2 SOWING DESERTS: THE SOCIAL AND ECOLOGICAL DEBT GENERATED BY THE FOREIGN DEBT ACQUIRED FOR THE JAIME ROLDÓS AGUILERA MULTIPURPOSE PROJECT

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"20 years of abandonment of the basin that supplies water to the Daule Peripa Dam have transformed it into an arid region, with high chemical contamination and with inhabitants that register the worst living conditions in the country. If the construction of this type of dams continues, it will mean the desertification of the sub-basins that supply water to the Guayas River".
- Jimmy Perez, Fernan Sanchez Castaño Defense Project[1]

I. INTRODUCTION

At a time when cheap credits abounded, the Inter-American Development Bank (IDB) offered Ecuador in 1980 a US$70 million credit facility with an interest rate of one percent and 40 years to pay back for the conduct of definitive studies on the building of one of the greatest infrastructures in the country: the Daule Peripa Dam. The entire project was named the Jaime Roldós Aguilera Multipurpose Project.

Construction work began in 1982. One year later a hydraulic plan was designed, bestowing this project with a multipurpose logic. The damming of the Daule

River was based on the following purported gains:

- Ample water will irrigate the semi-arid but highly fertile lands in the lower valley of the Daule River and the Santa Elena Peninsula;
- The supply of safe and clean drinking water for Guayaquil and other cities located by the riverbanks will be ensured;
- Flooding will be minimized, if not totally controlled; and
- Cheaper electricity will be generated.

Thus, during the next 20 years, through a continuous flow of foreign credit in much less favorable conditions than the original credit facility[2], the Jaime Roldós Aguilera Mutipurpose Project was completed.

The execution of these types of mega-projects has carried with them a great amount of social and ecological impacts, requiring a global evaluation of all the executed projects to determine if they have really contributed to the development of Ecuador. On the contrary, the foreign debt resulting from these mega-projects may have generated a social and ecological debt: the debtors being the financiers and executors of these facilities; and the creditors, the people of Ecuador.

It is in our interest to determine the positive and negative impacts of these mega-projects. Who are the beneficiaries? Are they national or international? Who are harmed by the execution of the same? Responding to these questions will permit us to make a general balance of what these credits have signified. Such an exercise could provide the necessary arguments to view the national debt from a broader perspective. A correct balance would compare the direct and indirect benefits with the sum of generated social and environmental liabilities. These still need to be valuated. We believe that an unbiased evaluation will permit us to demand from the liable national and international organizations, environmental restoration and indemnity for aggrieved parties. Furthermore, we could demand for the cancellation of the external debt linked to these mega-projects based on their illegitimacy.

Finally, additional mega-projects are awaiting financing in Ecuador. These will increase the country's external debt as well as the ecological debt owed to the Ecuadorian people since they have been conceived under the same politics and spirit as those that have already been executed.

Objective

The study aims to demonstrate the social and ecological debt generated through foreign loans, as well as to identify the beneficiaries and wronged parties resulting from the construction of the Jaime Roldós Aguilera Multipurpose Project in two of its foremost components: the Daule Peripa Dam and the water transfer system to the Santa Elena Peninsula.

Structure of the document

The present study contains four parts. Part I sketches the antecedents of the investigation, including a presentation of the Ecuadorian foreign debt, the concept of ecological debt, hydroelectric projects worldwide and their social and ecological impacts. Part II describes the mega-project under study, including history, description of the built facilities, its rationale, beneficiaries and wronged parties, and a critical analysis of the feasibility studies. Part III identifies and quantifies the ecological and social debt caused by these projects. Finally Part IV presents some conclusions, including a warning against the future execution of projects of this type, and the demands this study makes to the Ecuadorian State, financiers and constructors of this project.

The Ecuadorian external debt and the construction of development facilities

In examining Ecuador's external debt, the following principles must be taken into consideration:

- Latin America's foreign debt is illegitimate, whichever way you look at it. It has already been paid, and it is presently a means of extortion and pressure on Latin American economies and natural resources.
- The process of suctioning our economies dates from over 500 years ago. Then, as now, Northern countries have acquired a social, economic and environmental debt towards Southern countries that is much larger than the latter's external financial debt to the former. This debt has become an unsustainable burden that denies the people of Latin America control over their destinies.
- Thus, whilst Southern countries have paid more than they have received, there being a net flow of capitals out of these countries, the external financial debt has grown. Ecuador paid uninterruptedly, to creditors of its foreign debt, the amount of US$90.830 billion from 1982 to 2003. In the same period, it received the amount of US$80.597 billion. This signifies a net negative transfer of US$10.233 billion. In spite of this, Ecuador's foreign debt jumped from US$6.633 billion in

1982 to US$16.585 billion in February 2004 (Perkins, 2004).

- In the last 23 years, the percentage of the State's budget destined to servicing the foreign debt jumped from 16 percent in 1980 to 40 percent in 2003 (Perkins, 2004).

The factors associated with the increase in the foreign debt have been: credits of free dispensability (i.e. without strings attached) towards financing the general budget of the state, conditioned only by the country's implementation of structural adjustment policies; modernization loans destined for the adjustment of the institutional framework and towards the preparation of certain economic sectors in order to compete in the new framework of neo-liberal globalization; and loans destined for hydraulic, electric, road building and other mega-projects.

Free dispensability and modernization loans have been severely criticized as sources of social and ecological debt. On the other hand, infrastructure loans have been perceived by public opinion leaders and the press as largely positive. The indebtedness resulting from the construction of the Daule Peripa Dam is one of the latter cases. Yet this study will prove that the Daule Peripa Dam had substantial social, economic and cultural impacts. These may have been deliberately hidden to avoid sanctions.

The study will further demonstrate that, presently, one of the means to maintain a country that is subjugated and nature-alienated is through a triad that consists of the offering of foreign loans, supposedly for development[3]; national elites with strong power structures that benefit directly from these loans and apply pressure for the fulfillment of these projects; and, international and national enterprises that are interested in profitable building and management contracts.

Social and ecological debt

The social and ecological debt is the accumulated historical and present debt that Northern countries – their institutions and corporations – owe Southern countries and their people for the looting of the latter's natural resources, exploitation and impoverishment of their people, and the systematic destruction, devastation and contamination of their national patrimony and sources of revenue.

Northern countries are also responsible for the gradual destruction of planet Earth, the pollution of the atmosphere, the erosion of the ozone layer and

the generation of the greenhouse effect caused by the imposition of their development models and production and consumption standards.

The ecological debt began in colonial times. During this era, Ecuador's resources were looted aggressively by its European colonizers. Natives and negroes were exploited inhumanely. This permitted European countries to accumulate riches and to develop.

The ecological debt further expanded during republican times because of the development model, based on the export of primary products (e.g. cacao, bananas, oil, flowers and shrimp), which was impressed on Ecuador. The social, environmental, economic and cultural impacts, resulting from the misuse of natural resources and monocultural farming for export, exacted a heavy toll on Ecuador's forests, mangroves and moors. Underground water was contaminated. People lost their means of sustenance and their living conditions became sub-standard. It should be noted that Europe and the United States (USA) are fed with subsidized products, the prices of which do not account for all these damages. The exploitation of natural resources is a destructive practice that Northern countries have failed to consider or valuate, much less restore, and which have therefore increased the ecological debt that Northern countries owe to Southern countries.

Due to the immense offering of cheap credit[4], indebtedness began multiplying itself from the eighties onwards. When the debt crisis erupted in 1982 due to the increase in interest rates, credit organizations, through Letters of Intent with the International Monetary Fund (IMF) and the Country Assistance Strategy of the World Bank, designed new conditions to ensure the continuity of the looting[5]:

- The need to obediently pay capital plus interest forces Southern countries to seek new loans, creating thus a cycle of dependency.
- In order to pay the foreign debt, the exploitation of natural resources and monoculture farming for export is being further intensified, thereby increasing the social and ecological debt.
- Credit organizations place policy conditions that favor the interests of international capital. Pressure is being applied towards commercial openness as well as the privatization of services and resources, to the detriment of national sovereignty and the living standards of people.
- In order to maintain this model, financing and construction of mega-projects of different kinds, e.g. hydroelectric plants which are an important source of ecological and social destruction, are being promoted.

Hydroelectric projects: main sources of social and ecological debt

The following are important facts about fresh water in the world and intents to gain its control:

- Two thirds of the world is covered with water.
- Only 2.5 percent of the planet's water is fresh.
- Only 33 percent of the planet's water flows.
- Only 1.7 percent of the planet's water flows through waterways.
- Half of the world's rivers have been dammed.
- Presently, in the Northern hemisphere, there are no more spaces for these types of projects.
- Financiers and constructors have their eyes on the South.
- In Ecuador, a new law has recently been approved that exonerates the generation of hydraulic electricity from income taxes in order to attract foreign investments. This could mean a multiplication of these types of projects[6].

Global resistance against the damming of rivers has been achieved through much mobilization. This led to the preparation of a revealing report by the World Commission on Dams or WCD (1998) that casts doubts on the benefits that the defenders of these mega-projects claim. Let us take a look at the main outcomes of the report:

- The classical promises, i.e. drinking water, irrigation, flood control and "clean" electricity, are proven myths from the evidence gathered regarding the ecological and social impacts generated. One of the conclusions of this study points out that the cost-benefit analyses of these mega projects are slanted, both in terms of an overvaluation of the benefits as well as a hiding of costs, particularly of social and environmental costs.
- These hidden and undervalued costs are the source of the social and ecological debt to our countries.
- These projects have been questionable even in terms of the efficiency of the logic of intervention and in terms of what transformation was effectively achieved regarding irrigation and drinking water.

Since 1950, the World Bank and other organizations began to finance mega-projects. These types of investments have been defined as "development strategies for the South" by international financing organizations, which are interested in the execution of projects with high rates of return. Thus the World Bank began financing great dams in the fifties at a rate of more than

US$1 billion per year. Between 1970 and 1985 these loans had reached the US$2 billion mark. If we further add to this figure loans from Asian and African Banks, plus the loans granted by the Inter-American Development Bank and bilateral funds, the total grants for the building of great dams amounted to more than US$4 billion per year (WCD, 1998).

II. DESCRIPTION OF THE JAIME ROLDÓS AGUILERA MULTIPURPOSE PROJECT

This section of the study will make a detailed historical review of the design and construction of Jaime Róldos Aguilera Multipurpose Project. We will seek to determine the scope of the project, i.e. what, where, who and with which resources this project was implemented. Furthermore, we will critically analyze the project's feasibility studies.

History, antecedents and geographic location

The Jaime Roldós Aguilera Multipurpose Project was conceived in 1957. The Inter-American Agricultural Cooperative Service (OAS) and later the International Development Agency (IDA), together with agricultural exporters from Guayaquil, were the main drivers of this project.

The Commission for the Studies for the Development of the Guayas River Basin (CEDEGE) was created in 1965 in order to conduct several studies regarding possibilities for the development of hydraulic system in the Guayas River Basin. Since then, a series of consultants were contracted and paid through several non-reimbursable credits to determine the feasibility of the project, supervised by the American State Organization and the IDA. Environmental impact studies were also undertaken. In 1980, with offerings of cheap loans, the main components of the project, namely the Daule Peripa Dam, the hydroelectric plant and the irrigation system of the Daule River, were set up for public bidding.

Box 1. CEDEGE

The Commission for the Studies for the Development of the Guayas River Basin or CEDEGE was created in 1965 in order to conduct studies on a hydraulic system for the Guayas River Basin. In time, CEDEGE obtained legal attributions ranging from sand control in rivers to granting water concessions in the Daule River Basin. Presently it has become a supra-organization for territorial zoning. Within the framework of government reforms towards decentralization and privatization, CEDEGE awarded the concession for the operation of the Marcel Laniado Hydroelectric Plant to the Spanish firm, Union Fenosa, and created enterprises that work under private logic, some of which have already obtained concessions for electricity (i.e. Hidronación) and drinking water and sanitation (i.e. Aguapen and Hidroplayas). It also created user assemblies for the administration, operation and maintenance of the irrigation systems.

The Jaime Roldós Aguilera Multipurpose Project is located in the Guayas River Basin, in the mid-Western part of Ecuador. Its sphere of influence is the Santa Elena Peninsula.

The Guayas River Basin, with 34,500 km^2, is the largest in the South Pacific. It represents about 15 percent of Ecuadorian territory, where about 5.25 million inhabitants (40 percent of Ecuador's population) live at present. The Daule River Basin is the largest single sub-basin, with approximately 12 percent of the total surface of the Guayas River Basin. The Santa Elena Peninsula, with 6,050 km^2, is located in the Western part of the river basin. It is a now a dry region, where, historically, peasants and native communities have lived.

Description of the project rationale, components, execution and financing history

The Jaime Roldós Aguilera Multipurpose Project was designed for the control and regulation of the waters of the Daule River, one of the main tributaries of the Guayas River. Ten kilometers downriver, where the Peripa and the Daule Rivers meet, the greatest hydraulic infrastructure in the country was built from 1982-1987: a 90-meter high dam with a capacity of six million cm^3 of water, generating a flooded area of 30,000 hectares. This mega-dam is the basis for a series of lesser dams and sluices that permit the redirection of the river's water for drinking water for Guayaquil, other towns in the Santa Elena Peninsula and the Manabi Province; irrigation of specific zones near the Daule River and the Santa Elena Peninsula; electricity generation; and flood and salinity

control. Presently, an extension of the project is being considered. CEDEGE intends to build a new dam, named Baba-Vinces, which will feed the Daule Peripa Dam.

The Jaime Roldós Aguilera Multipurpose Project belongs in the framework of an aggressive transformation process that has profound effects on peasants and on the landscape of the Guayas Province and part of the provinces of Manabí, Pichincha and Los Ríos.

Map 1. Guayas River Basin and Santa Elena Peninsula

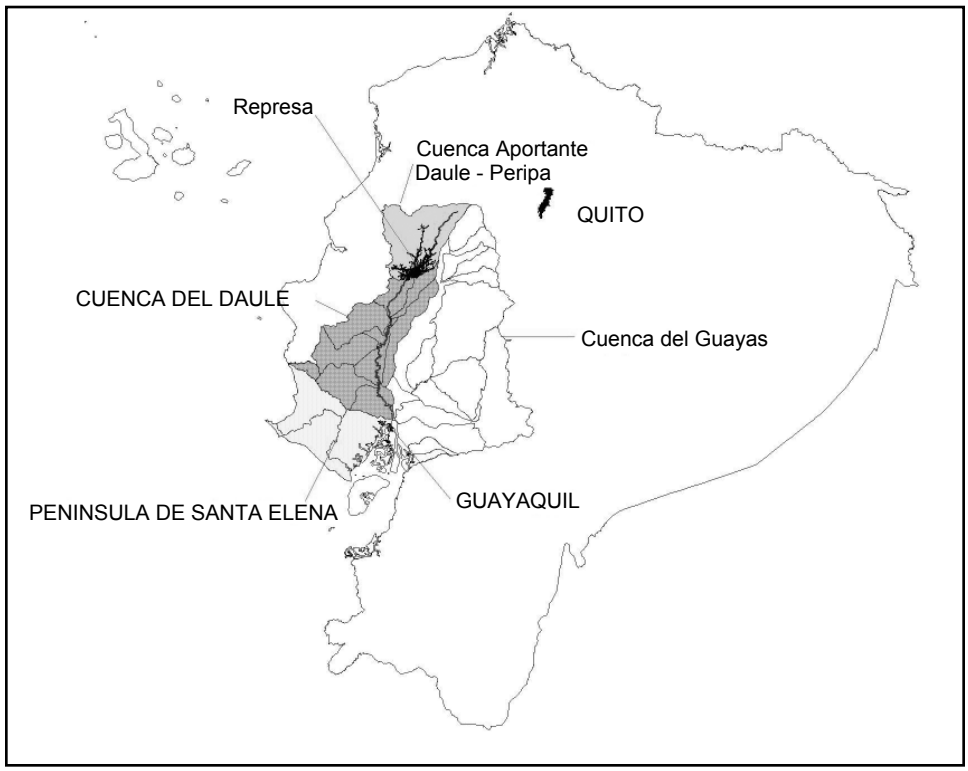


Figure 1. Jaime Roldós Aguilera Multipurpose Project Scheme

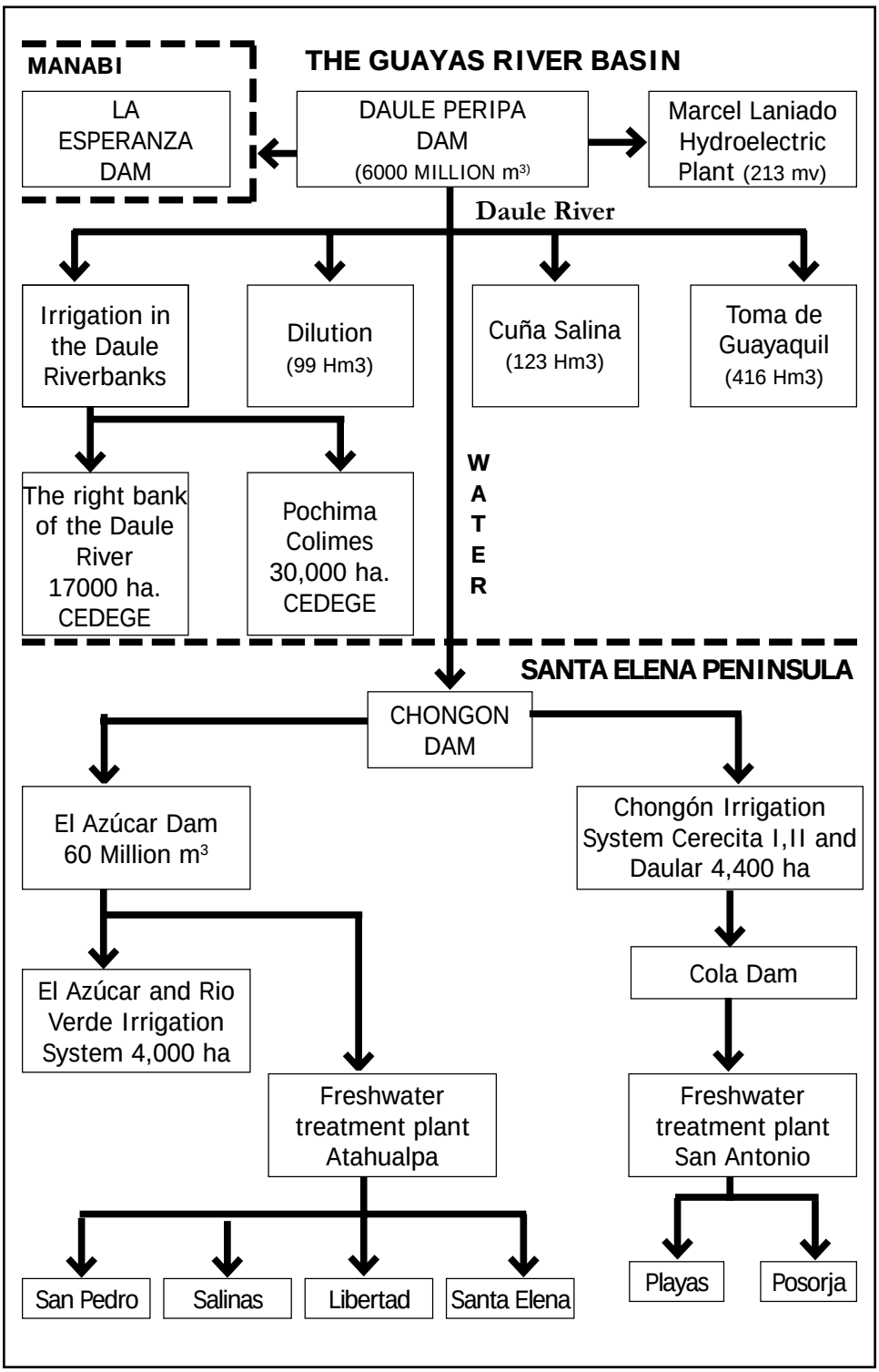
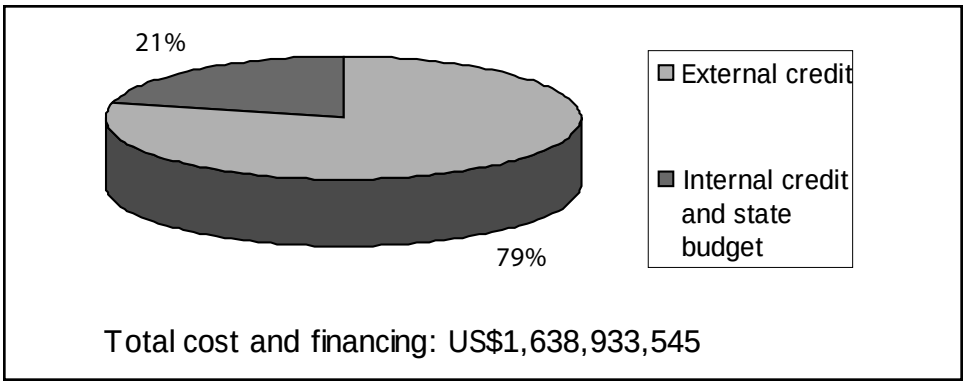


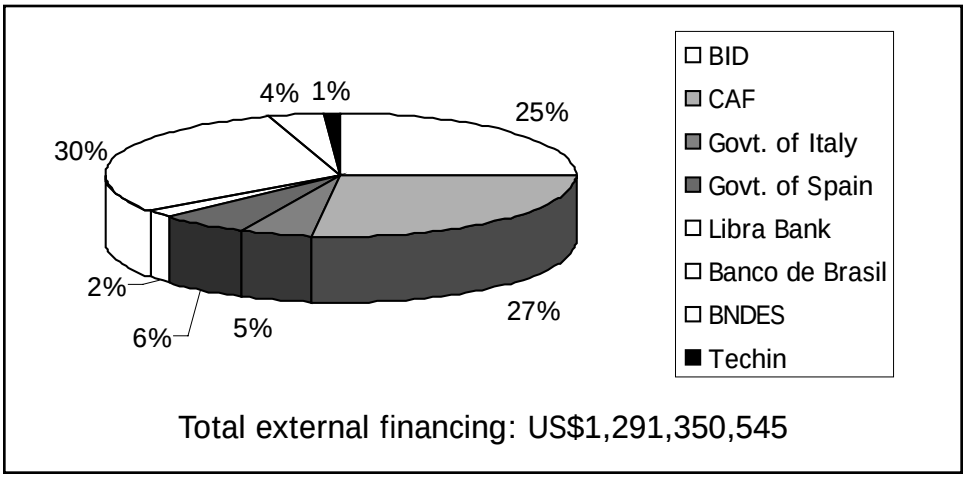
Figure 2. Total cost and financing



Source: University of Guayaquil (2001) and PIGSA (2002).

About 80 percent of investments in the project came from foreign creditors, which increased Ecuador's foreign debt.

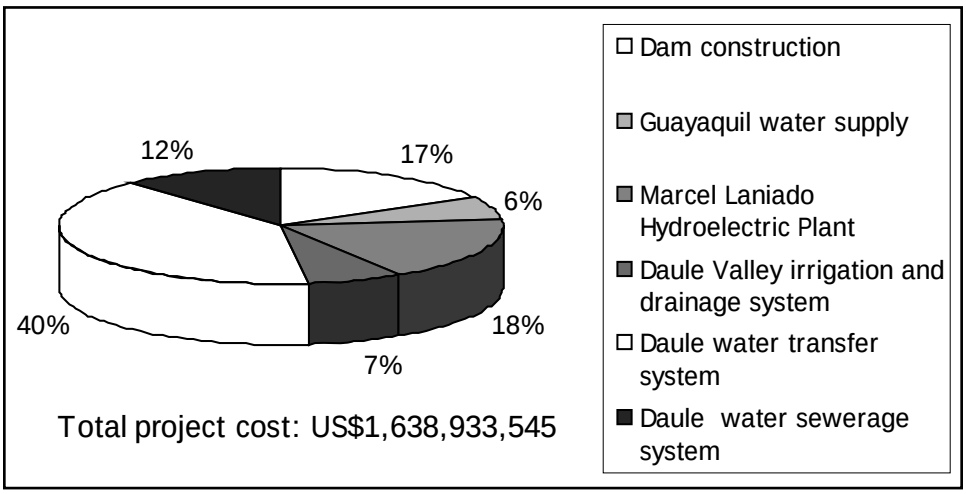
Figure 3. Main financiers of the project



Source: University of Guayaquil (2002) and PIGSA (2002).

Over 90 percent of the foreign financing comes from three sources: the Inter-American Development Bank (IDB), Banco de Brasil and the National Development Bank of Brazil (BNDES) of the Brazilian Government, and the Andean Development Corporation (CAF). The IDB started the sequence of foreign loans with an initial loan of US$70 million, an interest rate of one percent and a payback period of 40 years. Later, interest rates jumped to an average of two points above the international rate (varying between 7% and 9%) and the payback period became much shorter (12 years on average).

Figure 4. Project components



Source: University of Guayaquil (2001) and PIGSA (2002).

The most expensive component of the project was the construction of the water transfer system, which was seriously contested because of its costs. Investment in the water transfer system totaled US$644 million[6]. Out of this amount what was financed? What was not financed? The bulk, i.e. 99.7 percent, of the financing was used for project studies and design, construction of utilities and financial costs. Only 0.3 percent of the amount was used for an environmental and social management plan and for remediation of social and environmental damages.

Although all the components of the Jaime Roldós Aguilera Multipurpose Project depended on the Daule Peripa Dam, only when the hydroelectric plant was constructed did the CAF set aside around US$5 million for the management of the high river basin.

General balance of positive and negative impacts

Positive impacts

Four positive results of the project can be named: drinking water, irrigation, flood control and electricity for the interconnected network.

In spite of growing demand, Guayaquil should have sufficient drinking water for some centuries more. The provision of water for Guayaquil could have been obtained from other available, appropropriate, decentralised sources that do not generate social and ecological damages. However, Interagua, an affiliate of the North American company, Bechtel, has the administration of

this service, and presently, almost 10 percent of the inhabitants of the region do not have drinking water and, worse, the drinking water supplied has been criticized for its low quality[14]. Furthermore, as stated by the Chief Executive Officer of CEDEGE during a personal interview, the company does not pay one cent for the water it uses, in spite of the high prices it extracts from its users. Drinking water has reached the zones linked to tourism in the Sun Route (Ruta del Sol) in the Santa Elena Peninsula.

Situations have been reported wherein faulty management of the flood control system has generated floods similar to that which nature provokes during the rainy season. In spite of problems with the water control management system, the construction of the dam has helped to control flooding generated by the El Niño phenomenon including overflows in the lower Guayas River Basin during the rainy season.

The Marcel Laniado Hydroelectric Plant has contributed 213 megawatts to the country's power network. It has also benefited private and municipal entities that use electricity from this plant. However, at present they have serious administrative problems due to the lack of payment for the energy used.

Irrigation systems exist for both Daule and the Santa Elena Peninsula. Of the 50,000 irrigated hectares set as a goal, only 13,269 hectares have been utilized; and of these, only 9,200 hectares were in use in the year 2000. The same is true for the Santa Elena Peninsula: the goal was 44,000 irrigated hectares but only 6,000 hectares are actually in use. The biggest part of the irrigation project is concentrated in a few hands.

Negative impacts

The Jaime Roldós Aguilera Multipurpose Project generated direct and indirect costs, which financiers, constructors and managers of the mega-project must respond to. These will be discussed in more detail in part III of this investigation.

Analysis of project feasibility and critique of cost-benefit studies

Before the construction of the project, the IDB established that recovery of investment was not feasible: the project had a net negative value of US$50 million. In other words, Ecuador would acquire a debt in order to lose US$50 million. Even though the project was not found to be economically viable, it was approved by the IDB. According to an ex-post document, the IDB

approved the project because it was considered of national priority. The Jaime Roldós Aguilera Project was meant to be the "…the starting point of the development of the Guayas River Basin and the Santa Elena Peninsula (University of Guayaquil, 2001: 44).

Thirteen years after the end of the building stage of the main dam and after most of the components of the mega-project had been financed and started,

Table 1. Net benefits of the Jaime Roldós Aguilera Project according to University of Guayaquil study

Component	Benefit	Valuation
Irrigation for both sides of the Daule River in terms of net profits of the productive investment (note: positive benefit, i.e. this investment is not expected to be recovered)	Annual net profit for peasants: a) 13,000 hectares with irrigation with annual net benefit of US$310/hectare; b) 20,000 hectares of rice land with annual net benefit of US$62/hectare; and c) 10,000 hectares of various products with a net benefit of US$7,043,045	$27,503,045.00
Flood control (note: positive benefit)	Savings from estimated agricultural losses due to the El Niño in 1997 calculated on a basis of 50,000 hectares	$6,667,000.00
Electricity	Electricity sales	$24,002,020.00
Water transfer to Manabi, the Peninsula and Guayaquil in terms of payment per cubic meter of water including minimum volumes necessary for the maintenance of salinity in the rivers (note: positive investment)	Manabí: 500 m^3/yr. Peninsula: 760 m^3/yr. Guayaquil: 275 m^3/yr. Maintenance of salinity levels: 450 m^3 at US$0.005/$m^3$	$9,925,000.00
Yearly total		$68,097,065.00
Updated total benefits for a period of 50 yrs. at an interest rate of 12%		$565,511,807.27
Total cost		$695,285,000.00
Net updated benefits		($129,773,192.7)

Source: University of Guayaquil (2001).

the Guayaquil University conducted a study of the project in 2001 based on actual costs. It assessed that the negative net value of the project had increased to US$130 million.

Notwithstanding its own findings, the University of Guayaquil (2001) argues that the project continues to be a national priority, that the investment involved was totally justifiable, and that the problem may reside in a biased valuation of benefits. It mentions that the following benefits have not been taken into consideration: the optimization resulting from the joint use of the Paute and Daule Peripa Hydroelectric Plants that will permit the efficient use of electricity generation nationally.

However, according to our own accounting, eliminating the benefits of the water transfer system to Manabi (since this component has not been part of our investigation), but including potential net profits in agriculture due to the irrigation system in the peninsula and considering all the potential irrigated areas, the project has a present negative net value of around US$930 million. We have demonstrated that the project was not economically viable from the beginning. The notion that the initial investment would be recovered through new projects with positive net benefits has not been fulfilled. On the contrary, with each additional investment component, the project's net loss has increased. According to our investigation, the total loss amounts to almost US$1 billion.

Table 2. Updated net benefits of the project according to present investigation

Component	Benefit	Valuation
Agricultural irrigation in the Peninsula	Annual net profit for peasants: 20,000 irrigated hectares with an annual net benefit of US$1000/hectare	$20,000,000.00
Yearly total		$88,097,065.00
Updated total benefits for a period of 50 yrs. at an interest rate of 12% (excluding benefits from the water transfer system to Manabi)		$710,840,696.90
Total costs (estimated)		$1,638,933,545.00
Updated net benefits (based on present investigation)		($928,092,848.10)

Source of basic information: University of Guayaquil (2001).

Did we run into debt just to lose money? Who made money from this deal?

It is important to point out that while the IDB's and University of Guayaquil's studies have taken into consideration the direct benefits associated with capital recovery as well as the indirect benefits associated with, for example, agriculture, these have not accounted for the social and environmental costs, neither direct nor indirect, of the project. In the second part of this investigation we shall approach this subject.

Table 3. Main beneficiaries of the project: constructors, managers and concessionaires

Component		Construction of the Daule Peripa Dam	Drinking water for Guayaquil	Marcel Laniado Hydro-electric Plant	Irrigation and drainage of the Daule Peripa Valley	Water transfer to the Peninsula (stages I and II)	Water and sewage for the Peninsula
Constructors		Agroman (Spain)		Agroman (Spain)	Agroman (Spain	Odebrecht (Brazil)	Odebrecht (Brazil)
Operators		Union Fenosa (Spain)	Bechtel (USA) through Interagua	Union Fenosa (Spain)	CEDEGE and users assemblies	CEDEGE	Aguapen Hidroguayas
Financing	Multilateral	82%	0%	63%	74%	14%	33%
	Governments	0%	84%	20%	0%	53%	67%
			Spain	Italy		Brazil UK (minimal percentage)	Brazil
	National contribution	18%	0%	17%	26%	33%	0%

Source: University of Guayaquil (2001).

Main beneficiaries of the project

Who are the main beneficiaries of the Jaime Roldós Aguilera Multipurpose Project? These include the credit institutions and financiers of the project as well as the enterprises linked to the construction and management of the same.

The relationship between the origin of the loans and the construction companies is undeniable. The clearest case has to do with the most expensive component of the project: the construction of the water transfer system to the Peninsula was undertaken by the Brazilian company Norberto Odebrecht using Brazilian funds. Furthermore, most of the feasibility studies financed by external loans, both reimbursable and non-reimbursable, were executed by enterprises, the origin of which coincides with the origin of the financing sources[9].

The Spanish Unión Fenosa and Bechtel (Interagua) from the USA are the concessionaires of the hydroelectric plant and drinking water for Guayaquil, respectively. Bechtel (Interagua) does not pay anything for the water it supplies to the city of Guayaquil. It charges users increasing prices for very bad quality water supply. Because of this, the Citizen's Observatory of Guayaquil's Public Services has begun a campaign for the eventual assumption, possession and control of this service by the municipality.

According to Zapatta (2005: 11):

> "In the Guayas Province, using public funds, costly irrigation projects have been installed, but they serve only a few. Examples: The El Mate system irrigates 2,400 hectares but benefit only 50 landowners. The San Jacinto irrigates 1,960 hectares and benefits 88 users. The Higueron irrigates 3,490 hectares and benefits 163 users. The second stage of the water transfer system to the Peninsula is under construction presently. It will irrigate 22,000 hectares and will serve 900 users".

The water transfer system of the peninsula generated land speculation over the communal land in the zone that is directly influenced by the irrigation project. This situation benefited groups with economic power in Guayaquil, Quito and other cities in the country. One of the new landowners of the irrigated zone is Rodrigo Laniado. He has the third largest property in the zone, and is related to Marcel Laniado, Chief Executive Officer of CEDEGE for many years, who

used his political influence to push this project.

Summary of Part II

Dams are:

- An effective instrument for financiers and foreign construction companies to make huge profits;
- A means to subsidize power groups linked to agricultural exports; and
- A way to privatize water resources.

Main supporters of the project saw only one solution in the management of water: the damming of great rivers so that water could be controlled through water transfer systems, flood regulation and infrastructure works.

Vandana Shiva (2003) states that the wars for water began already 50 years ago and have been of two types: outright war for the territories[10] and – less visible and intense, but more effective in terms of obtaining control – the privatization of water resources. Large-scale hydraulic projects are the best means of transforming water into merchandise.

The actual case under study is a paradigm of how this logic of domination and looting takes place through mega-projects.

Financial and technical dependency generates high profits for financiers, constructors and concessionaires. The granting of loans for studies and construction of the facilities are conditioned by the use of capital, technology and goods from the lending countries. Thus we can see circles of created interests. The Brazilian Government finances part of project so that the Brazilian company Odebrecht can build the project. The Spanish Government finances the feasibility studies and the Spanish firm, Unión Fenosa, gets to manage the most important electricity project. The IDB also offers financing so that Bechtel Interagua of the USA can operate the principal water business. In short: the creditors lend the money and capture all the profits while the Ecuadorian people assume the debt minus all the benefits.

We also found out that the main beneficiaries of the irrigation system are families that are linked to agricultural exporters and who have used their influence to apply pressure towards the building of the project.

How does this paradoxical situation occur? It is a result of a series of factors,

all of which are related to the systematic and coherent form of domination linked to the policies of the international organizations that seek to create indebtedness in Southern countries. The process begins with the granting of cheap loans and the imposition of structural adjustment policies that promote foreign investment. Once the country accepts the first cheap loan, a series of "necessary investments" begins. In the case of the Daule Peripa Dam, the multipurpose characteristic of the project creates the necessity of acquiring additional loans at higher interest rates and shorter payback periods in order to complete all of its purported goals. The result is a project with estimated losses of about 60 percent of the investment.

Moreover, through adjustment policies promoted for the obedient payment of the debt, a normative framework is established for the concession of services. Thus the circle of dependency and looting is closed. When the whole system starts operating, the business of generating electricity and water for both drinking and irrigation purposes are given in concession.

According to the above analysis, we conclude preliminarily, without considering social and environmental costs, that at least 60 percent of the debt generated by this project is illegitimate. The fact that loans with projected losses of such magnitude were granted makes all of the financiers responsible or at least co-responsible for these loans.

III. QUANTIFICATION OF THE SOCIAL AND ENVIRONMENTAL IMPACTS

In this section, we seek to identify the ecological and social debt that is represented by all the impacts that this project has created and which have not been considered in the cost-benefit analyses by the financiers of the facilities or by the Ecuadorian State. As mentioned previously, these impacts have neither been confronted nor mitigated. Where compensations have been granted, these have been marginal.

In order to achieve this goal, we will investigate the situation before and after the construction of the hydraulic infrastructure both in the zone where the Daule Peripa Dam was constructed as well as in the Santa Elena Peninsula. With this information, we will make a preliminary valuation based on a detailed description of the ill-treated zone. This will be done in those cases where it is possible to make a quantitative valuation based on on-site research and similar existing studies.

The case of the Daule Peripa Dam

Geographic, administrative and political situation

The basin from which the water is led to the Daule Peripa Dam occupies the most Northern part of the Daule River Basin, which forms part of the Guayas River Basin. The site of the dam has an approximate area of 420,000 hectares, representing 35 percent of the Daule River Basin and approximately 12 percent of the Guayas River Basin. These territories belong to the provinces of Manabi, 66 percent; Pichincha, 13 percent; Los Rios, 9 percent; Guayas, one percent; and the not yet delimited zone called Manga del Cura, 12 percent. This means that the water that contributes to the development of the Guayas River Basin does not belong to the jurisdiction of Guayas, which will explain why the zone is not taken care of.

Previous situation

Due to its geographical location, where the tropical humid forest meets the dry forest, this has been a zone of high and endemic biodiversity. It has supplied fine timber during the colonial and republican times. Since the construction of the Quito-Santo Domingo and later the Santo Domingo-Guayaquil thoroughfares in the late fifties, it became a zone of intense colonization.

The colonizers came mainly from Manabi, dedicated to agriculture, cattle raising and fishing. The rivers, which they used for fishing and transport, formed their economic subsistence base.

Before the construction of the dam, previous studies had identified a downgrading of the vegetal topsoil, due to the colonization by peasants, mainly from Manabi. In a study by Jenkins (1979), it was estimated that the virgin forest occupied 67,200 hectares, representing 16 percent of the basin's surface.

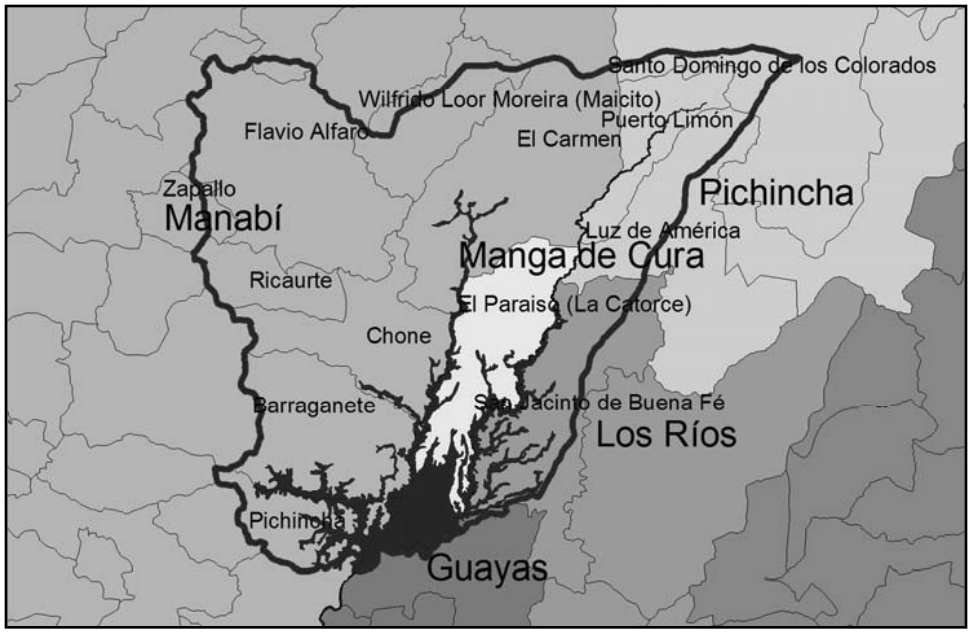
Actual situation

The construction of the dam created a lake that:

- Flooded 30,000 hectares of land. CEDEGE expropriated about 40,000 hectares. Of these, at least 16,000 hectares were used for agriculture;
- Displaced more than 4000 families or approximately 20,000 persons;
- And furthermore, left almost 100,000 people settled in the basin that supplies the water to the Daule Peripa Dam, in isolation.

Between the 1990 and 2000 there was negative population growth in practically all the parishes of the zone. Moreover, the living conditions of their inhabitants deteriorated. It is thought that currently about 120,000 people live in the basin[11].

Map 2. Political division of the basin that contributes water to the Daule Peripa Dam



Presently, due to communication problems and total abandonment by the state, all the parishes in the zone under study live in the worst conditions and are the poorest of the poor in the country. Thus, for example, whilst the national average of the poverty index (unsatisfied basic needs) is 61.3 percent, in all the parishes of the zone of the basin under the influence of the dam, this index is above 90 percent (with the exception of urban parishes such as Flavio Alfaro and Chone). However, parishes such as Manga del Cura and Barraganete have a poverty index above 98 percent.

Quantification and description of impacts

The social and environmental impacts of the building of the dam can be divided into two. Firstly, there are the direct impacts: human displacement, flooding of ecosystems, change in climatic conditions, erosion of the farming economy, and deterioration in the living conditions of the displaced and isolated. Secondly, there are the indirect impacts related to the absence of zonal planning programs for the mitigation of damages and health programs, which have caused more destruction of the plant cover and the deterioration of the quality of life of more than 100,000 inhabitants. These will be examined in detail.

Social impacts

1. Displacement

According to the information given by CEDEGE (2002), during the construction of the dam, 14,965 inhabitants were displaced from an agricultural surface of 16,922 hectares. Additionally, according to information from *The Empalme Review* (2003), approximately 23,000 additional hectares of non-agricultural land were expropriated, adversely affecting 4,000 families – or more than the 1505 families registered with CEDEGE. Four towns were flooded, namely La Balsa, Carlos Julio Arosemena, Gualipe and El Mate, of which, only Carlos Julio Arosemena was partially relocated.

One of the victims had this story to tell:

> "I remember very clearly. It was in the late eighties. Nobody believed that our community will suddenly go under rushing, turbulent floodwaters. We never had floods before. But when the rainy season began, the level of the lake also began to rise. Before people could accept that this was not just a nightmare, we saw right before our eyes farm animals, cats and dogs drowning and floating. Only then did people begin to run to the mountains to save themselves"[12].

According to people interviewed, indemnification has been minimal and has barely covered expenses for getting them. In many cases, they were paid 10, 15 and 20 years later. The amounts have been totally arbitrary. An inhabitant of the zone of Santa Maria, having known of our visit, gave this testimony:

> "The Peripa River had broad banks. They were very productive. Great extensions of flatlands, where houses, grasslands and crops existed, have been flooded. All was lost. Nothing was rebuilt, restored or recovered. After so many years, some of us residents were left with nothing. Many people migrated. I lost four hectares and have not been compensated at all. I used to go to CEDEGE to claim. They wanted to include me in my neighbor's compensation. They paid him, but only about 20 percent of what he was rightfully entitled…"[13]

In most cases, the wronged people have been subject to extortion by the middlemen[14]. Furthermore, only owners with land deeds have been recognized for compensation. Nonetheless, CEDEGE claimed that approximately 80

percent of the aggrieved have been indemnified according to the values that are legally recognized for these types of grievances.

Considering the information provided by CEDEGE, *El Palme Review* and the interviews we carried out, Table 4 elaborates the social costs of land expropriation.

Table 4. Social costs of the Daule Peripa Dam: expropriated land

Concept:	Expropriated agricultural land: Opportunity cost to peasants who did not receive compensation for lost agricultural land at an interest rate of 8%		
	Value 18 yrs. ago	No. of hectares	Total cost
Estimated value of compensation peasants should have received	$100	16,922	$6,762,064.20
Less compensation paid: 80% (at 50% of the real value)	$50	13,537.6	$2,704,825.68
	Loss of land with highest slope: opportunity cost to peasants who did not receive compensation for the loss of high slope agricultural land at an interest rate of 8%		
	Value 18 yrs. ago	No. of hectares	Total Cost
Estimated value of the compensation	$50	23,078	$4,611,006.90
Note: no compensation has been paid.			

2. Isolation of the population

One of the most complicated impacts of the dam construction and the creation of an artificial lake has to do with the isolation of the population of the basin. Approximately 100,000 persons experience extreme difficulties in transporting themselves and their produce or to get medical attention when necessary. Until 2000, a safe transport system in the lake did not exist. In Puerto Mono, Dos Hermanas and the zone of Carlos Julio towards Barraganete, diverse transport methods developed. In Dos Hermanas, a family built a bridge and charges 15 cents per person to get across and one dollar if there is a load. In the same zone, a locally built ferry (from balsa trees) charges up to five dollars per vehicle. Transport gets worse in the rainy season: the population becomes absolutely incommunicado. We estimate that the accumulated transportation cost during 20 years of isolation is at US$1 per person per month.

In Dos Hermanas (Two Sisters) people have difficult times trying to cross in these balsa rafts.

Table 5. Social costs of the dam: transport cost due to isolation

Concept:	Transport cost due to isolation		
	Cost/month/ person	No. of persons impacted	Total cost
Cost for 100,000 persons for a period of 20 years	$1	100,000	$59,307,505.73

3. Increase in mortality and morbidity rates

The flooding of 30,000 hectares created a series of health problems. The common ailments of the zone (mainly dengue and parasitical illnesses) have increased according to 100 percent of the interviewees[15]. Furthermore, according to focal groups, isolated cases of oncocercosis, esquistosomiasis, Chagas illness and Leishmaniasis have occurred. This is primarily due to the breeding of mosquitoes in the artificial lake. Additionally, as mentioned, public services like drinking water and sewage are insufficient, mainly in the counties of Flavio Alfaro, Buena Fé, Manga del Cura and Pichincha. Garbage collection and disposal are practically nonexistent.

Statistics on mortality or morbidity are not readily available. In 2005, in the zones of Barraganete and Santa María, seven children died of intestinal problems. The hypothesis is that the drinking water taken from the bottom of the flooded regions is highly contaminated. We received this testimony from an inhabitant of Santa Rosa:

People of the zone have no drinking water. Frequently they use stagnant water. Near the Dos Hermanas crossing, a woman drinks water from a small water deposit by the road.

> "My son's sickness began with fever and diarrhea. The diarrhea never stopped. He died 24 hours after the onset of fever. Probably, the contaminated water we had been drinking caused his illness. In the zone, during those months, some infants, toddlers and pre-teeners also died"[16].

For purposes of valuation, statistics on dengue have been used. Life itself is priceless, therefore the loss of lives has not been accounted for in the following table.

Table 6. Social costs of the Daule Peripa Dam: morbidity expenses due to dengue

Concept:	Cost of morbidity expenses: 80% of interviewees said that at least one member of the family had at least once suffered from bleeding dengue		
	Cost of treatment	No. of persons infected	Total cost
Costs of illnesses (calculated by the incidence of bleeding dengue)	$1,000	16,000	$ 16,000,000.00

4. Increased risk of dam collapse

Joseph Ellam, the former Pennsylvania Director for Dam Security reportedly once said: "with the exception of nuclear plants, no other structure built by man has greater potential for killing more people than a dam".

Where there is high probability of environmental risks, the security of towns, productive investments and housing is reduced. This implies a general reduction in the population's well being. The cost of an insurance policy for this type of accidents could be used as reference for the valuation of this impact. This type of insurance is not available in Ecuador. However, we can use the cost of insuring agricultural land to cover flooding risks, which is available in the Ecuadorian market.

Table 7. Social costs of the Daule Peripa Dam: cost of potential disaster in case of collapse of the dam

Concept:	Cost of insuring against dam collapse and potential disaster at US$150/hectare/yr[17] calculated for a period of 50 yrs. at an interest rate of 12%		
	Insurance cost/ hectare/yr.	No. of hectares at risk	Total cost
Cost of insuring agricultural land against natural disasters	$150	50,000	$62,283,738.66

Environmental impacts

1. Deforestation

Since 1982, almost 55,000 hectares of virgin forest have disappeared in a zone with the highest degree of endemic biodiversity in the country. This loss has generated numerous impacts due to the multiple functions that the forest has, from those related intrinsically to existence to those associated with the economies of human beings: hunting, gathering, forestry, recreation, medicine, tourism, research, etc.

Given our critical position regarding fixing a price on nature and its functions through a monetary evaluation of environmental services and the marketing of same, and also because of the irreversibility of certain degrading processes, such as the destruction of untouched ecosystems, we will use a referential value by identifying the costs of restoration of the damaged systems to their original form. Although this is practically impossible due to the complexity of the studied ecosystems, this could be a way to valuate the approximate ecological debt generated.

More specifically, we will apply the concept of restoration cost, i.e. the cost of

bringing the environmental condition to its original state so that it can provide all of its original functions, using a method developed by Carol Ramirez (2002) of the University of Chile. This method estimates the cost of restoration based on the prices of the necessary materials to bring back the preexisting condition. However, the prices may not have any relation to the value given to the condition by different people, which is one of its flaws.

In 1982, there were 67,200 hectares of virgin forest in the Daule Peripa zone. In 1999, the area was 13,629 hectares. In short there was a loss of 53,571 hectares of virgin forest as well as a loss of the ecological and social functions of the forest[18].

Table 8. Environmental costs of the dam: deforestation

Concept:	The cost of restoring 53, 571 hectares of virgin forest using Ramirez' (2002) methodology is estimated at US$43,878/ hectare/yr.		
	Annual cost/ hectare	No. of affected hectares	Updated value
Restoration Cost	$43,878	53,571 hectares	$2,350,6000,703.33

2. Erosion and increase in sediment deposits in the dam

Since neither prevention programs nor management plans have been developed for the upper basin, the areas with potential erosion indices above 50 tons per hectare per year now occupy half of the basin. This means that half of the surface of the basin that supplies the dam with water is carrying sediments to the artificial lake, thus decreasing the quality of the water with the presence of sedimentary materials in suspension, as well as diminishing the lifetime of the whole system.

In the secondary road from Santa María to Carrasco the vast erosion of the upper river basin of the Daule Peripa Dam can be seen.

According to one of our interviewees, Jimmy Pérez, of the Fernán Sánchez Castaño Defense Front, the situation is alarming:

> "We have taken measurements in both Gualipe and El Mate. The Gualipe dam has lost 20 meters since we first measured it. In the El Mate bridge we measured 60 meters, now there is 30 meters less"[19].

Judging from this information, we can deduce that the capacity of the dam has decreased by half in just 20 years.

As an example of bad management, Jimmy Pérez remembers that during the government of Durán Ballén, 300 hectares of teak were planted, supposedly to protect the riverbanks:

> "…a completely absurd decision, as the pivotal roots of teak trees fragment earth, mining the bases of the dam. It is therefore, one of the indefensible, if capricious and unnecessary deeds, of the engineers of the CEDEGE"[20].

The dwindling lifetime of the dam due to bad management is a new environmental liability in the making.

Table 9. Environmental costs of the Daule Peripa Dam: erosion and sedimentation

Concept:	Decrease in the dam's lifetime because of lack of proper care: value is calculated by the difference between the accumulated depreciation during the past 18 days, considering a lifetime of 100 yrs. and of 50 yrs.			
	Investments in the project	Lifetime (yrs.)	Annual depreciation	Accumulated depreciation
Accumulated depreciation (100 yrs.)	$1,638,933,545.00	100	$16,389,335.45	$295,008,038.10
Accumulated depreciation (50 yrs.)	$1,638,933,545.00	50	$32,778,670.90	$590,016,076.20
Decrease in the dam's lifetime				$295,008,038.10

The artificial lake created by the dam is almost covered with water lilies, causing difficulties in transport and serious health problems among the people living in the upper basin due to the proliferation of several types of mosquitoes.

3. Environmental impacts that were not estimated

We can further mention additional environmental impacts, which for lack of information have not been registered or valuated.

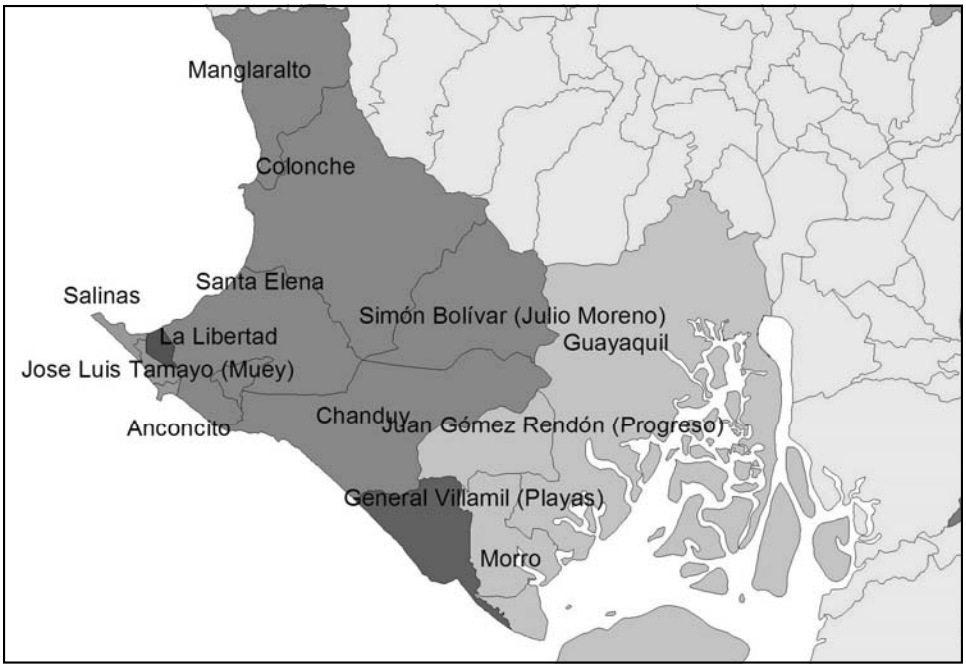
Table 10. Unvalued environmental costs

Concept:	Description
Pollution of stagnant waters	The scant circulation of water in the artificial lake, presence of water lilies, high sedimentation levels, high concentration of chemical contaminants in the riverbanks and the lack of sewage treatment determine the high degree of contamination. This has caused several impacts: health problems (which have been partially valuated in an indirect form) and contamination of fish as well as other aquatic resources.
Growth of water lilies (12,000 hectares)	Water lilies have invaded the Daule Peripa artificial lake causing transportation problems and nurturing thousands of mosquitoes that have degraded the quality of the environment and the health of the population.
Contribution to the greenhouse effect	It has been recently discovered that damming contributes about 7% of the rise in global temperatures. Methanol and carbon dioxide is emitted from the water that passes through the turbines, the overflow channels and from the water under the surface of the dam.

The Case of the Water Transfer System to the Santa Elena Peninsula

Geographic and administrative-political situation

Map 3. The Santa Elena Peninsula administrative-political division



The Santa Elena Peninsula is located Southeast of the Guayas River Basin, with an area of 605,000 hectares. It has a light inclination zero to five percent, a dry climate and poor soil, made poorer in time by the extraction of resources from the Peninsula (CEDEGE, 2002). It belongs to the Guayas province and specifically to the Guayaquil, Santa Elena, Playas, Libertad and Salinas counties.

Previous situation

The Santa Elena Peninsula has been traditionally settled by peasant communes, descendants of the Manta-Huancavilca cultures with possession and deeds covered by the communal law. Settlements cover 80 percent of the peninsula's surface. In the zones not occupied by communes, there existed large farms that were also occupied by individual peasants with collective access to the resources of the zone. The organized communes and the individual peasants had a common culture for the use of pastures and natural hunting and fishing grounds. In times of drought, water was brought through reservoirs

(albarradas), an ancestral technique for gathering water in the rainy season.

It is important to mention that prior to the construction of the project, there existed an expropriation process, aimed at the communal land and directed by powerful people of the province. Feasibility studies made by CEDEX comment on the fact and warn that the water transfer project will cause a multiplication of the fragmentation of the communal lands[21].

Despite previous studies indicating the economic non-viability of the irrigation project for the peninsula due its high cost considering the small amount of agricultural land it could cover, this project was designed in its final version by the Spanish company CEDEX, which is responsible for the hydraulic plan for the Santa Elena Aqueduct. The project started during the government of Febres Cordeo.

The irrigation program was expected to cover 44,000 hectares. In actuality, the infrastructure covered only 22,000 hectares approximately, of which only 6,000 are being used. The results of the project confirm the conclusion of the studies made almost 50 years ago: the scope of the benefit of the project did not justify an investment of this magnitude.

Map 4. Communal lands

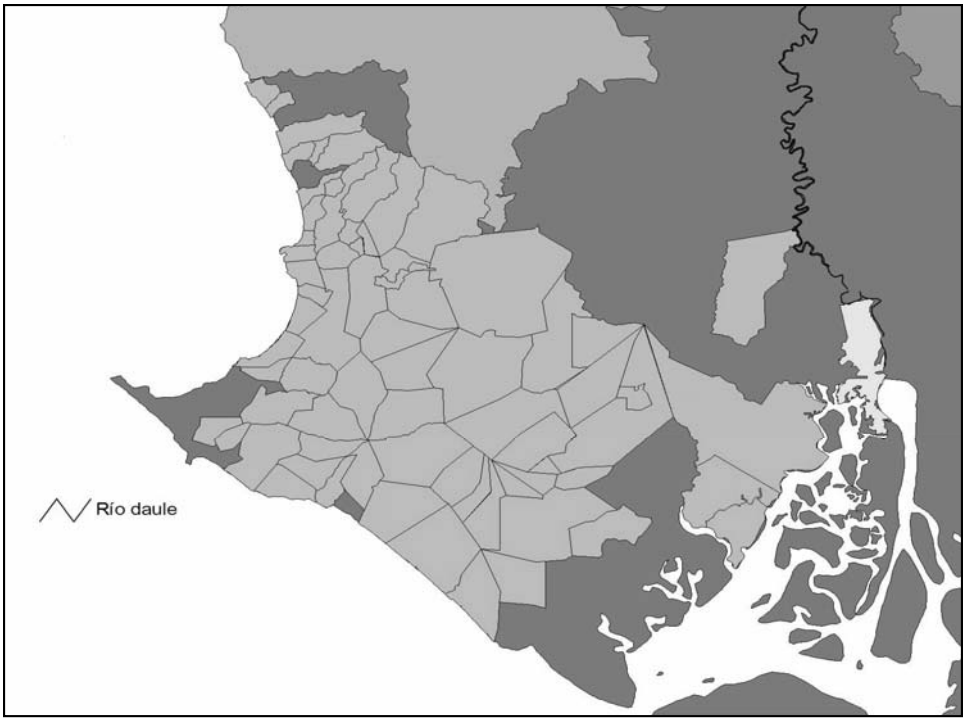


Image at right: Area with irrigation in the Santa Elena Peninsula, at the entrance to the Azucar Commune. Image at left: Area without irrigation at the same point at the other side of the road. The surface with irrigation infrastructure is much less than the areas that are being irrigated.

Actual situation

The building of irrigation facilities brought with it aggressive land speculation. The communes lost, through different mechanisms, approximately 25,000 hectares of land. This left the communities debilitated, without land with direct access to irrigation. As part of the ecological problems, the construction of the dam aggravated the already existing problem of the drying up of rivers, rivulets and water reservoirs in the area. After the building of the water transfer system, rivers and traditional sources of water, e.g. swamps and wells, began to dry up even in the rainy season, which impacted strongly on the ways the peasant cultures benefit of the natural resources.

Moreover, individual peasants, without land deeds were thrown out of their grassing zones. Those who did not leave the Peninsula live presently surrounded by new farms in the zone.

The only beneficiaries of the project have been the peasants that took over the communal lands who have developed high technology farming for export products like bananas, mango and vegetables, among others.
An inhabitant of Bajada del Progreso recalls that:

> "After the building of the water transfer system people started coming, interested in the projects. The rich, once they heard that irrigation would be available started to buy land at very low prices from the natives of the zone"[22].

Most of the zones with irrigation infrastructure are privately owned. Communal or free land was privatized. In the photo, the sign clearly alludes to the situation. It reads: "Trespassing Forbidden" and "Stop; identify yourself". The owner of this enterprise is Brazilian.

Quantification and description of the impacts

The impacts of the water transfer system to the Santa Elena Peninsula can be defined as direct and indirect. The direct ones are those that were caused by the building of the system: displacement, damage to the roads, damage to watercourses, and destruction of nature. Due to lack of information, these have not been considered in the present study. Indirect impacts are associated with speculation in communal lands, destruction of peasant organizations, invasion and theft of land. These are the aspects this investigation has concentrated on. Given exploratory character of this study, the valuation of the ecological and social debt is only approximate.

Social impacts

1. Destruction of the ownership of communal lands in the Santa Elena Peninsula

Even if the Constitution of Ecuador protects the right of communities to maintain their lands, under the new Law for Agrarian Development[23], the possibility to fragment communal lands is allowed if at least 80 percent of the members decide so. This and other factors related to political power broking

Table 11. Social cost of the Santa Elena water transfer system: disintegration of communal lands

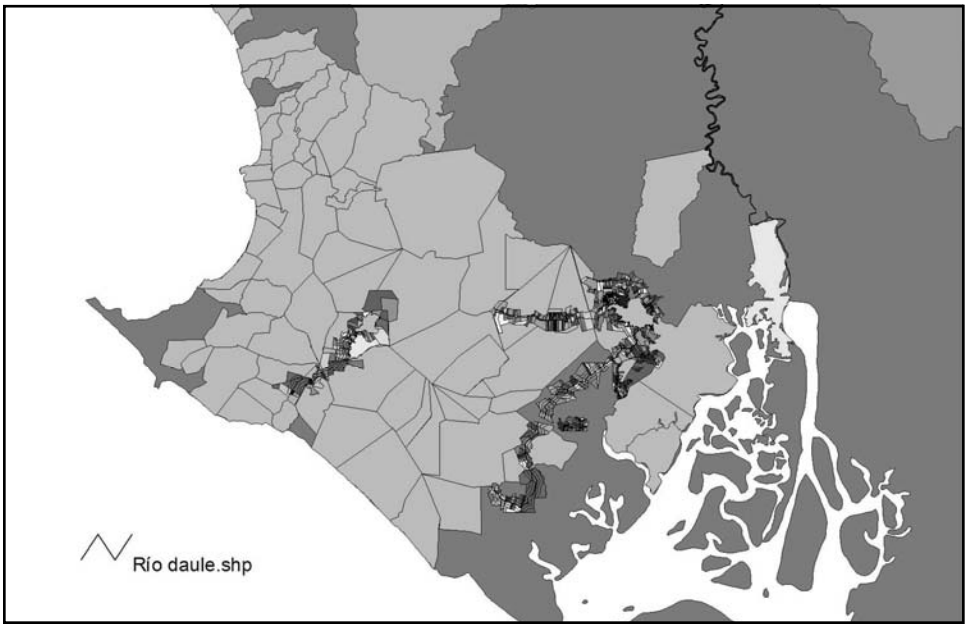
Concept:	The increased value of land, due to the irrigation system, was taken advantage of by land speculators, to the detriment of peasant communities. The cost of restituting communities for the lands they lost is estimated.		
	Actual value/hectare	No. of affected hectares	Total cost
Conservative Scenario	$1,500	25,000	$ 37,500,000.00

and the use of privileged information started an inexorable trafficking in land in the Santa Elena Peninsula.

According to information from *Blanco y Negro Review*, during the years 2000 and 2001, under the government of Noboa, more than 20,000 hectares of communal lands were subject to invasion and takeovers in the Santa Elena Province.

According to lawyer Miltón Yulán, president of Fenocin in the province of Guayas, in order to obtain lands from the communes, unlawful methods, extortion and violence were applied against the communities. Land litigation,

Map 5. Surface with irrigation



invasion, illegal sales and "voluntary" abandonment occurred (the latter due to lack of means of payment for irrigation water).

For quantification purposes, we can distinguish two cases: the first concerns communal lands and the second, lands without deeds belonging to peasants of the zone.

According to one of the peasants we interviewed:

> "Most of the communal members, between brothers, gather the "heritage" and sell big lots, because they know that they will not have sufficient financing to make their land productive. It is a pity; those that have stayed in the communities and have sold their lands work now as day laborers in their former lands"[24].

A member of the communes explains that, even if the waterways reach several communes, the scope is minimal. The people that benefit from the waterways are persons with possibilities to make investments, who became communal members when they bought communal land, even if the buying processes have been questionable. Segundo Suárez (71 years old), from the Sucre communality asks:

> "What are we going to do if we have water but neither the know-how nor the credit for the required investments?"[25]

Of the 25,000 of expropriated hectares, at least 5,000 were not communal land, but settled by individuals without property deeds who have access to the resources of the zone. In this case eviction was made directly.

An old lady, a descendant from inhabitants of the zone who had occupied the land for decades without any deed, tells the consequences of the eviction:

> "Everything is different now. We had a house in there; we had lots of cattle. We stayed in the place in January, February, April, and May. Now we don't have anything, neither goats nor cows, nothing. The first one who came was José Salem. Then came a mister Aranda, a mister Serafín, then came the madam. Yes, they took our land… even this little lot. She made herself owner. Since we don't have deeds, she took advantage of us"[26].

Box 2. Logic of the Santa Elena Water Transfer System

The Santa Elena Water Transfer System was not thinking of the communes. Even if the project was justified as a means of supporting the agricultural sector, the project's logic was directed to big investors and thus to small groups of agricultural exporters. For example, the investment required to plant one hectare of asparagus is US$300,000[27]. In his PhD thesis, economist Paúl Herrera concluded that the water transfer system is not efficient. CEDEGE and the financiers responsible were preoccupied only with the construction of the services but not with a series of related aspects that could have permitted the success of the project, according to their objectives. He states that there is a contradiction between water policies that have only focused on the building of the irrigation system and the absence of agricultural policies that would permit the use of the benefits of such infrastructure. In spite of a great opportunity for agricultural development, an erroneous vision of "development" failed to consider the communal population of the zone and what came out of it was an eviction process of the communities from their own land. Herrera is emphatic when he states that: "... the PHASE project was designed from a very particular development model for which the communal organizations are irrelevant, which could explain why, at a certain moment massive sales of communal land was effected"[28].

On the other hand, Jorge Falconí, an ex civil servant of the National Institute for Agrarian Development (INDA) was one of those who questioned the communal form of land property in the Peninsula, alleging the supposed incapacity of the community members to transform the zone in a productive area: "Communities are not capacitated to work the land and make it yield for several reasons…they do not have anymore the number of people required for that activity; most of the community members have migrated to the city or to other countries and that has provoked the loss of the agricultural tradition that existed in the Peninsula"[29].

2. Destruction of the ecosystems, culture and survival economy of the population of the Peninsula

After the construction of the Azúcar and Chongón dams, the water sources were strangled and with that, the subsistence economy of the population of the Peninsula. Even if there exists no precise information regarding the number of affected inhabitants, we will use the reference figure of 2,500 inhabitants, considering an average of 50 hectares and five family members (ESPOL, 2000).

House closed by E.C, new proprietor of th e lands in the lower zone of the Bajada del Progreso in the Santa Elena Peninsula. Testimony of an inhabitant: "She has already taken our lands and left us in this matchbox. She has closed our house. Here we are like parrots in a cage".

A community member describes the situation before the construction of the water transfer system:

> "In the swamps we had reservoirs. We had savory fish. We drew water from there in gallon cans with the help of our donkeys. Further inland we had another reservoir. In the river we had shrimp, a small fish called "guaija" and snails and many food fishes for our meals. We raised wild chicken, maria chicken and doves. In the surroundings of the reservoirs there were lots of small animals we used to hunt which formed part of our sustenance. Now, our sources of food, potable water and places of recreation are gone forever"[30].

While this was happening, CEDEGE engaged in propaganda to enhance its image. The development of water sports was the excuse for the building of the Chongón Dam.

Table 12. Social cost of the Santa Elena water transfer system: loss of sustenance

Concept:	Loss of life sustenance for peasants since the dams of Chongón and Azúcar strangled the rivers and food sources of the local inhabitants. To evaluate costs, we calculated the accumulated cost of what the peasants had to spend for food: US$1 per person per day for the last 15 years (winter seasons) at an interest rate of 8%.		
	Present value/ hectare	No. of affected persons	Total Cost
Accumulated loss of food	$5,458.37	2,500	$13,645,927.37

3. Unvalued environmental impacts

Some of the adverse effects of the Santa Elena Water Transfer System have not been estimated in this investigation.

Table 13. Unvalued environmental impacts of the Santa Elena Water Transfer System

Concept:	Description
Destroyed forest surfaces	The area of the destroyed forest in the upper basin of the area of the Chongón Dam is estimated at 60,200 hectares. For this area, no detailed information exists regarding the affected ecosystems. Therefore, this value cannot be taken into consideration.
Contamination of soil and superficial water	Due to the necessity to develop high yield agriculture, chemical products are commonly used in agricultural activities in the irrigated lands. It is estimated that 10,200 tons/year of fertilizers and 260 tons/year of pesticides are used un the irrigated zones. These have important environmental impacts which have been estimated.
Salinity increase in the irrigated lands	It has been detected that about 17,000 hectares of the project that presently are under irrigation run the risk of increasing salinity levels, if the present inadequate methods are maintained. The cost thereof has not been accounted for.

Conclusions of Part III

Table 14 shows the estimated social and ecological debt resulting from the two major components of the Jaime Roldós Aguilera Multipurpose Project, namely the construction of the Daule Peripa Dam and the Santa Elena Water Transfer System. The total social and ecological debt owed to the people of Ecuador because of the project is an astounding US$2,843,555,123.74.

Table 14. Social and ecological debt due to the Jaime Roldós Aguilera Multipurpose Project

Partial social and ecological debt arising from the Daule Peripa Dam	$2,792,409,196.37
Partial social and ecological debt arising from Santa Elena Water Transfer System	$51,145,927.37
Total social and ecological debt	**$2,843,555,123.74**

IV. CONCLUSIONS AND RECOMMENDATIONS

The Jaime Roldós Aguilera Multipurpose Project is a clear example of the generation of ecological and social debt, apart from foreign indebtedness, resulting in the privatization of benefits and the socialization of costs.

In spite of the economic non-viability of the project, both the IDB and later on the CAF and the Banco do Brasil financed the components of the same.

In effect, the Ecuadorian State and its inhabitants continue to underwrite the debt while the benefits went in the first instance to the financial organizations that lent the money for the project's construction and then to their linked transnational enterprises: the constructors of the mega-projects (e.g. Agroman of Spain and Odebrecht of Brazil) and concessionaires of electricity generation, water supply and irrigation systems (e.g. Unión Fenosa of Spain and Bechtel of the United States of America).

The project has modified the existing zoning of the lands in the Guayas River Basin and the Santa Elena Peninsula, through a blind capitalist logic, to the detriment of nature and the peasant population.

In Ecuador, a small, economically powerful group linked to agricultural exportation has been the main beneficiary of this multimillion-dollar project.

Furthermore, the project has generated an aggressive onslaught against the farming population, which has caused the eviction and displacement of approximately 20,000 people in the upper basin of the Daule Peripa Dam. By denying them their lands, their culture and their means of sustenance, it has undermined and weakened farming communities. In the Santa Elena Peninsula, peasant communities have lost at least an estimated 25,000 hectares.

About 100,000 people have been isolated by the construction of the dam. Inhabitants now live in precarious conditions: without adequate transportation and communication means, without safe water, without electricity, and without a sewerage system.

The project has caused the destruction of ecosystems. At least 53,000 hectares of primary ecosystems have been destroyed in the upper basin, the waterways have been radically changed and the erosion processes have been intensified. Thus, the sources of important ecological functions have disappeared.

Hydraulic regulation, food and medicine sources, climatic regulation, among others, have been compromised.

The logic guiding this type of projects is the building of infrastructure without attention to critical issues regarding the sustainability of the investments in the long run.

The upper basins that supply the water to the dams have not been protected, nor have they been managed in an integrated form.

The displaced population has not been properly indemnified. No programs for the bettering of the well being of the concerned population have been made.

From an estimate and partial quantification of some of the social and environmental impacts generated by this project, this investigation has revealed that the ecological and social debt amounts to at least **US$2,843,555,123.74.**

If to this amount we add the economic losses that this project is generating to the tune of US$928,092,848.10, then the net damage to the Ecuadorian society caused by the Jaime Roldós Aguilera Multipurpose Project adds up to US$3,711,647,971.84. This is approximately one fourth of Ecuador's foreign debt.

In spite of the scope of the social and ecological debt resulting from the construction of the Daule Peripa Dam and related components of the project, interest groups, including the Brazilian company Odebrecht, the present government of Ecuador and CEDEGE, are intent on continuing the destruction and looting through the building of the Baba-Vinces Dam.

With this new project, the ecological and social degradation of other zones of the Guayas River Basin will further escalate:

- 10,000 peasants will be displaced;
- 20,000 peasants will be isolated;
- 3,500 hectares of agricultural land will be inundated; and
- What little remains of the natural forest of the zone will disappear.

Furthermore, there are plans to finance and grant concessions for about 236 hydroelectric projects, 22 of which will provide more than 100 megawatts of power; 76, between 10 and 100 megawatts; 45, between 1 and 10 megawatts; and 93 between one and zero megawatts. Of the 22 hundred megawatt-

hydroelectric projects, at least nine would have a height of more than 110 meters. In short these will be even bigger than the Daule Peripa Dam. Most of them are intended to be installed in the Ecuadorian Amazon region.

Based on the above findings and conclusions, we demand the following:

For the State of Ecuador

- **To return the communal lands to the peasants of the Santa Elena Peninsula who have been unjustly evicted from their territories.**
- **To indemnify the displaced and isolated peasants of the upper basin of the Guayas River.**
- **To stop the building of new hydroelectric projects, namely the Baba-Vinces Dam and the water transfer system towards Daule Peripa project, since these will only feed the process of destruction of the environment and continue the dismantling of peasant economies in favor of financiers and building companies.**
- **To execute an integrated audit of the financial, social and ecological impacts of the Ecuadorian foreign debt, especially those generated by loans acquired for the Jaime Roldós Aguilera Multipurpose Project.**
- **To conduct an integrated audit of CEDEGE's management of the Jaime Roldos Aguilera Multipurpose Project and all its components in order to identify the economic, social and environmental impacts and to establish national and international responsibilities.**
- **To sanction those that promoted and executed this project for the damages caused to the peasant communities and the natural patrimony of the Ecuadorian people.**
- **To demand financiers, mainly IDB, CAF, Banco do Brasil and BNDES and the construction companies Agroman from Spain and Odebrecht from Brazil the return of payments made by the state of Ecuador and the Ecuadorian people in the amount of US$1,638,933,545 for the construction of the project and the annulment of any difference, if it exists.**
- **To demand that financiers and construction companies recognise the social and ecological debt caused by the project and to assume all costs that are partially estimated at US$2,843,555,123.74. This amount may then be used to restore destroyed ecosystems, indemnify the peasants directly or indirectly harmed by the project, return expropriated lands stimulate the farming economy.**

- **To initiate a process of social control of the natural resources of the Guayas River Basin towards the integrated management of the hydrographic basins in order to sow water and not deserts.**

NOTES

1 The Fernán Sánchez Castaño Defense Project was established in order to protest the abandonment of peasants inhabiting the river basin that supplies water to the Daule Peripa Dam. Its name comes from the Fernán Sánchez and Castaño trees, which are emblematic of the region and which are in danger of extinction.

2 In 1983, Ecuador signed the first Letter of Intent with the International Monetary Fund to cover the budgetary deficit for that year due to the increase of financial costs caused by hikes in interest rates in 1982 (Letter of Intent, 1983).

3 The building of dams has an ideological consequence. Its construction ratifies the dominion, control and use of nature for humankind's benefit; therefore it is linked to progress and development. After India's independence in 1947, dam construction became a symbol of modernization and scientific progress and an expression of national sentiments. During the inauguration of the Bhakra Dam, 741.5 feet high, in 1954, the Prime Minister Jawahar Lal Nehru called them "the temples of modern India".

4 After the USA officially eliminated the Gold Standard in 1973, a great amount of dollars began to circulate in Europe without returning to the USA because of the risk of runaway inflation. At the same time, members of Organization of the Petroleum Exporting Countries linked their surplus oil to those floating dollar deposits in European banks. Thus, a dollar market, unregulated by the Federal Reserve was established. With this mass of dollars, unregulated by any country's Central Bank, credits without any kind of control were established. These European money markets placed pressure on countries of the South to accept loans.

5 John Perkins (2004) in his book, An Economic Hit Man, states how part of the North American strategy for control and domination has been the submission of public authorities of Southern countries in order to make them accept external loans, which, on the one side ensure economic dependency and, on the other side, ensure the use of North American companies in all phases of development projects. This is something the present study aims to prove.

6 See at the end of the document the investment projects for hydro-electric generation.

7 This includes nternal credit.

8 This is based on studies conducted by the Public Service Observatory.

9 Some of the studies were made by a Canadian consulting company in the seventies to establish the feasibility of the project. The funds for said studies were Canadian and were granted through the IDB.

10 Cases of such include the Israeli-Palestine war and Turkish-Arab war.

11 The only year for which there exists complete information of the zone under study (using information from previous census) is the year 1974, where the number of inhabitants in the basin was 84,000. In 1982, neither the population of Manga del Cura or El Carmen was counted. A population of 111,766 inhabitants was calculated, considering the population growth in neighboring parishes (TRDI, 1990). Then the population of Manga del Cura was calculated to be of 18,193 inhabitants. According to the census of 1990, this number

increased to 24,706 inhabitants. However, according to the census of the year 2001, the population in Manga del Cura was only 17,692 inhabitants. Therefore, considering the negative growth rates, we can estimate the number of inhabitants for the whole zone to be about 120,000.

12 Source: Personal interview.

13 Source: Personal interview.

14 During the visit to Manga del Cura, five people who had received indemnification in the past months were interviewed. Fifty percent of what they received was paid to the middleman.

15 Two focal groups were interviewed for purposes of the study: one in the zone of Santa María and the other in Cabecera de España, with 8 and 15 persons, respectively.

16 Source: Personal interview.

17 This information is approximate and was supplied by insurance broker Fabián Bustamante.

18 In this estimate, we have not included functions of erosion control and soil formation, the effects of which will be calculated independently in the following chapter, due to the importance they have in prolonging the lifetime of the dam.

19 Source: Personal conversation with Jimmy Pérez.

20 Ibid.

21 The Center for Hydrographic Studies of Madrid, was the institution in charge of the design of the hydraulic plan for the Santa Elena Aqueduct.

22 Source: Personal interview.

23 The law was approved by the government of Durán Ballén, with the support of the World Bank and the IMF.

24 Source: Personal interview.

25 Source: Personal interview with Segundo Suarez.

26 Source: Personal interview.

27 Source: Personal interview with Master Morán.

28 Source: Personal interview with Paul Herrera.

29 Source: Personal interview with Jorge Falconí.

30 Source: Personal interview with one of the community members in Bajada de Chanduy.

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