PLHINO is a project designed to transfer water from the middle of Nayarit, to northern Sinaloa and the south of Sonora. It was first conceived at the end of the 1960s, and embodies the "think big" attitude that our nation maintained, until it was infected by the pseudo-ecological doctrine that we should only have self-sustainable projects with "appropriate technology."

During the José López Portillo government, which centered its National Development Plan on the concept of achieving food and energy self-sufficiency, projects of that scope were once again put on the table, but an engineering design was never drawn up for the realization of the PLHINO's transference of vast volumes of water and the connection of the 16 different river basins, which extend from the Santiago River in Nayarit to the Yaqui River in Sonora.

As a result of a mobilization by the productive sectors of the northwestern region, headed by the 21st Century Pro-PLHINO Committee, the outstanding Mexican civil engineer Manuel Frías Alcaraz prepared a physical design for this project. And thanks in great measure to the information provided by his consulting firm, Mexico Tercer Milenio, it has been possible for us to move on to the task of preparing a Bill of Materials, the requirements that such a water project demands. We have in effect been able to take an "X-ray" and observe the skeleton that supports that plan. However, the following analysis and conclusions are the sole responsibility of this author.

The PLHINO is the greatest engineering and infrastructure feat that Mexico has ever conceived—a work whose objectives encompass water supply, electricity generation, irrigation, flood control, tourism, navigation, fish-farming, aquiculture, and the recharging of aquifers. The project would be 900 kilometers (559 miles) long (see map) and includes 173.5 kilometers (107 miles) of tunnels, 460 kilometers (286 miles) of canals, seven challenging dams (very similar to those of the Aguamilpa project on the Santiago River), three pumping systems, and the entire support infrastructure for carrying out the project; that is, cement and steel production, building of roads, bridges, levee confinement, and hydroelectric projects, to mention just a few.

What we present in the following pages is what is known in physical economy as a bill of preliminary

FIGURE 1
**Mexico's Major Rivers**


Source: INEGI (Mexico).

materials for the PLHINO project, a list of the physical products required to carry it out. These are measured in tons, cubic meters, kilowatt-hours, numbers of workers, and other physical-economic units.

You, dear reader, are going to have two conceptual difficulties in approaching this subject matter, difficulties that you will try to disguise as objections or protests. To wit: (1) "It is too large. We would be taking away resources from other areas." And, (2) "But how much will it cost? Where are we going to get so much money?"

The first objection we have already begun to deal with. Regarding the second, for the moment, you must just forget about money altogether. As noted physical economist Lyndon LaRouche has explained, economy is not money. Economy is the capability of a society or a population to physically produce what it needs for the development of that population, measured in per capita and per square kilometer terms (see *So You Wish To Learn All About Economics?* by Lyndon LaRouche, 1984). The PLHINO is feasible not because it costs a lot or a little, but because we can produce the physical-economic elements that the product requires. Mexico is capable of producing nationally between 75-85% of the physical components needed to build the PLHINO. The rest—in particular, certain capital goods—will have to be imported from other countries. These proportions define the monetary part of our proposal, a capital budget with one component in pesos and another in international currency.

We can summarize the physical-economic requirements of the PLHINO in the Bill of Materials shown in **Table 1.**

## First, the Dams

Because the dams are to be located in the upper regions of the Western Sierra Madre, which have steep watersheds, the best choice would be to use concrete or rigid dams,[1] instead of flexible dams, using graded

1. The main characteristic of this kind of dam is that its spillways can be integrated in less time and in a more optimal way.

TABLE 1
**Bill of Materials for the PLHINO**

| Item | Required | Current Production | Required as % of Production |
|---|---|---|---|
| Concrete (million $m^3$) | 30 | | |
| Cement (million tons) | 15 | 39 | 39% |
| Sand (million $m^3$) | 10 | | |
| Gravel (million $m^3$) | 19 | | |
| Water (million $m^3$) | 6 | | |
| Steel (million tons) | 9 | 20 | 46% |
| Electricity (MwH) | 9 | 228 | 4% |
| Pumps (14,000 $m^3$/h) | 110 | | |
| Giant diggers | 10 | | |
| Nuclear plant (1.3 GW) | 1 | | |
| Skilled workers | 70,000 | | |
| Unskilled workers | 280,000 | | |

materials with a concrete wall.[2] Although Mexico has a lot of experience constructing flexible dams, these dams take a long time to build; and it is necessary that this project be built within a decade, to be able to significantly expand our land under cultivation and deal with the food emergency that we already are facing.

Each of these dams will require concrete, steel, gravel, sand, water, and a lot of both skilled and unskilled labor. We estimate the approximate requirements for this kind of project (don't stop thinking big!) to be as follows:

The construction of each dam in the PLHINO and its spillway will require an average of 2 million cubic meters of concrete. Each dam needs an average of 25,000 workers—4,250 skilled workers, that is engineers, topographers, geologists, etc., and 20,750 day laborers and workers with some construction experience.

Imagine working on a project of this size, providing productive employment to hundreds of thousands of Mexicans who are being deported due to the collapse of the U.S. economy, while at the same time giving thousands of youth graduating from the universities who otherwise end up in unproductive jobs or, worse, joining bands of organized crime at the service of narcoterrorist assassins, the opportunity to develop their professional vocations.

It is always better to build the future rather than to feed fantasies that will collapse with the system that feeds them.

Construction of the PLHINO's seven dams and their spillways is going to require approximately 14 million cubic meters of concrete and 175,000 workers. Remember: This only takes into account the dams!

## Then, the Tunnels

To optimize the use of water, and to transfer it efficiently, engineer Frías designed a series of tunnels for crossing watersheds between basins, to thereby assure, by the location of the dams, that a good portion of the water transfer occurs through gravity, thus saving the construction of nearly 300 kilometers of canal.

The best examples of Mexican engineering experience in tunnel construction are the Collective Transit System Metro (STC-Metro) of Mexico City, and the deep drainage system of that city, which involves 165 kilometers (102 miles) of tunnels whose capacities in the area of greatest rainfall diversion are similar to the tunnels required by the PLHINO. The engineering corps that built the STC-Metro and Mexico City's deep drainage system is among the best in the world. Today, we are on the verge of losing that engineering capability, unless we undertake great infrastructure projects that will continue to strengthen our skilled labor force.

The Mexican Association of Tunnel and Underground Works Engineering (AMITOS) has the knowledge and ability to take up this challenge of drilling and lining the 173.5 kilometers (107 miles) of tunnels the PLHINO needs, barely eight kilometers (five miles) more than the deep drainage system already underlying Mexico City.

The PLHINO's tunnels have to be eight meters in diameter. Their safe operation requires the prevention of rockslides throughout the length of the tunnels. Thus, as geological conditions require, some of the tunnel lengths will have to be lined with one-meter thick concrete layers.

Drilling 173.5 kilometers of tunnels through the steep Western Sierra Madre will require ten tunneling machines. Approximately 8 million cubic meters of material will be extracted during the tunnel drilling, while the amount of concrete needed to line the tunnels is an estimated 2 million cubic meters.

## Next, the Canals

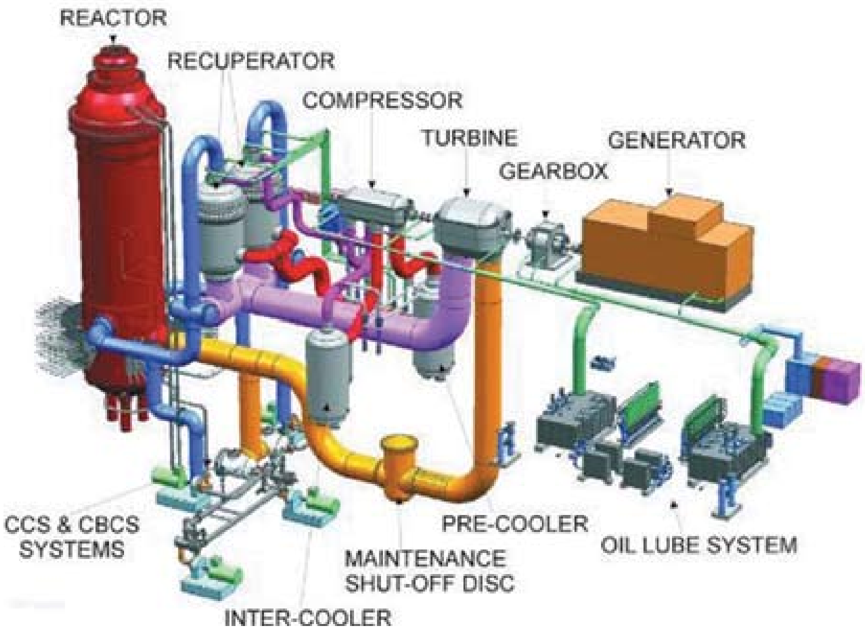
From the Santiago River to the Culiacán River, the transfer of water will be accomplished by linking the

2. They are called flexible, because their construction requires crushed rock, gravel, and sediment. The disadvantage is that this kind of dam requires ten times more material, although it significantly reduces the amount of concrete.

river basins through tunnels. But starting with the Sanalona Dam on the Culiacán, the concept of the project changes. From there, the water will be conveyed by a 460-kilometer (286-mile) canal to the Yaqui River in southern Sonora. The span of this river-canal project, which will transport nearly 300 cubic meters of water per second, will require the construction of levees and bridges to protect it from the torrential floods that would either threaten its structures or clog it up.

The canal needs to be of a trapezoidal shape, and lined in concrete to prevent leakages and losses through filtration, while at the same time serving as a versatile and economic waterway. Construction of the support structures for the 460 kilometers of canal require approximately 14 million cubic meters of concrete, a quantity similar to that which will be required for building the dams and their spillways. Added to the 2 million cubic meters of concrete required for lining the tunnels, we expect total demand for the PLHINO to be on the order of 30 million cubic meters of concrete.

FIGURE 2
**The Pebble-Bed Modular Reactor**




PBMR

*The pebble bed nuclear reactor (shown: a diagram of the modular nuclear energy systems 350 MW PBMR) is among the most advanced types of reactors. Nuclear energy will be required for the PLHINO, and will substanitally cheapen energy costs.*

Producing these 30 million cubic meters of concrete will, in turn, require 6 million cubic meters of water, 10 million cubic meters of sand, 18 million cubic meters of gravel, 15 million tons of cement, and 9 million tons of steel.

Where are we going to get these materials? Does Mexico have the installed capacity to produce them?

## We Still Have the Capacity

Despite having been severely pounded by the destructive programs of the "invisible hand" of the free market, Mexico's national industrial sector still has the capacity to meet a challenge like this. In the course of 2007, the country's cement producers, with their 32 plants distributed across the nation, managed to produce 39 million tons of cement. Three of those plants which supply cement and concrete, are located in the PLHINO area, in the states of Baja California Norte, Sonora, and Jalisco.

The 15 million tons of cement needed for the PLHINO represents 38% of the country's annual national production. If we consider that the estimated time for building the project is ten years, we would be consuming an average of 1.5 million tons a year, which barely represents 3.8% of national annual production. On average, for every million tons of cement produced, 567 direct jobs and 3,092 indirect jobs would be generated.

The other key element in the construction of the PLHINO is reinforced steel. The country's steel industry produced 19.5 million tons of liquid steel in 2007. The 9 million tons needed for the PLHINO represents 46% of annual national steel production in 2007. Since the PLHINO will be built over a decade, the 900,000 tons of steel that will be required each year, on average, represents barely 4.6% of national annual production.

Incorporating the abundant Santiago River into the PLHINO project, to transfer its contribution of 220 cubic meters per second into the San Pedro river basin, involves construction of a 17-kilometer (10-mile) tunnel that would connect with the reservoir created by construction of the Ixcatán Dam. From there it would be necessary to install a powerful pumping system to move the water to the Rodrigo Dam's reservoir, which also needs to be built on the same San Pedro River. This

Mexico City government

*The engineering corps that built Mexico City's Metro and its deep drainage system is among the best in the world. Today, that engineering capability will be lost, unless great infrastructure projects are undertaken. Shown: Mexico City's water tunnel.*

would represent management of a total flow of some 420 cubic meters of water per second, that would make it possible for us to expand land under cultivation by 1.3 million new hectares (3.2 million acres) in the states of Nayarit, Sinaloa, and Sonora.

Along the PLHINO route, in its first phase, which starts with the San Pedro River, only two pumping stations would be needed, each with a capacity of handling 35 meters per second, installed at the juncture of the Sinaloa and Fuerte Rivers.

The nuclear energy plant on the Pacific that will be required for the PLHINO pumping system will substantially cheapen energy costs.

Finally, keep in mind that at an annualized rate of investment which expends $14 billion over ten years, we would be in a position to generate at least 300,000 direct and indirect jobs a year. That doesn't include the number of jobs that will be added once the project begins to expand land suitable for cultivation.

According to international estimates by companies involved in the construction of basic economic infrastructure, for every billion dollars that a nation invests as capital, the country has the potential to recover five times that amount in taxes, as a result of broadening its tax base. Together with all the other economic benefits already mentioned, the most important benefit is that we would be generating optimism within the population, which would find pride and hope in seeing that its nation has given itself to the task of building one of the largest water transfer projects in the world.