

AN INSTITUTIONAL MODEL OF WATER RESOURCES  
ADMINISTRATION IN CONGO

by

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## STATEMENT BY AUTHOR

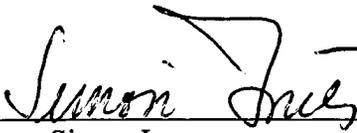
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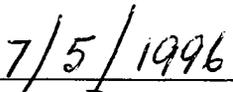
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To my wife and my children who endured long years of separation during my graduate study, and to our families, I owe a tremendous debt.

## DEDICATION

This is dedicated to my late mother,  
Mbondzi Pauline, my brothers, my children, and my wife.

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## ABSTRACT

Adequate Water Resources Administration in Congo is a major concern for its government and its people. Water resources administration is a dilemma for government throughout the world, and Congo is no exception. An assessment of water resources administration practices in Congo today reveals several inadequacies attributable to deficiencies in the framework for decision making in the use and allocation of water resources.

Actually, the entire field of water resources administration is dominated by one level the national government. In Congo, there is no water law to guide water development. It is known today that the administration of water resources in Congo is notorious for its inability to provide for the public welfare, partly because the structure of decision making is not conducive to an accurate definition of the public interest. There are no specific water organizations at the local level to represent water users and provide the delivery of essential water services, whereas this is the area which is critical to the enhancement of economic and public welfare.

The institutional problem in water resources administration in Congo may be helped by adopting one of the three models proposed in this thesis. The first model will be the alternative of organizing water institutions by level of government. The second alternative will organize water institutions on the basis of resource geometry. While the third will be a mixed institutional model between the two systems above. If these models are adopted,

successful social and economic development.

## CHAPTER 1

### INTRODUCTION

#### 1.1 Background

In western Central Africa, the People's Republic of Congo, sometimes called Congo-Brazzaville, is situated on the equator and is the epitome of many newly independent Black African countries which possess distinctive assets and liabilities. Like other former French tropical dependencies, its current problems derive from a rapid population growth, galloping urbanization and unemployment, a sharp decline in food-crop production, and the coexistence of a traditional subsistence economy with a modern economy dominated by foreign capitalists and technicians. These problems all lead to the ever growing demand for water and the importance of this resource for the social welfare and economic development of Congo.

The Congolese government and its people recognize the fact that effective water resources management will provide the necessary foundation for the successful social and economic development of Congo as a whole. One attempt to provide an adequate administration of water resources was evidenced when the third Congress of the Congolese Party of Labor created the Ministry of Energy and Water Resources in 1984. However, this national focus of managing or administering water resources has not yet totally succeeded because it does not extend beyond the national level to the intermediate and local or user level. The water institutions at all levels will have to be dynamic in themselves to respond

to the problems which the country will, no doubt, face in the future. There is a need for comprehensive multi-level policies on water use, including the multi-level organizational arrangements for the planning, development, and management of the nation's water resources.

### 1.2 Motivation for the Research

The United States has had a long and diversified history of water resources development and administration. In fact the United States has passed through periods comparable to the stages in which Congo is now passing in terms of economic development and organizational maturity with respect to water administration or management. Actually, Congo is trying to adopt a decentralized constitution, similar to that of the United States, which proposes a structure of national, intermediate, and local governments. Thus, the experience of the United States is to be taken as a positive guide.

### 1.3 Research Objective

The Objective of this research is the development of an institutional model of water resources administration for the Congo. Three alternative models will be studied: a model based on level government, a model based on resources geometry, and a mixed institutional model. One model will be chosen and modified to reflect the specific Congolese circumstances. Given the ultimate goal of national development, certain factors will be

identified which could limit effective water resources management. The technical solutions to Congo's water problems have to be implemented within an institutional framework of Congo's capabilities. Ostrom and Ostrom (1972, p.5) state that every new technical solution to water problems necessarily implies that decision-making capabilities will need rearranging. The wider the ramification of the consequences which flow from any particular technological development, the more complex will be the task of rearranging decision-making capabilities in the development of appropriate institutional arrangements within and among the community of users. If a model can be devised which includes these technical solutions and the appropriate institutional arrangements for carrying out effective water programs, Congo will move toward a more successful social and economic development.

#### 1.4 Research Outline

This study comprises 8 chapters. Chapter 1 outlines the objectives of the study. Chapter 2 examines water resources administration and water institutions in Congo. Chapter 3 summarizes the water resources administration in the United States; chapter 4 discusses the water institutions in the United States. In chapter 5, a comparison between water administration in the United States and Congo is summarized. The institutional model of water resources administration in the United States is studied in chapter 6. Chapter 7 proposes an institutional model for water resources administration applied to Congo while chapter 8 presents specific conclusions for the future water administration in Congo.

## CHAPTER 2

### WATER INSTITUTIONS AND ADMINISTRATION IN CONGO

Of all natural resources, water is the most essential commodity for many purposes, including domestic and industrial water supply, irrigation, power generation, and recreation. As long as the state of development does not require more water than the readily available supply, there is little problem. In other words, the greatest challenge is posed by competition for scarce water resources as the readily available supply can no longer satisfy competing and sometimes conflicting demands.

Today, the industrialized countries are concerned both for the environment and human welfare as a result of degradations to the quality of available water as well as limitations on the quantity of water available. In the developing countries such as Congo, however, the exploitation of water resources has never really been extensive or well organized. In addition to this situation, the Congo has environmental pollution, water shortages, and flooding as a result of poor management of water resources.

## 2-1- PHYSICAL SETTING

### 2.1.1 Geography

Lying between 5 degrees South and 3 degrees North, the Congo straddles the equator and covers an area of 342,000 s.q.km (132,012sq.mi). With a maximum length of 1006 km (625mi) and width of 225 km (140mi), it has a 150 km coastline on the Atlantic Ocean. To the North it is bounded by Cameroon and the Central African Republic, to the West by Gabon, to the East by Zaire, and to the South by Angola. The geographic location of Congo is shown in figure 2.1.

### 2.1.2 Climate

The Congo has a tropical climate marked by high temperatures, heavy rainfall, and very high humidity. The seasons are reversed north and south of the equator; the dry season (winter) in the north corresponds to the rainy season (summer) in the south. North of the equator, which runs about 30 miles north of Owando, the rainy season lasts from early April until late October and the dry season from early November to late March. Variations, however, do occur, and certain areas on both sides of the equator have two short wet and two short dry seasons.

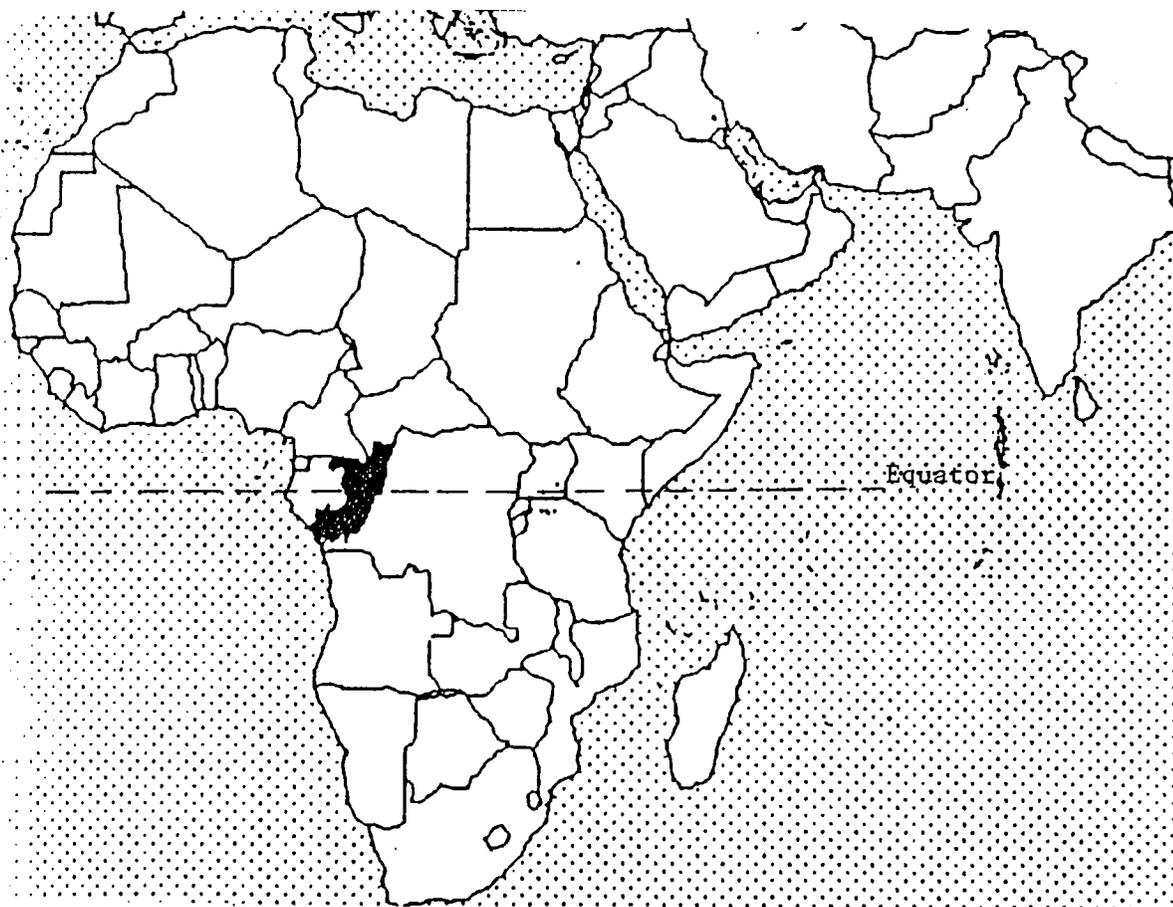


Fig. 2.1- Location of Congo

Relative humidity is consistently high throughout the country, averaging daily readings of about 80 percent. Temperatures range from 80 degree F to 90 degree F on the average with only slight variation. In southern portions of the nation the temperatures are somewhat moderated by the Benguela Current, and readings as low as 54 degree F have been noted.

Rainfall is in the neighborhood of sixty inches per year, but amounts vary from season to season. In the North precipitation is particularly heavy. During the wet season some portions of the Congo basin register from five to ten inches per month. Cloudiness, too, is extensive over most of the country, averaging almost 200 days a year. At the beginning and end of the wet seasons, line squalls with winds up to fifty miles per hour can be experienced anywhere, accompanied by violent thunder and lightning.

### 2.1.3 Hydrography

The country's hydrography system is made up of approximately 4,000 miles of navigable streams and rivers. The heaviest concentration is in the northern and central sections of the country, where the many tributaries of the Congo furnish arteries of transportation into the interior towns and settlements. The principal terminus and focal point of this network of inland Hydrography, which converge on the Congo River, is the major river port of Brazzaville.

Above Brazzaville two principal water routes extend to the north, one via the Congo and Oubangui rivers to the Central African Republic, and the other via the Congo and Sangha rivers to Cameroon. The major navigable rivers south of the Sangha River are the Likouala and the Alima, but many small tributaries of these two also permit travel by shallow-draft boats for considerable distances during certain seasons of the year. On the southwestern coast the Kouilou and the Loueme rivers are navigable for short distances.

In Congo, rains are frequent. It rains nine out of twelve months of the year. Water Resources in Congo are plentiful but this abundance is not equal throughout the whole country. The hydrographic network is dense and organized around two main basins (Congo basin and Kouilou-Niari basin). The hydrology is dominated by the Congo River which flows more than 600 kilometers in the country. In Brazzaville the Congo River has a module of 43,000 m<sup>3</sup>/s, for it is the second largest river of the world after the Amazon.

Water balance of Congo River(Table 2.0)

Drainage area	Precipitation	Runoff	Evapotranspiration	Runoff coef.	Water yield	Mean annual discharge
km <sup>2</sup>	mm	mm	mm	%	l/s/km <sup>2</sup>	m <sup>3</sup> /s
43,830	1143	313	1246	.20	9.9	43,000

The uppermost reach of the Congo River, the Chambeshi River above the Bangweulu Swamps, has its peak discharge sometime between March and April. The Kassai, an important tributary in the lower basin under the combined climate effect found south of the equator, has its first peak already between December and February and its second in March/April. The Ubangi, in many ways a typical equatorial river, has its peak in September. Thus, each of the important tributaries contributes to the formation of the Congo River hydrograph at Brazzaville (Figure 2.3) in its own way. As a result, the main flood comes in November/December and contains the delayed effect of the Congo headwaters. A second peak comes in March/April.

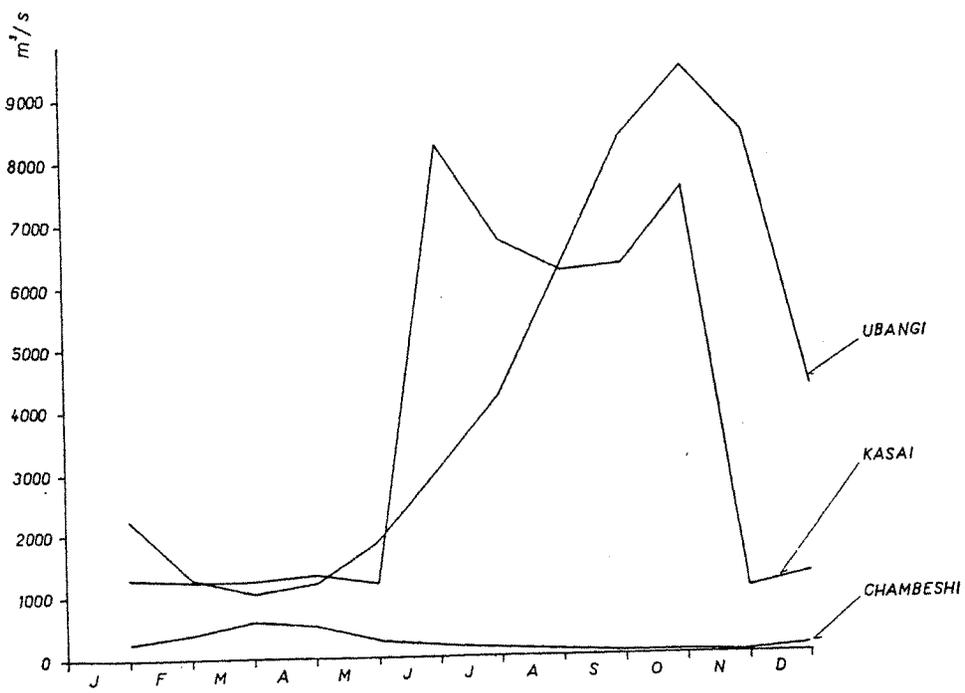


Fig. 2.3- Flood regime of the Congo River's tributaries

#### 2.1.4 Geology

There are four systems which constitute this geology:

- Continental Terminal and recent is located in the coast sea and the Congo's cuvette.
- Terminal Pre-Cambrian system is situated between Chaillu Massif and Mayombe.
- Precambrian 1-2-3 system represented by the lower, middle, and the upper Precambrian. The lower Precambrian is represented by a granite-gneiss "basal complex". The uncomfortable middle Precambrian is known as the "Ogoue system". It comprises at the base the "Ndole series" (chlorite schistes, slates and quartzite).

The upper Precambrian is represented by the "Intermediate system".

- Marine cretaceous and Eocene is the oldest beds rest directly on the Precambrian basement. They belong in the east coast of the ocean.

#### 2.1.5 Soils and Minerals

The tropical rain forest that covers almost two-third of the country contains mostly coarse-grained soils with a fairly high sand and gravel content. Lateritic soils are widespread in low-lying areas and usually have been seriously leached. The soils of the evergreen rain forest produce little else but forest products and certain tree crops such as palm oil. The constantly high temperature and moist conditions foster the destruction of organic matter before it can be converted into valuable humus, and heavy rains wash away the topsoil. Under these conditions most soils tend to become poorer rather than richer with the passage

of time. The country's mineral wealth was not abundant, but existed in a wide variety. The low concentration of minerals and metals, combined with the lack of transportation, difficult terrain, and unpleasant climatic conditions, have served to discourage exploitation. The most valuable deposit was the potassium chloride (potash) field at Holle.

High-grade iron deposits had been located in the southern part of the country. Although the ore reserves in these fields had been calculated at more than 500 million metric tons, their exploitation was considered impractical because of the expense involved. This area lies deep in the tropical rain forest, and it would have required the building of new rail lines into the fields to evacuate the ore.

## 2-2- GOVERNMENT AND ADMINISTRATION

In late 1967 a reorganization of the administrative structure of the country took place that abolished the existing fifteen prefectures and replaced them with nine regions and the capital district of Brazzaville(see Fig 2.2). In addition, eight administrative control posts were created and placed under the direct control of various regions. In 1990, the new constitution established again the prefectures but maintains them to nine.

The nine prefectures are subdivided into districts, communes, and villages. Each prefecture is placed under the authority of an appointed governmental commissioner, and its principal town is designated as the prefectural capital. The number of districts varied from

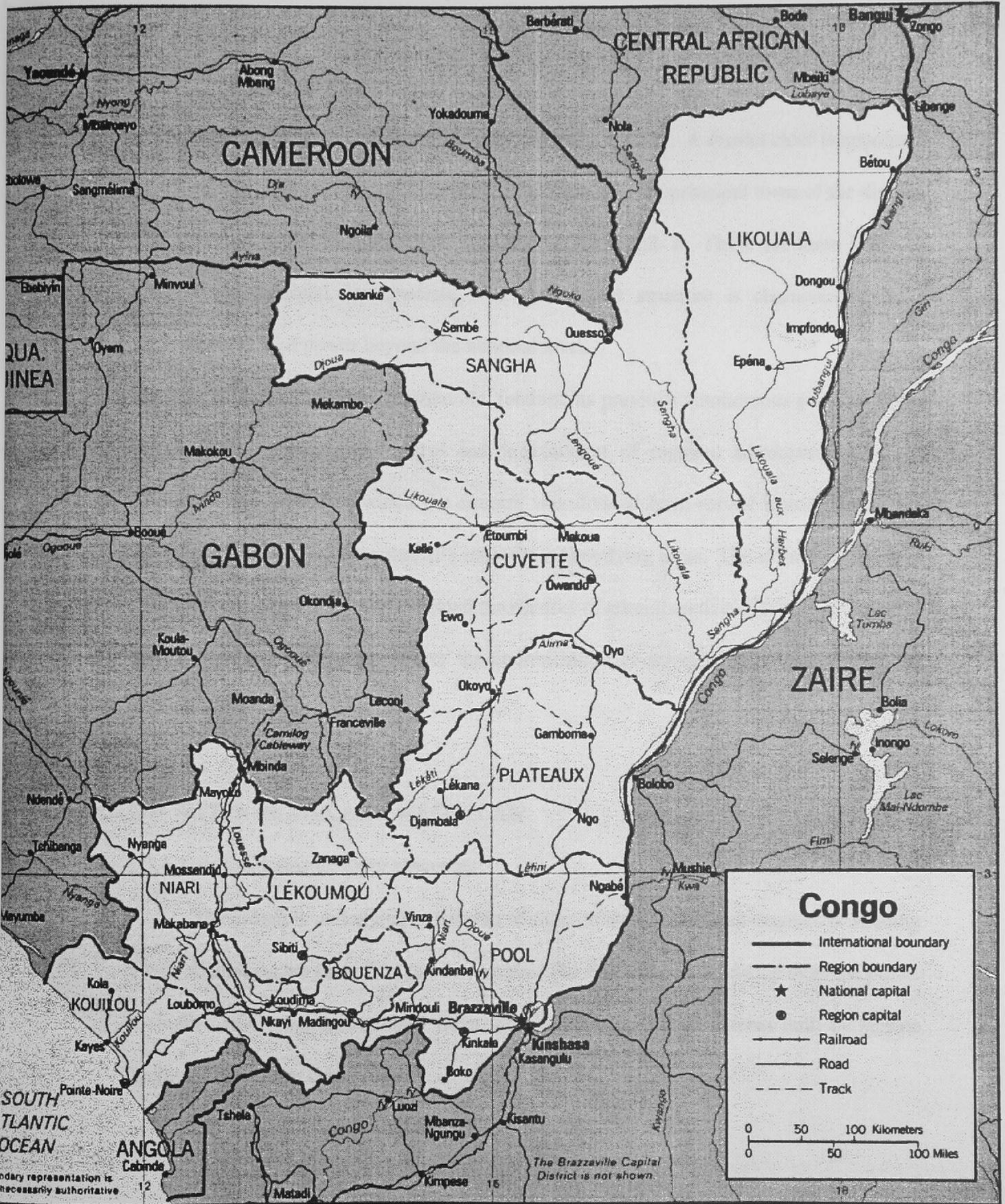


Fig.2.2- Administrative Divisions of Congo

prefecture to prefecture but totaled sixty for the entire country. A district chief is appointed by the central government, and his residence is located in the principal town of the district. The structure of the administration is shown in figure 2.2. a. There are three levels of government: national, intermediate, and local. The structure is characterized by a decentralization of power beyond the national level.

The nation's capital, Brazzaville, retained its previous autonomous position under direct central government control and independent of regional administration. The administrative units into which the country was divided have served historically as the extension of the central government's authority into outlying areas. The reduction of fifteen prefectures to nine prefectures lessened the number of administrative channels of authority and also served to increase further the centralization of governmental control over the population.

## 2-3- WATER RIGHTS AND WATER LAW

### 2.3.1 Juridical status of water resources

The principle underlying ownership of water resources is that all stagnant or running water, all streams are part of the public domain. The following are excluded from the public domain : rainwater, spring, well water, and watering points or cisterns built by private landowners on their own property.

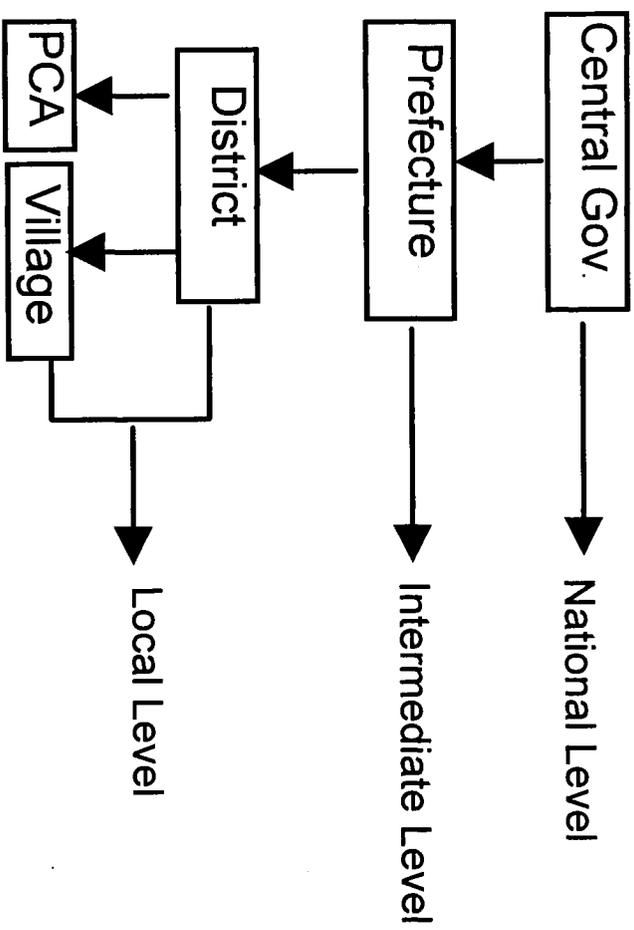


Fig.2.2.a - Congo Government: Administration

Furthermore, since groundwater is not mentioned as belonging to the public domain, it can be deduced that it comes not under public law but private law.

### 2.3.2 Mode of acquisition

Water belonging to the public domain cannot be acquired by private persons. In fact, public domain assets are inalienable and not subject to prescription although rights to the use of public waters may be acquired by acquiring permits for occupying the public domain. On the other hand water described as being private in paragraph 2.3.1 may be the object of transactions between private parties.

### 2.3.3 Water use authorizations

Concessions may be granted for the use of public water in homes, commerce, crop growing, industry in the manner and under conditions set by the council of Ministers. In fact, authorization to occupy public domain may be granted by decree of the Council of Ministers on the proposal of the Minister in charge of management of the public domain. Such authorization is essentially temporary, being revokable at any time in the public interest by decree of the Council of Ministers. No indemnity is granted in case of withdrawal of such rights except in the case of incomplete amortization of structures, the installations of which is deemed to be clearly in the public interest.

The duration of such permit or licences is established in each case by a special decree granting such authorization, but generally may not be for a period of over 20 years. Such authorization is granted only for erection of structures deemed to be definitely in the public interest, which require investment in the land that is both too large for amortization over a 20-year period and which will allow normal utilization of the works. The only valid reason for granting authorization for occupying public domain rivers or streams is for navigation purposes or for the erection of either warehouses, industrial or commercial plants or private facilities for which proximity to river banks is essential.

#### 2.3.4 Order of priority

There is no law expressly providing for the preference of one use of water over another, just as there is no text providing that certain zones have prior rights to others.

## 2-4 - LEGISLATION ON BENEFICIAL USES OF WATER

### 2.4.1 Domestic and Household uses

The Ministry of Energy and Water Resources is responsible for water supply. Within this ministry, the Division of Water Resources is responsible for administering and providing the supply of water as well as for the research, the impounding and distribution of water, and the regulation of and control over water distribution.

The National Water Society, a semi- governmental authority, is responsible for delivering drinking water to cities, towns. It is also responsible for the maintenance or extension of water supply network to all towns and cities. Rural centers with independent water supply systems, are controlled by the Division of Water Resources of the Ministry of Energy and Water Resources.

#### 2.4.2 Municipal uses

The Ministry for Public Works is responsible for land reclamation projects but it is the National Water Society which supplies water required for fire hydrants, for street washing and cleaning of slaughterhouses and for city sewage systems.

#### 2.4.3 Agricultural uses

Congo produces very few crops other than wood so that the law relating to the agricultural use of water is somewhat restricted in scope. Canals, dams and waterworks drawing on streams are part of the man-made public domain, and a permit to occupy the public domain must be required before using such water. On the other hand any landowner who for irrigation purposes wishes to use water to which he is entitled either under the civil code or by virtue of an administrative authorization may obtain permission to conduct such water over other holdings on condition that he pays in advance appropriate compensation to the landowner across whose land the water is conducted.

#### 2.4.4 Fishing

Sea fisheries are governed by more elaborate rules and regulations than are either freshwater fisheries or pisciculture. Only vessels fishing in territorial waters are required to obtain a fishing licence. However, the Minister for Water and forests is responsible for keeping an inventory of the biological resources of streams belonging to the public domain.

#### 2.4.5 Hydro-electric power

The Ministry of Energy and Water Resources is responsible for the production and distribution of electricity. On the other hand, the National Electricity Society is specifically responsible for power utilities, electrification of towns and cities.

### 2-5 - WATER RESOURCES INSTITUTIONS AND ADMINISTRATION

#### 2.5.1 At the National Level

Authority to issue permits to occupy public domain land is vested in the council of Ministers which does so by decree at the instigation of the Minister for the Public Domain. The Council of Ministers may also, if it is deemed in the public interest, revoke such permits at any time by decree.

The Ministry of Mines and Energy and Water Resources is responsible for water resources.

The Ministry of Water and Forests is responsible for the implementation of measures deemed necessary for the protection or improvement of matters relating to water; the conservation, development, reforestation, and administration of public domain forests and other forests not privately owned; the delimitation of reforestation or plant cover restoration districts and for all works projects connected therewith; the implementation of soil protection and restoration measures on cultivated land in terms of an overall policy of soil conservation; and the organization and surveillance of river fisheries.

The Ministry of Agriculture is responsible for experimentation in agricultural water management; for research and for executing or having executed under its control programs and projects for the utilization of water for agricultural purposes, in particular those for land reclamation, drainage and irrigation. But there is no law relating to agricultural water use.

#### 2.5.2 At the intermediate level

Congo is divided into nine prefectures, each under the authority of a prefect. Each prefecture is divided into several districts or subprefects each under a subprefect. At the regional level the functions of the ministry of water and forest are performed by prefectural services, i.e. in each prefecture the prefectural service of that ministry is responsible for maintaining an inventory of the biological resources of public domain rivers, promulgating regulations for the conservation of fish stocks and conducting research and experimentation on methods for increasing or improving fish stocks and enhancing pisciculture productivity.

### 2.5.3 At the local level

Each district of Congo consist of a rural community that has legal personality and is governed by a council, the decision-making body for all acts involving the property of the rural community. Some expenditures for which these rural communities are responsible are mandatory(e.g. water tanks and slaughterhouses). It is up to the head of the rural community to decide jointly with the council over which he presides on methods for the most suitable application of the funds available in terms of the council's budget. He works in collaboration with the subprefect who acts as a technical consultant.

The departments responsible of water resources administration in Congo are shown in figure

2.5. There are four departments responsible for water resources, all responsible to the President. Among them, only three are represented at the intermediate level: agriculture, work, and water and forest.

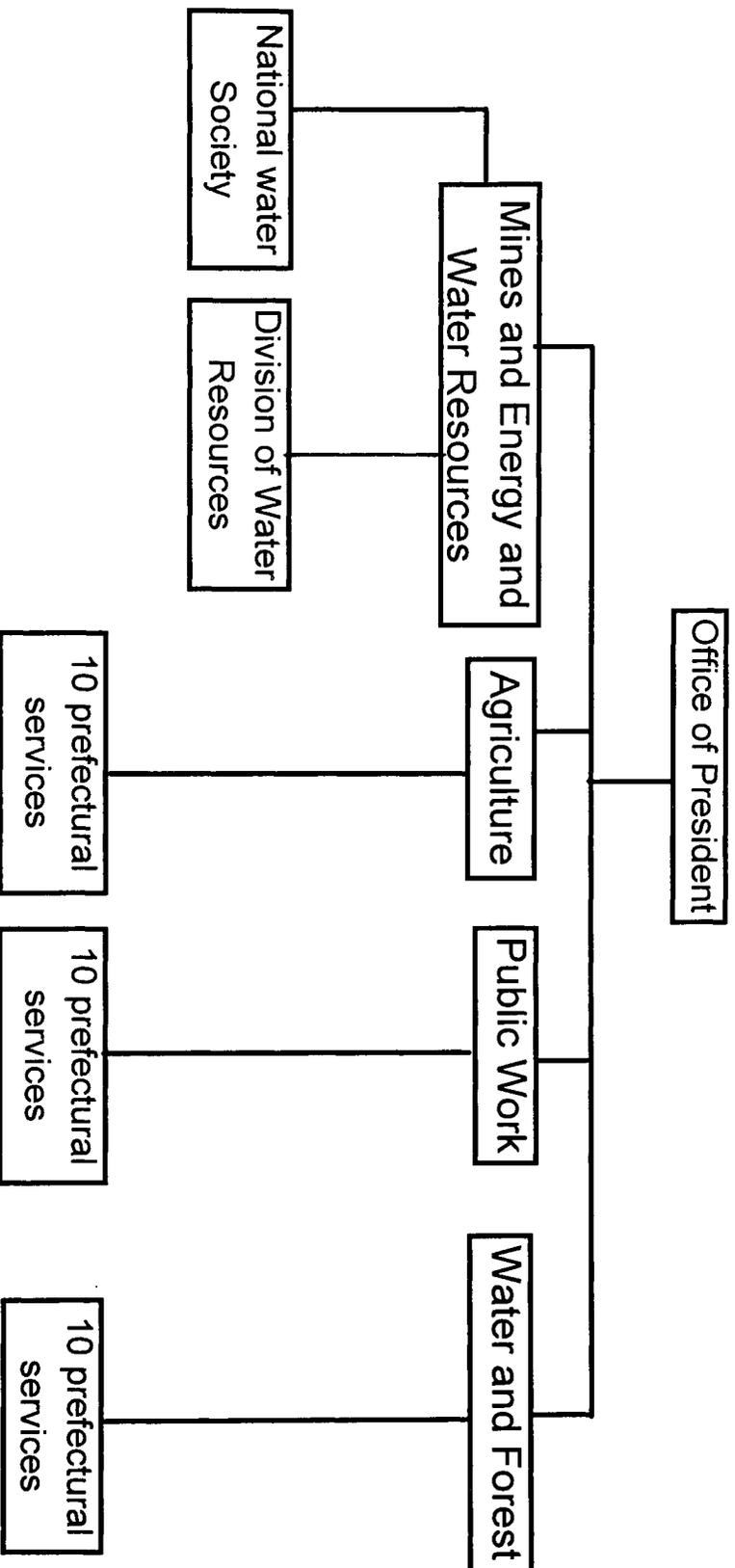


Fig 2.5 - National Ministeries and Intermediate Water Development

## 2-6- LEGISLATION ON WATER RESOURCES DEVELOPMENT FINANCING

### 2.6.1 Government financial participation and reimbursement policies

The Government of Congo has assisted in the financing of all water resources projects. It has unconditionally underwritten the loan concluded between the country and the African Bank for Development. It has also agreed to take all measures deemed advisable by the bank to ensure repayment to any other lending agency (including the immediate provision of any funds that be required) whenever there is good reason to believe that the funds available from the bank will not be sufficient to cover estimated expenditures for completing the project.

The government has contracted several loans from the Central Economic Cooperation Bank for water supply purposes and for the electrification of towns, cities and rural villages.

### 2.6.2 Water rates and charges

Annual taxes of one thousand franc CFA are levied on any public domain used for habitation, commerce, and industry. However, as an exception, and only provided it is found to be in the public interest, either total or partial exemption from such annual taxes may be granted. People recognized as disabled are exempted from paying this tax. These taxes are collected in advance by the public domain service and accounted for in the budget under the heading of "Income from the public domain" by the public domain service.

## CHAPTER 3

### WATER RESOURCES ADMINISTRATION IN THE UNITED STATES

One of the most durable and pervasive issues of the American constitutional order is the distribution of powers geographically. The federal system affects nearly every policy issue in America, ranging from issues such as national defense and medical care to the management of natural and therefore water resources. The present distribution of functions between levels of government closely affects state activity in water resources administration. Major responsibility for development of irrigation projects, floods control works has become federal--although this was not always the case. Certain parts of these programs are carried on cooperatively with local governments and, to a lesser extent, with some of the states. The states' concern has come to be primarily regulatory and, to a much lesser extent, research and development.

#### 3.1- Federal and State Governments Relationship

##### 3.1.1. Bureau of Reclamation

Of water institutions, none has been more important to the West than the federal Bureau of Reclamation. The federal government assumes responsibility for all irrigation projects in which it participates. It handles planning, design, construction and initial

operation and maintenance. Funds are provided initially by federal appropriation. Contracts based on charges for delivered water irrigation provide for repayment of capital costs without interest, based on the users' ability to pay. The contracts are with local governments, special districts, mutual and private companies, and private users. After a period allotted for "development" of a project. Local agencies may take over the operation and maintenance of certain parts of it--the distribution facilities but not the main reservoir.

Water from federal projects is acquired in accordance with state water rights laws. The Reclamation Bureau may use state research facilities--especially state colleges and universities for the analysis of problems encountered in planning and operating its projects. And the bureau and state water agencies may cooperate in certain basic data collection activities beyond that done by the state, under regular cooperative arrangements with the United States Geological Survey. General provisions, however, are as follows. Project plans must be submitted for review to the states in the drainage basin. The Governor of the state in which the project is located(or an appropriate state agency designated by him) must find the project to be economically feasible if it is to be authorized for assistance. The federal government will make loans available for the reimbursable portion of thr project (by Reclamation Bureau standards for reimbursability) and will make grants for the nonreimbursable portion. The local organization must finance all costs of acquiring lands, rights, and water rights.

### 3.1.2 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers conducts an extensive program of flood control and rivers and harbors projects. The flood control programs actually go well beyond flood control, as the reservoirs are usually multi-purpose. They may involve generation of power, provision of water for municipal supply and irrigation, and improvement of navigation. Consideration is given to the preservation of fish and wildlife and to recreational possibilities at reservoir sites. From time to time, federal flood control acts have added other activities to the Corps' responsibilities, such as participation in major drainage projects and in preparation of comprehensive river basin plans. The major flood control reservoir projects are entirely federal. For channel improvement, levee and other related local projects, non-federal interests (for practical purposes this usually has meant local governments--municipalities, counties and special districts) must provide lands, easements and rights-of-way, and provide for the moving of utilities. Local flood protection projects after completion are to be maintained and operated by non-federal (local) interests. The federal government controls all navigable waters, and the Corps of Engineers assumes virtually complete responsibility for the construction, operation and maintenance of major navigation projects as well as some of purely local or regional significance. In certain cases local contributions may be required.

It is difficult to generalize about relationships between states and the Corps of Engineers. Many states have no single, established policy in this matter and deal with new

problems, as they arise, by special legislation. In the majority of cases the states have passed enabling legislation that allows local governments to cooperate with the federal government.

In connection with planning or executing several major river basin projects, formally constituted coordinating committees have been established, composed of representatives of all interested federal agencies and the basin states. For example, the Missouri Basin and Columbia Basin Inter-Agency committees are voluntary, continuing bodies set up pursuant to resolutions by the Federal Inter-Agency River Basin Committee to effect coordination during the planning, construction and operating stages of water development and use. The committees can only recommend, but the procedures gives the states an opportunity to contribute to planning and coordinating programs on a continuing basis.

### 3.2- Interstate Water Resources Administration

The interstate compact has come into increasing use in the last quarter century to establish interstate machinery for administration of regional water problems. In the West the major interstate problem has been apportionment of water of interstate streams in connection with irrigation. In the East the emphasis has been on pollution and flood control. The basic apportionment of water between the states concerned is provided for in the compacts, either by actual amount or by establishment of an index to be applied to waters subject to interstate apportionment. The compact commissions are composed of representatives of the signatory states and presided by federal representatives who, as a rule,

do not have a vote. The participating states agree to make payments in lieu of taxes to local political subdivisions of any state in which are located reservoirs or facilities of another state.

The compact includes a number of bi-state agreements, and in one instance it provides for joint apportionment of a special water commissioner with authority to administer the water in two states.

In addition to interstate compact arrangements ,several joint state governmental agencies have been created by parallel legislation in groups of states. The best known of these is the Interstate Commission on the Delaware River Basin, commonly known as Incodel.

### 3.3-The States and Local Governments Relationship

Local governments--municipalities, counties and special districts-- have major responsibility for a number of important water functions. Public water and sewage systems are among the most important services provided by municipalities and special districts. Local governments bear the primary nonfederal responsibility for flood control structures such as levees. The Army Corps of Engineers develops major flood control programs as a federal function, and most local work is in cooperation with the Corps. Special districts generally are used to develop and maintain drainage facilities. In some instances this work is considered part of a Corps of Engineers-flood control project and is eligible for federal aid.

Provision of water for irrigation farming usually is by special districts or private companies. The special districts contract directly with the Bureau of Reclamation West of the Mississippi.

A number of other water resources activities likewise are the responsibility of local special districts: soil and water conservation, development of water supply facilities.

The local governments involved are responsible for financing, construction, operation and maintenance of projects and works under all of these programs. However, the state maintains a number of contacts with the localities. A state agency often is responsible for the formation and supervision of local special districts. The supervision may be primarily of a fiscal nature, but it also may involve continuing supervision of certain current operations. In addition to supervision, state agencies may provide technical assistance and guidance to special districts. Quite frequently a state agency, while giving no direct financial assistance, may cooperate in surveying, investigating and planning for projects. In a relatively few cases, the states provide direct financial grants or loans or assume part of the cost of constructing and, less frequently, maintaining local water resources facilities and projects.

## CHAPTER 4

### SOME REPRESENTATIVE WATER INSTITUTIONS IN THE UNITED STATES

#### 4.1 The Tennessee Valley Authority

The Tennessee Valley Authority was established by Act of the United States Congress in 1933 to help the people of a region put natural resources to work in overcoming deep-rooted problems of poverty and inadequate opportunity.

The major principles upon which TVA was based had long been known, but the uniqueness of TVA lay in its mission to develop the region's resources as a unified program, rather than as separate and competing entities. For the first time, water, land, minerals, and forests were seen as one interrelated set of opportunities for improving the living standard of a region's people.

In only six short decades, this striking concept of unified resource development has left an indelible mark on the Tennessee valley region and its people. From a predominantly agricultural region, the Valley has become a predominantly commercial and manufacturing region. From a land pocked with erosion where rivers constantly threatened destruction by flood along their banks, it has become a region of green pastures, expanding forest, and beautiful lakes. Its people have new opportunities for a secure and productive future.

Many of these changes were taking place elsewhere in the United States, but none were as pronounced as in the Tennessee Valley. Many factors of national scope had their influence on the region. None, however, was more profound than the revitalization of the region's natural resources and its effect on the life-style of the people.

#### 4.1.1 Origin of the Tennessee Valley Authority

The TVA is not only a unique experiment in government as well as an engineering feat of tremendous significance but also a unique water resource institution in the United States. It was established in 1933 as a public corporation owned by the federal government for the purpose of developing the water and other natural resources in the natural drainage basin of the Tennessee River.

The Tennessee River Basin covers an area of approximately 42,000 square miles and had a population of 2.5 million people prior to the establishment of the TVA. The area was one of general economic and social depression at the time and the federal government was interested in alleviating these conditions. The farmers living in the area were "originally of excellent British stock... practiced shifting cultivation of the type usually associated with primitive African tribes... Throughout most of the region debilitating diseases like malaria and hookworm were common"(Huxley, 1943, p.10). The prevailing situation in the Tennessee Valley region prior to the establishment of the TVA hardly differs from what obtains in most underdeveloped countries today. The area was subjected to disastrous floods

from the uncontrolled waters of the Tennessee River. There was extensive soil erosion caused by farmers stripping forest cover for timber in an area of heavy rainfall. Without the forest cover, the soil lost its fertility very quickly as large amounts of good topsoil were washed away downstream. Further discussion of the social and economic conditions prevailing in the area of the TVA prior to 1933 can be found in Ransmeir(1942). President Roosevelt, in his message to Congress on April 10,1933, remarked that it was time to extend planning to a wider field, in this instance comprehending in one great project many states directly concerned with the basin of one of our country's greatest rivers (House Document, 1933). He suggested that the TVA should be charged with the broadest duty of planning for the proper use, conservation, and development of the natural resources of the Tennessee River drainage basin and its adjoining territory for the economic welfare of the nation (House Document, 1933).

#### 4.1.2 The TVA Act of 1933.

The TVA Act of May 18, 1933, was a response to conditions then existing in the Tennessee Valley region--idleness of investment, unemployment, exploitation, neglect, inefficiency, and waste. More than a remedy, it was a significant step in a national move toward a wider use of resources. It was evidence of the determination, in the national interest, to help a region discover its potential and begin to realize it.

TVA was a new approach, a new idea, toward developing the resources of a region. Its broad goal was not simply the limited objectives of producing and distributing power and producing and selling fertilizer, but the physical, economic, and social development and improvement of the whole area.

The TVA Act provided a general, but clear-cut assignment, to develop the Tennessee River for navigation, flood control, and power, leaving the details in an atmosphere of reasonable autonomy granted by Congress to the TVA Board of Directors.

TVA would plan its programs with respect to the people of the region. Planning would be loose and flexible, resting upon mutual consent and voluntary cooperation to achieve results in action. Implicit in the act was the philosophy that TVA would do its job in a spirit of partnership with the people of the Tennessee Valley region.

In addition, the act was based upon the policy of regional decentralization of resources development functions, and located the offices of TVA within the region. TVA would be a region Federal agency that lived where it worked.

The relationship between land and water resources was recognized in the statute-- that poor water use could interfere with the proper use of land, and improper use of land could interfere with effective use of water; and that the proper development of one would aid and support the proper development of the other.

The act authorized the use and improvement of the fertilizer plants, and provided both for experiments in the production of improved fertilizers and in the use of new and improved processes, and for plant scale demonstration of those products and processes.

Finally, the act laid down the fundamentals of a public power program. TVA would establish a comprehensive Federal public power policy for a region based on service to “preference” customers at low rates using publicly-owned facilities and operated on business principles.

#### 4.1.3 TVA Organization

The Board of Directors, under the TVA Act, is vested with all the powers of the Corporation. The Board establishes general policies and programs; reviews and appraises progress and results; approves projects and specific items which are of major importance, involve important external relations, or otherwise require Board approval; approves the annual budget; and establishes the basic organization through which programs and policies are executed. The organization of the TVA is shown in Figure 4.

The General Counsel advises the Board on legal matters. He, or the representative he designates to act in his absence, serves as Secretary to the Corporation.

The General Manager is the principal TVA administrative officer. He serves as liaison between the Board and the offices and divisions in the handling of matters of Board concern, and is responsible for coordinating the execution of programs, policies, and

decisions which the Board of Directors approves or adopts. He brings before the Board matters which require its consideration or approval; assists the Board in presenting the TVA budget to the Office of Management and Budget and to Congress; affirms to the Board the adequacy of staff coordination and contribution in matters presented for its consideration, including judgments relating to broad public consequences, social and economic effects, and planning and program direction.

The General Manager assigns duties and makes delegations to the TVA offices, divisions, and staffs in their execution of programs and policies which the Board of Directors adopts, subject to such controls as it may establish. He provides for the formal definition and communication of TVA programs, policies, procedures, and continuing delegations of authority and responsibility.

The office of the General Manager includes the Planning Staff, the Information Office, the Equal Employment Opportunity Staff, the Washington Office, the Power Financing Officer, and such other assistants as the General Manager may require to perform specialized duties or to aid him in expediting, coordinating, and disposing of current business.

The Office of Agricultural and Chemical Development formulates, recommends, and carries out plans, policies, and programs for research in and development of experimental new and improved forms of fertilizers and process for their manufactures; for testing and demonstrating the value and best methods of fertilizer use as an aid to soil and water

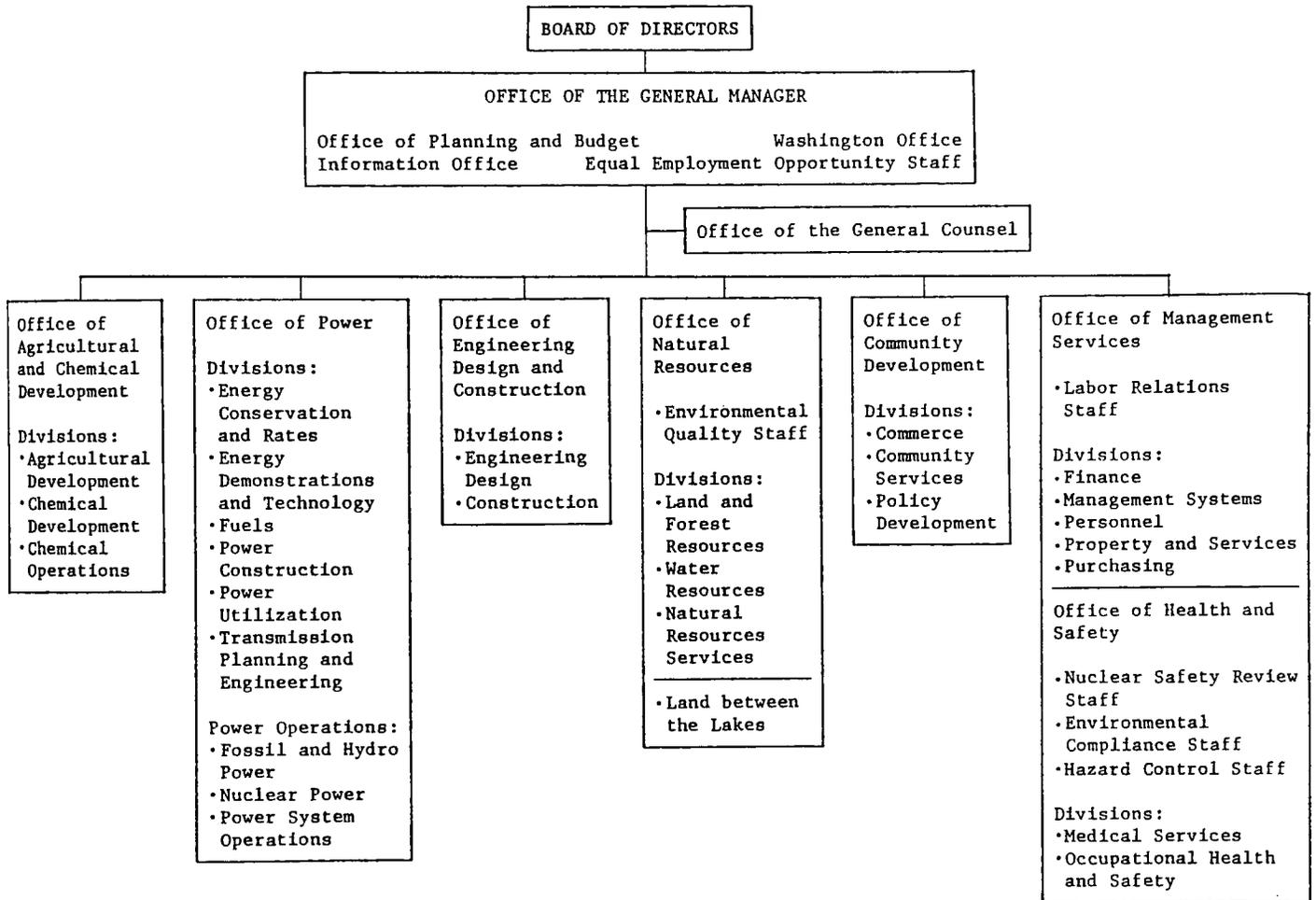


Fig.4.0- Organization of the Tennessee Valley Authority 1979

conservation and maintaining facilities to serve as a national laboratory for the dual purposes of research in chemistry and chemical engineering in the development and production of experimental fertilizers and the design and testing of improved manufacturing processes.

The Office of Engineering Design and Construction participates in the planning and provides or obtains the architectural treatment, engineering design, and construction of all permanent structures and permanent engineering works which are authorized to be built in the TVA program, in accordance with the requirements determined by the offices and divisions having program responsibilities for such structures and works, except for power transmission, distribution, and communication facilities and switch houses at substations not adjacent to generating stations; and provides other engineering, architectural, and construction services as feasible and economical.

#### 4.1.4 TVA as a Model Water Institution

The TVA is transplantable with reservations and qualifications; its characteristics merely help to bring out the problems and to suggest alternative solutions. Efforts have been made in various parts of the world to duplicate the TVA's success in regional development through water and natural resources management. These efforts could benefit from a better understanding of the TVA experience. The engineering aspects of river and other types of development are relatively well understood. But the economic, social, and

administrative dynamics of development are much less understood than, for example, the problem of sending a man to the moon (Robock,1967). The TVA model can be proposed for Congo. The prevailing conditions in the Tennessee Valley then were typical of what today is called the colonial economy of an underdeveloped country (Martin, 1956). Congo is interested in regional development with water control and development at the center of a comprehensive program of natural resource development. This is the sort of activity that the TVA has been doing well for almost sixty years.

There are certain characteristics which make the TVA unique as a water institution. First, is the nature of the organization itself, as a public "corporation clothed with the power of government but possessed of the flexibility and initiative of a private enterprise" (Pritchett,1943, p.222). This was President Roosevelt's message to Congress on the subject of the TVA. Although the TVA operates in the states, it is not politically influenced by them. This insulation from state and local politics is an important characteristic of the TVA which an agency in Congo modeled after the TVA should have.

Second, planning and execution are consolidated in a single agency, and both are subject to a single management.

For a variety of reasons, these principles-- unity of management and the relationship of planning to execution-- so familiar to TVA people, are difficult to achieve in most underdeveloped areas. In these areas there is a shortage not only of technical skills but more critically of management skills. And there is a shortage of capital. As a result, the decision-making process tends to become diffused and actions are frequently taken on a piecemeal basis. (Olivier, 1967, p.38)

It is important that a water institution modeled after the TVA should possess the powers to formulate its own policies and programs, including the capability or administrative skills necessary to implement these policies and programs. Training is expected to be an important component of a TVA counterpart in Congo.

Third is the administrative philosophy of the TVA which is one of extreme decentralization and its grass roots approach to development. "The effectiveness of an organization (given competent people as an indispensable foundation) is strongly influenced by the philosophy and the managerial concepts which give it direction" (Olivier, 1967, p.43). The TVA's decision to cooperate with and work through local organizations whenever possible, rather than compete with them, actually contributed to its effectiveness and general acceptance of the TVA idea throughout the Tennessee Valley region.

Finally, a model water institution patterned after the TVA must strive for professionalism. The TVA had earned a reputation for sound work in many different disciplines, and the initials "TVA" have become a generic term to represent any kind of comprehensive development program (Olivier, 1967). The TVA was created to solve development problems. This it did by operating in an environment in which its trainees, workers, and administrators, largely free from political constraints, were best able to contribute to the development of the valley.

## 4.2 The State Water Institutions of Louisiana

### 4.2.1 Physical setting

Geographically, Louisiana is located roughly between latitudes 29.5 degrees North and 33 degrees North and from the 94th meridian eastward to the Mississippi River as the northern part of that boundary and to the Pearl River as the Southern part. Elevation ranges from sea level in the coastal areas to over 500 feet above sea level in the hills of the northwest. The total area of the state encompasses 48,523 square miles, ranking it thirty-first among the states. This area consists of 45,106 square miles of land and 3,417 of water.

Mean annual precipitation ranges from 46 inches in Caddo Parish in the north to 66 inches in parts of the south, with a meridian of approximately 56 inches. The average annual temperature varies from 66 degrees F in the north portions of the state to 69 degrees F in the southern parts. Of the southern states, only North Carolina contains more live saw timber. The production of lumber, pulp, and forest products ranks as one of the state's major economic activities.

Louisiana has been fortunately endowed with ground and surface water resources. However, the popular idea that Louisiana has water is simply not true. Although Louisiana is considered to be a "water-rich" state, there are several areas where little or no fresh ground water is available.

#### 4.2.2 Water Situation

Louisiana has historically been regarded as a water-rich state. Water rights have provoked minimal litigation in Louisiana, and the state's legislators and bureaucrats have only recently attempted coordinating the development and protection of water resources and regulating the use of water. Benign neglect may be justified if there is abundant water for all- and Louisiana probably contains more than enough water to meet its foreseeable needs. But that water is not evenly distributed: in some areas, water is not readily available, particularly when quality requirements are taken into account. One study published in 1952 indicated some concern on the part of industrial business and farmers that state water policy could not assure a sufficient water supply in the future. Indeed, data indicate the future will bring sporadic water shortages in portions of the state.

In fact, many studies discovered actual and anticipated potential water problems in several parts of the state. The most pressing problems have related to groundwater. A number of these studies centered on the Baton Rouge area and surrounding parishes and indeed eventually led to legislation establishing the Capital Area Groundwater Control Commission, which has been, to date, Louisiana's most comprehensive management approach to either ground or surface waters.

Southwestern Louisiana has also received considerable attention in this area. Several monographs have identified salt water encroachment in that area of the state as an ever-present, if not immediate danger. Another potential threat to Louisiana water supplies would

be a political one; e.g., there have been periodic suggestions that Mississippi River water be used to replenish the declining Ogallala Aquifer, which provides irrigation water for the high Plains of Texas. In response to these suggestions, empirical work has been done to determine whether and under what circumstances such a diversion would be a threat. But, for the foreseeable future it seems that the "threat" is moot because the countermeasures are economically infeasible.

Satisfactory solutions to a number of the problems identified in the above mentioned studies may exist within the present framework of Louisiana water law. However, a number of other states which either have suffered water shortages, or in which water shortages have been projected, have found specialized legislation necessary for more control over the use of water and for better coordination of water resources planning. The Louisiana state is governed by two types of water laws: riparian and prior appropriation.

#### 4.2.3 State Water Law

The water law of Louisiana is in the first instance derived from the French and Spanish sources that were the foundation of the Louisiana Civil Code. But those articles of the Civil Code have been developed through judicial interpretation in a process more akin to the common law than to the civilian treatment of precedent in Europe. The process of judicial development is specially apparent in the development of oil and gas law in Louisiana, a matter of significance for groundwater law as the Louisiana Mineral Code is

now expressly made applicable to subterranean waters. The Civil Code articles had only the most general application to oil and gas, but the courts of Louisiana used the Civil Code to create a body of law that may be said to be *sui generis*. The judicial precedents were codified in the Louisiana Mineral Code enacted in 1974.

#### 4.2.4 Surface Water Law

Surface water rights are governed under two general regimes: riparian and prior appropriation. The riparian regime is followed by states east of, or bordering on, the Mississippi River, although the doctrine has been modified by statute in several of those states. These eastern states have usually enjoyed an adequate water supply. The drier western states, on the other hand, developed the regime of prior appropriation, the basic premise of which is that one who makes an actual decision of water acquires a vested right to use it-as long as the water goes to a beneficial use. The right is transferable and perpetual unless abandoned, and separate from the land on which the user is situated. It pertains to a specific quantity of water. It is superior to all later rights to the save supply. Hence, a drought may force junior appropriators to cease drawing water in deference to senior appropriators. The doctrine does not require that an appropriator own the land at the point of diversion, and the diverted water need not be used on riparian land.

Riparian rights are of more ancient origin. They existed in Roman law in somewhat the same form as we know them today. The term "riparian rights" includes a bundle of rights.

The traditionally recognized riparian rights include those:

- (i) of access to the water;
- (ii) to build a wharf or pier into the water;
- (iii) to use the water without transforming it;
- (iv) to conserve the water;
- (v) to acquire accretions (alluvium); and
- (vi) to own the subsoil of non-navigable streams and other "private" waters.

In a riparian state, the water right is "part and parcel" of the land that borders on or contains a watercourse. The right is either to enjoy the watercourse's undiminished natural flow or its flow as diminished by upstream users' reasonable uses. Hence, riparian rights states were often distinguished as either "natural flow" or "reasonable use."

In Louisiana, riparian rights are listed under the civil code articles 657 and 658 provides as follows:

The owner of an estate bordering or running water may use it as it runs for the purpose of watering his estate or for other purposes.

The owner of an estate through which water runs, whether it originates there or passes from lands above, may make use of it another direction and is bound to return it to its ordinary channel where it leaves his estate.

If the water does not run, then these Civil Code articles do not apply. Hence, a riparian along a non-running water body may be prevented from putting his water to beneficial use.

#### 4.2.5 Groundwater Law

##### 4.2.5.1 Louisiana: "an absolute ownership" state

Traditionally, groundwater has been divided into two legal categories: underground streams and percolating waters. The former have been generally subject to the same legal regime as surface water, either riparian rights or prior appropriation. Underground streams are presumed to have the same characteristics as surface streams, i.e., a bed, banks, and a more or less defined channel of water. On the other hand, percolating waters are said to "ooze, seep or filter, through the soil beneath the surface, without a defined channel..." But because of the difficulty of proving that a stream exists, underground waters are presumed to be percolating absent a showing that the water is flowing in an underground stream. Because such showing seem to be rare, the law deals only with percolating waters.

There are several articles of Louisiana's Code which might relate to property rights in groundwater. Article 490 provides:

Unless otherwise provided by law, the ownership of a tract of land carries with it the ownership of everything that is directly above or under it. The owner may make works on, above, or below the land as he pleases, and draw all the advantages that accrue from them, unless he is restrained by law or by rights of others.

Article 490 reflects the maxim *cadges est solum ejus est usque ad coelum* which is consistent with the absolute ownership rule. One apparent limit is imposed by Louisiana's incorporation of the *sic utere* principle in article 667:" although a proprietor may do with his estate whatever he pleases, still he cannot make any work on it, which may deprive his neighbor of the liberty of enjoying his own, or which may be the cause of any damage to him.

#### 4.2.5.2. Alternate approaches to Groundwater

If the present rule is unsatisfactory, it can be modified by the legislature. In fact the rule has been effectively changed in five parishes of Louisiana. The one agency in Louisiana that currently has significant, although to an extent inchoate, powers over the use of groundwater is the Capital Area groundwater Conservation Commission. It has jurisdiction over a five-parish area (East Baton Rouge, East Feliciana, Pointe Coupee, West Baton Rouge, and West Feliciana) and has the power to expand into neighboring parishes. The commission has power to control the spacing of wells and the volume of pumping in certain situations. It has the power to set groundwater use priorities. In fact, in the parishes within the boundaries of the commission, the applicable legal regime is no longer "absolute ownership" but rather "correlative rights," albeit correlative rights as determined by an administrative agency. This agency might serve as a model for a statewide agency or as a model for other regional commissions.

Certain uses of groundwater in the Capital Area District are exempt from the regulatory provisions of the statute: wells with a total depth of less than four hundred feet, wells in the Mississippi River alluvial aquifer, wells used “exclusively for bona fide agricultural or horticultural purposes or for domestic use of persons resident upon the same premises and capable of producing not more than fifty thousand gallons per day.

#### 4.2.6 State Water Agencies

Jurisdiction of Louisiana state agencies over water is quite fragmented. Some agencies have jurisdiction over the entire state while others are for special drainage areas or groundwater areas or are local in nature.

Perhaps the most significant agency with water jurisdiction is the Department of Environmental Quality. This department was created in 1983. It is to "have the regulation and the control over matters pertaining to the protection of ...water quality...". The principal responsibility within the Department for enforcement and administration of the water control laws and the regulation of discharge of waste materials, pollutants and other substances into the waters of the state lies with the office of water resources. Louisiana has not assumed primacy under the federal Water Pollution Control Act.

The Department of Transportation and Development is the Louisiana agency with primary responsibility for flood and drainage control, reclamation, water resources, soil conservation and related functions. Water well drillers are licensed by this department. The

department has promulgated comprehensive regulations for the location, drilling, and operation of water wells for protection of the public health.

The Department of Natural Resources has several offices responsible for regulations that have an important impact on water resources in Louisiana. The Office of Mineral Resources is the agency authorized to grant leases of state land for oil and gas development. The commissioner of Conservation, who heads the Office of Conservation, is charged with regulation of all phases of oil and gas development within the state. The Office of Coastal Restoration and Management performs the functions of the state relative to conservation, development, restoration and enhancement of the state's coastal wetland resources.

A variety of special bodies have been or can be established under state law that regulate water resources. There are a number of Levee and Drainage Districts and Water Conservation Districts which have taxation and expropriation power in many instances and have authority to undertake such projects as building dams and levees. Such districts are established by specific statutes; for example Lafourche Basin Levee and Drainage District. The projects of such districts are carried out by the Department of Transportation and Development. Irrigation districts, waterworks districts, and gravity drainage districts may be established by parish police juries.

There is one special purpose district worthy of note. It is the Capital Area Groundwater Conservation District, established in 1974. It is to provide for the efficient administration, conservation, orderly development and supplementation of groundwater

resources in a five parish area around Baton Rouge. It is governed by a fifteen member Commission. Unlike most other authorities of the state, the district does have the power to restrict the uses of groundwater by landowners within the district

## CHAPTER 5

### A COMPARISON OF WATER RESOURCES ADMINISTRATION:

#### THE UNITED STATES AND CONGO

##### 5.1 A general comparison of water resources administration systems

In most developing countries such as Congo, water resource administration is dominated by one level of government--the national government. The resulting lack of functional roles by lower levels of government means that the focus of the administration is far removed from the locus of the water resources problems. This distance is one of the major causes of ineffective administration of water resources found in Congo and other Third World countries. Although existing Third World political or government units are well-suited for performing the broad, general, non-specific administrative functions such as formulating water rules, policies, and decisions, and funding water projects and programs, they are ill-suited for the specific functions associated with providing the myriad of water services which require technical expertise and skills. Consequently, specific water problems are never resolved by these national government bodies; moreover, the quality of water service delivery at the local level remains undesirable. The greatest impact on the welfare of the people occurs at this local level of service delivery, and it is also at this level that the weakest institutional arrangements exist for dealing with water problems in Congo.

Congo today has no multilevel organized system of water resources administration to manage its water resources. No government prior to Congo's independence had succeeded in teaching Congo to regulate its water resources. All previous governments followed the nationally controlled administration water rights used in France.

In contrast in the United States today, water resources administration is not the monopoly of any one group or level of government. Instead, it is a cooperative effort among three levels of government and private individuals. At the national level, broad water policies are formulated and assistance is provided to the states in the execution of their various water programs. The intermediate level is actually where most of the planning, development, and regulation of water use is accomplished. Implementation of water policies is then carried out at the local level, focusing on the delivery of water services, which has the greatest impact on the economic and social well-being of the people. There is even in addition a separate branch of government at this level as far as water resources administration is concerned, the water district, which is responsible for the provision or delivery of essential water services to consumers. These special districts are organized to deal with specific public problems interests. These special water districts--irrigation, reclamation, flood control, water supply, and others--are the ultimate agencies responsible for the development and administration of water resources in the United States, performing the important task of providing essential water services to the consumers.

### 5.2 A comparison of water resources administration at the national level

At the federal level of organization, although water resources administration in the United States and Congo are both responsible for national planning, development, data collection, research, and financial assistance to the intermediate level of government. It would be expected that the water resources responsibilities of the administrative organizations in the United States and Congo are not comparable. While federal agencies in the United States have the capabilities and do perform the technical aspects of their responsibilities, in Congo the national administration does not perform similar technical functions. Also there are no Congolese national agencies to do the same tasks as American agencies do. In Congo national water planning is a fictitious exercise because of unreliable data which, in turn, is due to the lack of funding. For example, the fiscal policy of Congo is to pay for every water resource development project, including operations and maintenance costs. The policy of the United States calls for costs-sharing between the federal government and the beneficiaries.

### 5.3 A comparison of water rights and water law at the intermediate level

At the intermediate level water rights and water law should play a significant role in the administration of water resources. Since the federal government of the United States maintains a policy of delegating primary authority and responsibility for water resources administration to the various states, it is at the state level that water rights and water laws are

established. As an example, as we have seen in chapter 4, two doctrines underlie the system of water rights and laws in Louisiana. One is the doctrine of prior appropriation, and the other is the doctrine of riparian rights. These two doctrines form different approaches to the allocation of water in different geoclimatic conditions. The eastern part of the state adopts riparian rights, while the western part of the state applies prior appropriation concepts. Thus, at the state level, Louisiana was entitled to adopt its own system of water laws over waters arising within its jurisdiction but not to conflict with federal laws. Consequently, there are significant variations for quantity control of surface and groundwater among the states. While the evolution of state water quantity laws was simple and direct, states' water quality control laws are more uniform, however, and follow the pattern set by federal legislation. These laws are a consequence of geoclimatic conditions, source of supply, need, and reflect the varying states of technology that existed at the time that pressure was exerted on the resource.

In Congo, there are no established water rights or water laws to deal in matters of water resources administration at the intermediate level. The Congolese national government merely reacts spontaneously to try to solve water resource problems. There is no plan or law. The government tries to solve problems when they occur. The country follows its former colonial ruler in matters of administration in general and water resources in particular. As in France, there are no legislative provisions establishing a general order

priority between different water uses, water areas or existing water rights. Consequently, Congo does not have order of priority for water.

#### 5.4 A comparison of intermediate level organization systems and water control

##### 5.4.1 State administrative organization

In the United States all intermediate state agencies perform more or less the same functions of water administration. These functions are water quantity control, water quality control, and planning and development of water resources utilization.

The differences in these agency organizations are partly due to different approaches in performing their functions. Three model types of organization have been recognized, and within each model type there are variances due to subtle differences in the approach to water resources administration in the particular state concerned. These variances reflect the degree of interagency cooperation or coordination in performing the water functions (Radosevich and Skogerboe, 1978)

##### 5.4.1.1 State Model Type A: Basic Agency

In this model, since planning and development of water resources at the state level are practically non-existent, each individual water user is responsible for his own planning and development of water resources. Originally all state water organizations belonged to this type, with separate agencies responsible for water quantity and quality functions. This basic

agency model would not be appropriate in Congo because the whole field of water resources is the exclusive prerogative of the national government.

#### 5.4.1.2 State Model Type B: Independent Agency

In this model there are distinct or independent state level agencies performing each of the three major water functions which are the water quality, water quantity, and water planning and development. The degree to which these agencies interact in the performance of their duties can be classified as follows:

1. Type B1: no coordination and limited cooperation among functional agencies; similar  
To type A
2. Type B2: with some form of liaison or informal cooperation among functional  
agencies
3. Type B3: formal coordination among functional agencies generally achieved by the  
establishment of standing committees, commissions, or interagency boards.

Most of the state water organizations in the United States follow this model. In Congo, there is currently no state agency organization; the type B3 model, which is used in Louisiana, could be a starting point for Congo if the central government delegates primary responsibility and authority to the prefectures for the administration of water resources within the prefecture.

#### 5.4.1.3 State Model Type C: Integrated Agency

Since the impact on the development of resources on each other and on the environment generates unwanted consequences, the current tendency or trend in state administrative organization is towards integration of all water functions and ultimately all resources management under one umbrella agency. The integrated administration of all water functions under one agency is found in only two states so far: California and Washington. These two states have actually re-organized to integrate the control of all natural resources. This reorganization type C1 for California is shown in figure 5.2 and the type C2 for Washington shown in figure 5.1 are both under one administrative agency with subdivisions or departments for water resources (Radosevich and Skogerboe, 1978). In Congo there is no structure similar to this integrated agency.

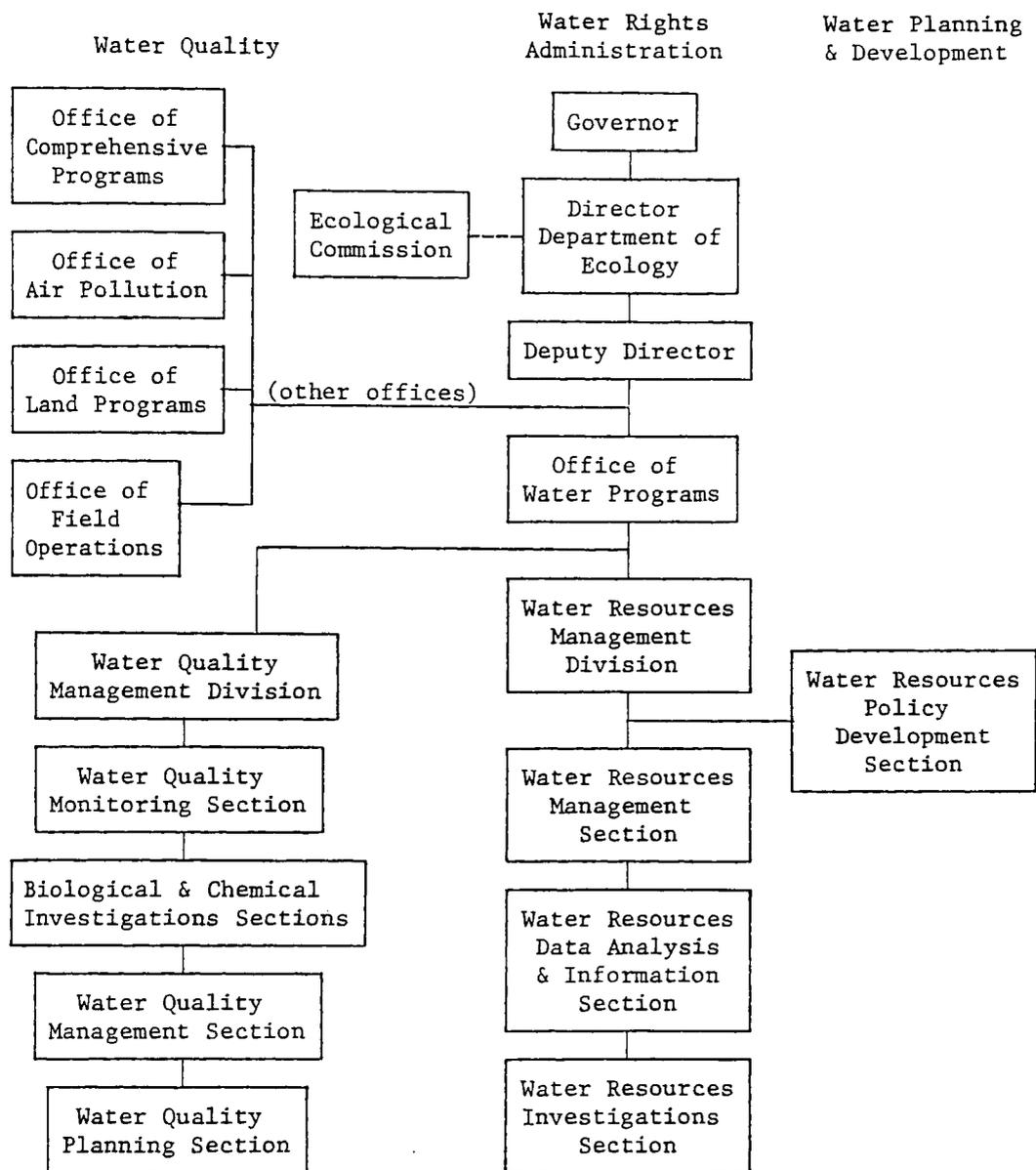


Fig. 5.1- Washington Water Agencies and their Functions

Water Quality & Water Rights Administration

Water Planning & Development

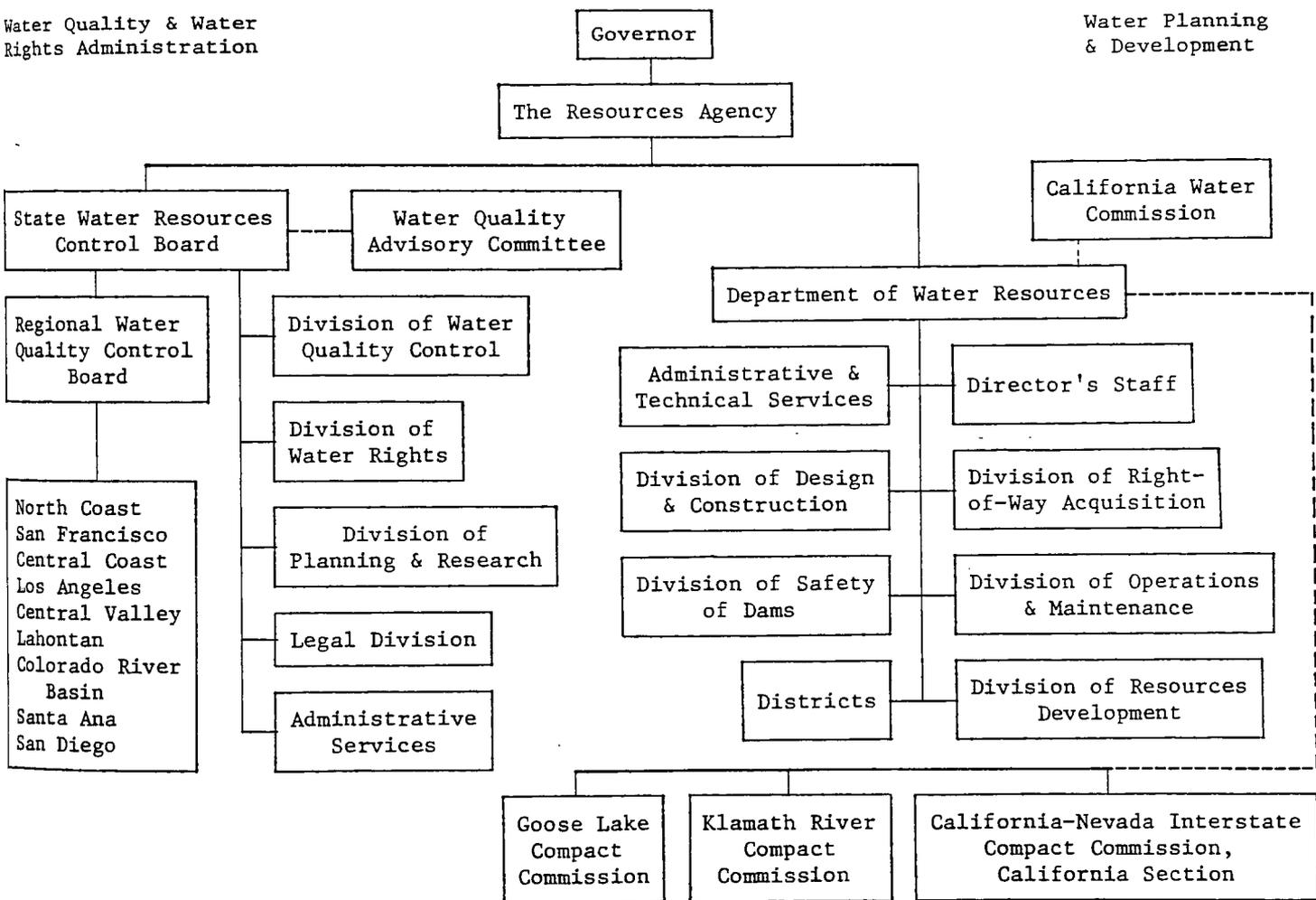


Fig. 5.2- California Water Agencies and their Functions

#### 5.4.2 Louisiana administration of water rights

Louisiana has no state structure or system for administering private water rights. This is understandable since it appears that most water use is not pursuant to individual rights in the stream but is accomplished through sale and distribution of water by agencies authorized to develop water supplies for various uses. Louisiana appears to have no administrative structure to aid in the resolution of water use conflicts between individual claimants. Water disputes, whether involving conflicting claims of rights to use water, or whether involving activities which impair wells or spring flows, or whether involving rights to drain or obstruct drainage flows, have been resolved by the courts. On the other hand, Congo does not have problems related to water rights because there are no established water rights.

#### 5.4.3 Louisiana administration of water control

##### 5.4.3.1 Water quality control agency

The Louisiana Stream Control Commission was established in 1940, and the statute authorizes the commission to control pollution of the water of the state, including rivers, streams, lakes, and all other water courses, within the state or on its borders, including the Gulf of Mexico.

#### 5.4.3.2 Other Public Water Agencies

Aside from the stream control commissions as mentioned above, the other state agencies and entities dealing with water are:.

The Department of Transportation and Development which is the Louisiana agency with primary responsibility for flood and drainage control, reclamation, water resources, soil conservation and related functions. Water well drillers are licenced by this department. The department promulgates comprehensive regulations for the location, drilling, and operation of water wells for protection of the public health. The Department of Natural Resources which has several offices responsible for regulations that have an important impact on water resources in Louisiana. The Office of Mineral Resources is the agency authorized to grant leases of state land for oil and gas development. The Commissioner of conservation, who heads the office of conservation, is charged with regulation of all phases of oil and gas development within the state. The Office of Coastal Restoration and Management performs the functions of the state relative to conservation, development, restoration and enhancement of the state's coastal wetland resources.

Louisiana provides a constitution and statutes for a number of entities which have important water resource responsibilities. In Congo, the administrative control of water quality does not exist. The Department of Health supposedly controls the quality of water quality; however, the adoption of socialism in Congo never allowed certain state services to make public charges or to control other departments.

### 5.5 A comparison of water agencies at the local level

The local water agencies or water districts number in the thousands in the United States. They are the primary mechanism for the delivery of water. They also control substantial amounts of water resources which may be used for recreational purposes. They have vested legal rights to a very substantial portion of the developed water supplies in the United States. Because of the strategic position that they hold in the total water resources system, they must be taken into account in the development of effective water policies, programs and plans.

In the United States, local water agencies which deliver water directly to the consumer have a vital link within the water resource system and play a critical role in the total planning process. The planning activities and the decisions of these organizations have a direct effect upon the quantity and quality of water that will be available to meet future needs. Similarly, the effectiveness of more comprehensive plans for water resource development, preservation, and utilization is dependent to some extent on the activities of local agencies. In the United States, water planning from the perspective of the local water agency is a significant component of the understanding of the total planning activities present in the water resource system and an important source of information relevant to the calculation of the probable effectiveness of more comprehensive planning efforts upon the actual operation of the water supply system (Radosevich, 1978, p.229)

On the other hand, Congo is characterized by a very low level of performance in the delivery of essential services. In Congo water supply is an activity only in the big towns. The activities in the rural areas do not exist because the low income of people in these area does not allow them to pay their bills. There is no doubt that this is also the level where the greatest positive impact on the welfare of the people of Congo can be achieved if the necessary corrective measures are applied.

#### 5.6 Considering the United States experience in water resource administration for Congo

The United States has had a long and diversified history of water resources development and administration. The successes and failures, strengths and weaknesses of the United States system of water resources administration, which has been operating continuously for over one hundred years, have been examined and are well-documented (Ostrom, 1971, p.vi). Developing countries, such as Congo, can learn a great deal from the history of strategies and tactics of water resources administration in the United States. Each conceivable idea has been tried in the past and the current practice is the result of a long process of distillation of ideas and practiced procedures. As a developing country, Congo has neither the time nor the resources to experiment with systems of water resources administration. Consequently, Congo could learn from the United States experience and try to adopt the more successful aspects of the various models which have emerged in the United States..

There are several reasons why the experience of the United States is relevant to Congo. Many water consumers in the United States, especially in the Tennessee Valley region, have experienced water administration conditions similar to what the people of the developing countries are experiencing today. Prior to the establishment of the Tennessee Valley Authority, the farmers living in the region practiced shifting cultivation of the type usually associated with primitive African tribes. Throughout most of the region debilitating diseases like malaria and hookworm were common (Huxley, 1943, p. 10). The subsequent virtual elimination of few water-related diseases such as typhoid fever, amoebic dysentery, infectious hepatitis, and schistosomiasis, has been attributed to successfully administered community water supply and wastewater disposal programs (figure 5.4). The figure 5.4 explains that when the introduction of number of water supplies increase, the number of deaths among the population decrease due to amelioration of health conditions. These diseases have now earned the name "tropical," a region in which most of developing countries are concentrated today.

The water industry in the United states has been credited with a high level of productivity:

When much of the world cries out in want, institutional arrangements which are capable of a high level of productivity can be viewed as important assets in American life. The basic structure of the American water industry should not be radically altered. Relatively small, but important, changes can, however, be expected to bring distinct improvements in its performance. (Ostrom, 1971, p.vi)

Congo must aspire to achieve, in its own way, results similar to those in the United States water industry. However, Congo has not yet been able to benefit from these methods

and experiences. The reason for this failure is that they have been unable to make meaningful progress towards adoption of an effective and efficient legal and institutional system for the administration of its natural resources, including water resources.

The objective of this thesis is to develop an institutional model of water resources administration for Congo. Since the performance of the institutions in the United States is different from those in Congo, an institutional model based on the experience of the United States but adapted to the special social, cultural and economic conditions in Congo.

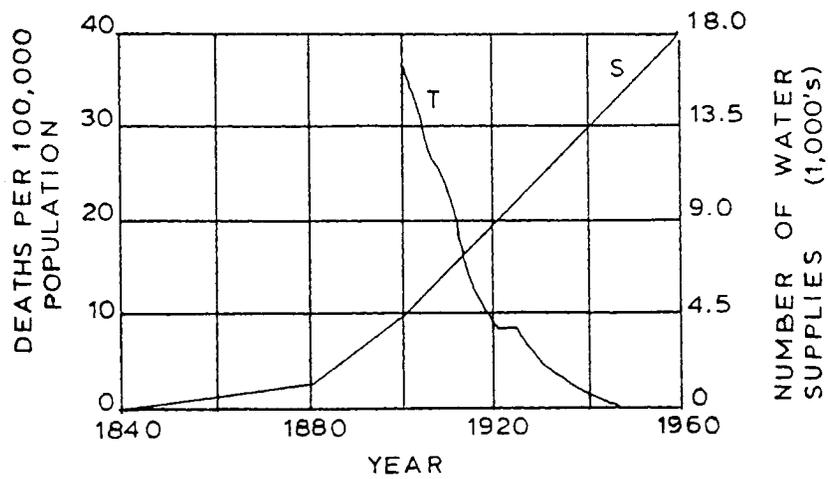


Fig.5.4- Simultaneous Decline in Typhoid Fever Death Rate and Rise in Number of Community Water Supplies in the United States  
From Wolman (1969, p. 225)

## CHAPTER 6

AN INSTITUTIONAL MODEL OF WATER RESOURCES ADMINISTRATION  
IN THE UNITED STATES

In the administration of water resources for public welfare, the basic functions which must be performed are the same in all political, administrative, or governmental systems, whether these are found in developing countries or not. The differences lie in the allocation of these functions, manner of decision making, and the degree of public participation in the process. Water institutions can be characterized by their functional and territorial jurisdictions. There are several possible combinations. At one hand, one can identify institutions responsible for performing only a single function operating over a limited area. At the other hand, one can identify multi-functional institutions operating over large areas.

The institutional models suggested in this chapter are a step in the direction of reforming the ineffective and inefficient institutions which currently obtain in Congo. Of all the countries surveyed in 1977 (see Table 6) no developing country has a decentralized organization (Howe, 1977). It is suggested that decentralization will lead to better administration of water resources, especially in the developing countries with moderate to large areas and large populations.

Country	Area (X1000km <sup>2</sup> )	Size Description	Population (million)	Degree of Centralization
Botswana	600	small	0.708	centralized
Israel	21	small	3.532	centralized
Hungary	93	small	10.596	centralized
Indonesia	1,904	moderate	138.699	centralized
Iran	1,648	moderate	36.027	centralized
Argentina	2,777	large	25.817	centralized
Soviet Union	22,402	large	256.674	centralized
German Democratic Republic	108	moderate	16.786	coordinated decentralized
Pakistan	804	moderate	73.223	coordinated decentralized
Tanzania	945	moderate	15.845	coordinated decentralized
United Kingdom	244	moderate	55.959	coordinated decentralized
Brazil	8,512	large	115.389	coordinated decentralized
India	3,288	large	632.375	coordinated decentralized
Mexico	1,972	large	61.599	coordinated decentralized
France	547	moderate	52.914	decentralized
Spain	505	moderate	35.972	decentralized
Canada	9,976	large	23.025	decentralized
United States of America	9,363	large	215.142	decentralized

Table 6.0 - Degree of centralization of national organization for water resources administration

From Howe (1977) and Sivard (1980)

In the United States, three alternative institutional models for water resources administration are known and named as follow:

- I. Institutional model defined principally by levels of government.
- II. Institutional model defined principally by water resources geometry.
- III. Mixed institutional model defined partly by levels of government and partly by water resources geometry.

The evolution of water institutions in the United States has progressed through these three types of alternative models. Water institutions in the United States were initially established and identified with each level of government and these can be found today at the federal, state, or local government levels. There has always been a debate over whether this is an appropriate framework for water resources administration in the United States.

We may also ask whether the political arena is a good mechanism for giving us the right answers. One great difference between a decision made by an administrative agency and one made by a legislature or elected chief executive lies in the type of institutional constraints upon the decision maker. The agency is bound by law to apply statutory standards, while the legislature or governor is not. The agency must act on substantial evidence; the others may react to political pressures. (Trelease, 1980, p. 211)

### 6.1 Alternative I: Model Based on Level of Government

In the United States, this model is illustrated by the Colorado River Basin. The functions which are expected to be performed by any institutional framework for water resources administration are given in Figure 6.1. a:

1. LAW
2. POLICY AND OBJECTIVES
3. PLANNING
4. IMPLEMENTATION
5. OPERATIONA AND MANAGEMENT
6. FINANCIAL AND ECONOMIC
7. ORGANIZATIONAL

FIGURE 6.1.a - Functional Areas of Water Resources Administration

1. Formulation of water legislation, including laws governing the use and allocation of water and laws governing individuals and agencies developing and using water resources.
2. Formulation of water objectives and policy.
3. Water planning, including all data collection, analyses, research, and dissemination of water information
4. Water development and program implementation, including implementation of policy proposals and construction of projects, and water conservation matters.
5. Operations and management of projects, including administration of laws for water development and use.
6. Financial and economic investment in water programs.
7. Organizational, including the formation, dissolution, restructuring, and administration of formal and informal arrangements through which water services are provided, and arrangements through which other water-related activities are performed.

The national model consists of institutions at the federal, state, and local levels. All water functions will be divided among the institutions at the various levels of government based on the perceived range of the field of effects of the water resources problems encountered and the anticipated solutions (Radosevich, 1980).

The nature of politicians in government at any level is such that they are best suited for resolving matters of general policy and setting objectives. A popularly elected legislature

is also well qualified to establish the legal framework which will set the bounds on, or prescribe, the behavior for the general public as well as for the agencies developing and using water resources. Hardin (1968) describes this process as mutually agreed upon. Proper resolution of these first two functions (Figure 6.1. a) is a prerequisite to carrying out successful water resources administration. Water law is the foundation of water management (Radosevich, 1980). If there is no proper legal basis, we can expect deficiencies in the resulting administration of water resources (Howe, 1977). Consequently, the model calls for a popularly constituted (elected) law-making body at each level of government to be responsible for rule making (legal functions) and for formulation of general policy and objectives.

The next three functions of figure 6.1. a will be the responsibility of professionals in an executive agency of government. In order to be effective and institutionalized, a high percentage of the work in this area must actually be performed by local people working in a locally based organization directly influenced by policy matters set by the operating on an ad hoc basis. Such approaches in the past have hindered the long-term process of institutionalization-- a device of society to manage itself-- in developing countries. "Some countries, primarily in Africa, rely to a very large extent on expatriates in the planning and execution of their rural water supply programs. This enables them to proceed with their development programs although there is a discontinuity in many posts due to the quick turnover of expatriates and delays in the recruitment of replacement" (Shultzberg, 1978,

p.338). In some developing countries, several aspects of functions 3, 4, and 5 (Figure 6.1. a) and program and internal structure elements of Figure 6.1. b are controlled by external or foreign agencies, factors, and actors, rather than internally or locally in what would be an emerging institution in the developing countries. There can be no real water institutions in developing countries under these circumstances.

Financial and economic matters (figure 6.1. a) should be addressed by the representatives of the people and the professionals in the organization. The law may prescribe the form of the organization (Figure 6.1. a); however, the daily control of the activities of the organization should be an internal affair by the professionals within the organization.

Federal level administrative responsibilities will include financial and technical assistance to lower level institutions, in addition to general responsibility for all matters which have national scope, such as national planning for water, establishment of uniform water quality standards, and data collection and research for a national water plan. Where federal agencies develop and execute programs of water development of regional nature outside the scope of any lower level of government, then such programs must stand the scrutiny of the people on whose behalf the federal government is operating (Ostrom, 1971; Trelease, 1980). There are recognized and established procedures for this purpose (Arnstein, 1969; Sewell, 1974).

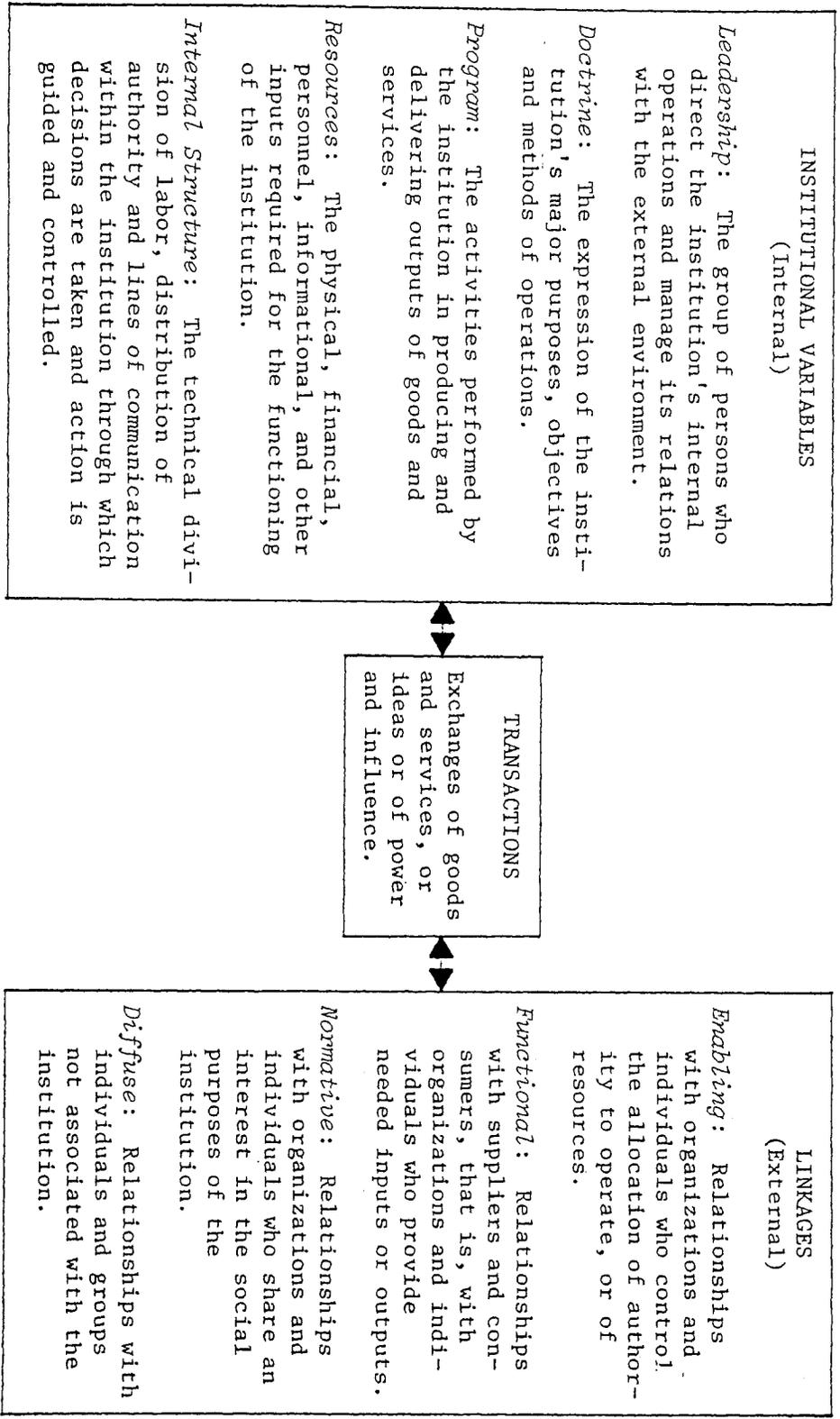


Fig.6.1. b- The institutional-building model, from Duncan (1975, p.4)

In this model, most water development and management will fall on state and local institutions. Actually, in most developed countries, the local level contains the most critical institutions in terms of service delivery. “Most of the effort in water resources development and management actually occurs at the level of the individual” (James, 1978, p.381). Consequently, there is a need to couple state institutions with the local institutions of the special water district variety presented in previous chapters. Three alternative state models were suggested in chapter 5: Type I --basic; Type II -- independent; and Type III -- integrated agency. The choice of a particular state model will be strongly influenced by the stage of development and available manpower in each state. However, it is suggested that most states should start out with the type II (independent agency) model. Since the administrative structure of state governments includes popularly elected state legislatures, a significant portion of the legislative function in water resources administration should be shifted to the states. The advantage in such an arrangement is that an appropriate legal framework will be provided for the development of water resources in each state. The chances of appropriate legal solutions is enhanced if laws are developed on a state basis instead of applying a national law, especially on water rights matters.

Institutions at the local level of government have the ultimate responsibility for service delivery to consumers. This is also the area where the greatest breakdown has occurred in the water institutions of developing countries. It is a mistake to plan for water resources development in any country without adequate consideration being given to the

wants, needs, and capabilities of individuals being served (White, 1972). Developing countries and the foreign development experts trying to assist them have repeatedly made this mistake. The emphasis for the reform of institutions responsible for water resources administration in developing countries should be at this level. Every attempt must be made to incorporate water-using individuals into the framework of the decision-making process.

These individuals spend a great deal of their own time and have a strong personal commitment to making sure that their work achieves the intended purpose. This kind of commitment for success tends to be missing in public projects. A project creating incentives that makes these users feel that their own best interest is best served by using project output and making sure that the project continues to function successfully will be many times more successful than one where the users feel better off continuing in their old way or with some strange new technology. For example, villagers provided with a new water supply or sanitary system need to be made to feel so much better off with the new technology that they are willing to learn how to take proper care of it when it is working and repair it when it fails. (James, 1978, p.381)

The best framework yet devised anywhere for incorporating local people or users into the administration of water resources is the institution of the special water district. Special districts are devices for use in solving problems at the local level which are otherwise elusive to civil or political government solutions.

Special districts are units of government created through processes specified by state enabling statutes.... The functions of special districts are narrower in scope than are the functions of civil governments. Districts usually have a single function, but occasionally they may have several purposes. However, even multifunction districts have fewer functions than civil governments. Districts have legally, functionally, and spatially defined areas of jurisdiction which are superimposed on the pattern of civil government. (Hanson, 1968, p, 8)

The institution of the special water district is basic to all three alternative institutional models of institutions for water resources administration proposed for developing countries. At the local level of the water user, there is no other comparably effective institution. “Special districts have proven marvelously effective in many situations. Thus, the real task is to make sure that they are the most efficient manner” (Hanson, 1968, p. 10). The effectiveness of the special water district has been demonstrated for over one hundred years in the United States. Figure 6.1. c is a schematic representation of Alternative Model I of institutions based on levels government.

### 6.2. Alternative II: Model Based on Resource Geometry

The illustration of this model in the United States is provided by the Tennessee River Basin. The river basin has a tremendous appeal as an administrative unit for water resources development because of the unity of the hydrologic basin. However, Britain is the only developed country of fairly large size to base the administration of water resources throughout the country exclusively on river basin authorities. Water resources administration by river basin authorities precludes much state and even local participation in the process. The Tennessee Valley Authority (TVA) in the United States is unique in its approach to the idea of basin-wide administration of water resources based on decentralized, grass-roots administration. The form of the organization was decided upon after fifteen years of deliberation in the United States Congress. The organization itself was allowed to evolve

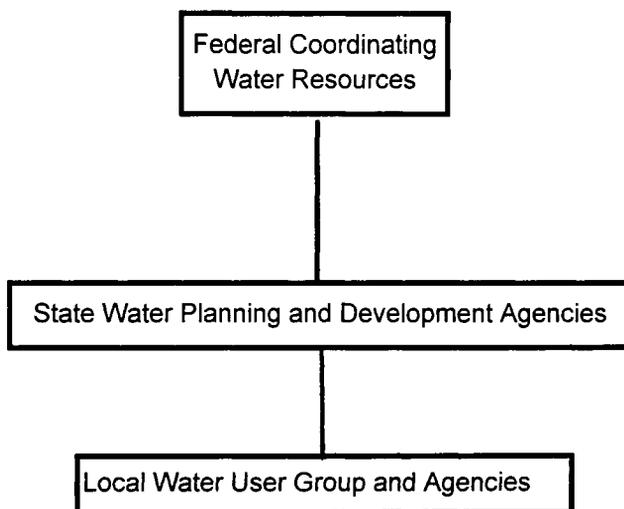


Fig. 6.1.c - Institutions Based on Levels of Government

its own internal structure and approach of the TVA as an institutional model for water resources administration has been found to be both highly effective and efficient.

Even though the TVA is an acknowledged institution for water resources administration, the TVA idea was not extended to cover the entire United States. However, it is possible to conceive of a national institution model consisting entirely and exclusively of institutions patterned after the TVA operating throughout a given country. The TVA idea could also be extended throughout the United States (Lilienthal, 1953), although this would involve difficult reorganization in the existing system of water resources administration (Pritchett, 1943), which is based on Alternative I. Actually, the adoption of Alternative II would preclude Alternative I in any country (Pritchett, 1943); otherwise, there would be wasteful duplication of functions among states agencies and river basin organizations.

The regionalization of water resources administration in river basin authorities need not be achieved at the expense of local participation. The institutional model provided by the TVA provides the relevant lessons for Congo interested in improving water service effectiveness and efficiency through broad-based local participation. The model was described in Chapter 4.

Since there is no state representation on the board of Directors of the TVA or other elected officials, legal functions are performed by the federal legislature, or Congress, and its appropriate committees. Congress is also where financial allocations to the TVA are made. The TVA is essentially a federal corporation whose operating area cuts across state

boundaries. Figure 6.2 is a schematic representation of Alternative Model II showing several regional TVA operating independently to form the national model water institution. A national coordination will be required to coordinate the activities of the various regional agencies which will be directly controlled by the federal executive and legislature. The local institutions are not usurped by this model and are represented by the various special purpose water districts.

This alternative model is highly recommended for Congo which has not developed an entrenched bureaucracy similar to Alternative I, which would be difficult to dismantle as the United States has found out.

### 6.3. Alternative III: Mixed Institutional Model

Apparently this institutional model is currently existing in the United States today. The administration of water resources is a dilemma for politicians around the world. Political boundaries are rarely drawn with the facilitation of water resources management in mind. The river basin is an appropriate unit for organizing a program of water development (Ostrom, 1971), but the territorial units into which governments are organized do not coincide with basin units, either nationality or subnationality (Quinn, 1973). No matter how they are organized, political units of government must grapple with the problem of water resources development.

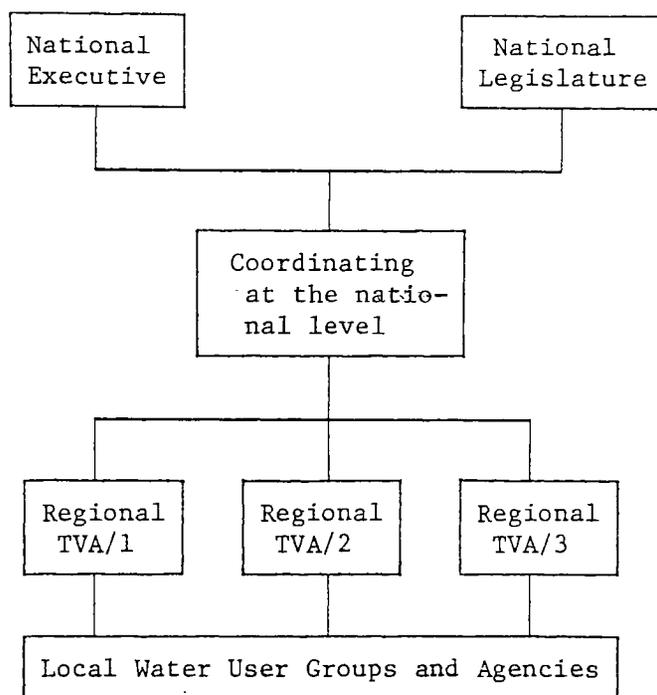


Fig.6.2- Institutions Based on Resource geometry

The various experiments throughout the world with different forms of institutional arrangements such as basin commissions and valley authorities are efforts at reconciling the political structure with water resources geometry. The reality of the political situation in the present world as well as the experience of other developed countries suggests that a desirable regrouping of political and administrative units of government along river basin lines will be difficult to implement. Whatever its strengths and weaknesses, however, probably the chief reason for the river basin not emerging as a unit for substantial planning and administrative independence lies in the refusal of existing government to accept it" (Quinn, 1973, p. 27). Part of the problem in organizing water resources development along river basin boundaries, given existing political boundaries, is that policy making assumes a regional, interstate character, the resolution of which calls for significant state cooperation or federal intervention. Federal intervention robs the affected areas of desirable local control.

The British model provides an example of this loss of local control and accountability:

As an alternative to local accountability, central parliamentary accountability offers some scope for democratic control of water planning. Water authorities are responsible now to Ministers who are themselves accountable to parliament but this form of accountability is far more indirect and remote than the previous local government forms and the adequacy of current parliamentary scrutiny is questionable. (Parker and Penning-Rowse, 1980, p.248)

The preceding considerations suggest that the formal organization of government is not conducive to efficient water resources administration. Also, the most efficient

framework for water resources administration-- along basin boundaries-- in most cases is not acceptable to politicians at the state and local levels of government.

State and local governments have jealously withstood the formation of basin administration even more than Congress. River basin regionalism, what there is of it in the United States, would appear to be less an inspiration on the part of subnational governments and water users than a requirement occasionally imposed from without, through the planning and funding of Uncle Sam. (Quinn, 1973, p.26)

This problem is also evident in Congo where the local water users and intermediate politicians or representatives are forever in disputes against the national government which is trying to control their water resources. In the United States, these two realities-- the need for pragmatism based on the existing order and the realization that greater efficiency can be achieved in water resources development through regionalization-- has led to the adoption of a "mixed strategy" approach. In this approach, the federal government encourages and participates in regional associations for water resources development, especially regional planning and coordination of implementation programs. These regional associations-- called basin commissions-- have less scope and authority than a TVA, but offer some opportunities for improved efficiency in planning and project implementation without jeopardizing much state and local control.

In this alternative model, the intermediate government will operate along the lines of alternative Model I, but with the superposition of regional basin commissions to coordinate planning among the affected intermediate governments. This model does not preclude the

existence of a TVA in any area of the country, but it does preclude TVA-type institutions covering the entire country in addition to duplication of functions with state agencies.

The functions of water resources administration (Figure 6.1. a) are divided among the states legislature, professional staff of individual agencies, and as many regional basin-wide organizations as necessary to cover the country, as shown in table 6.3. The primary responsibility of the regional agency will be coordinating the planning activity of each basin state and reconciling this with a regional plan. The regional organization will also be responsible for coordinating financial and economic assistance from the federal government to the member state governments of the regional agency.

Local institutions will be constituted as previously described for alternative Model

I.

Function	Individual State Legislature	Professional Staff of Individual State Agency	Regional Organization
1. Law	X	-	-
2. Policy/objectives	-	-	-
3. Planning	-	-	X
4. Implementation	-	X	-
5. Operations/management	-	X	-
6. Financial/economic	X	-	X
7. Organization	-	x	-

Table 6.3 - Distribution of Functions of Water Resources Administration

## CHAPTER 7

INSTITUTIONAL MODEL OF WATER RESOURCES ADMINISTRATION  
APPLIED FOR CONGO

Congo, like many other developing countries has failed to provide an acceptable level of water service delivery to its general population. Congo has invested heavily in water resources development without appreciable improvement in the overall situation. For example in 1977 the community water supplies in Congo is shown in Table 7.1

Urban population ('000)	Population served ('000)	% of urban population served	Rural population ('000)	Population served ('000)	% of rural population served	Total population ('000)	Total population served	% of total population served
284	278	98	657	46	7	941	324	34

and the target for 1980 and estimated costs are shown in Table 7.2

Urban population ('000) To be served	Increase over 1970	Cost (Million) of US \$	Rural population ('000) To be served	Increase over 1970	Cost (Million) of US \$	Total population ('000) To be served	Increase over 1970	Cost (Million) of US \$
473	204	11.4	186	140	2.8	659	344	14.2

The real reason for this appalling state of affairs in Congo is that certain critical aspects of water resources administration have been seriously neglected or not properly understood at all. Today there are no real water institutions in Congo, a real water institution being regarded as a device of society to manage properly its water resources. The transformation of the present virtual institutions into real water institutions was the objective of this study. The lack of real institution to carry on water resources administration in Congo is reflected in the incapacity of its government to implement even the plans that have been prepared for them by foreign experts. The necessary institutional reforms which are preconditions for self-sustaining development have never been introduced. In order to solve the above difficulties three models are proposed.

## 7-1. ALTERNATIVE I: MODEL BASED ON LEVELS OF GOVERNMENT

Alternative I involves each level of government in the task of water resources administration. Strong organizations at the local level, such as the special water district, provide essential water service delivery to consumers. At the prefecture level, it will be the administration of water laws and prefecture-wide planning for water development. The prefecture administers national assistance programs to the local organizations and exercises oversight functions on the local water agencies. Each level of government is charged with certain water functions and provided with the authority and means of executing the responsibilities assigned to it. There will be a cooperative effort among the three levels of government in the administration of water resources.

In Congo, the administration of water resources was the responsibility of the under-prefecture before the Revolution of 1963. The national government did not play a significant role to organize water administration until 1984 when the third Congress of Congolese Labor Party created the Ministry of Energy and Water Resources. In the past, the activities of water resources were mostly restricted to water supply to major cities and did not operate in the rural areas on a nation-wide basis. There are no agencies which rate the performance of each of the seven major functional areas of figure 6.1. a. In the country there is no water law to guide the water development or to regulate water use and development. Beginning in 1984, a draft of a water code has been written but never reached the National Assembly for approval. Guidelines for water policy and objectives

expressed. Planning and implementation of water projects are left for expatriate consultants who are usually called in at times of crisis. Management of existing projects have traditionally been poorly carried out by the national government. One of the reasons for their poor performance is related to the fact that they do not operate on an economic or business basis to provide enough revenues to meet their operating expenses.

The greatest shortcoming in the existing framework for water resources administration in Congo is that there is no organization responsible to water users which is also capable of representing their interests outside of the government framework. National, Prefectural, and local agencies are not established to perform all the tasks which they should really be undertaking.

The efforts of the national government should have been directed towards improving the capability of prefectures in discharging their responsibilities and also towards helping the prefectures to establish water institutions at the local level where the greatest impact on human welfare can be achieved through improved service delivery. According to the above suggestions, the Congo would benefit from adopting a model based on administration of water resources by prefectures and local agencies, supported by national financial assistance. The national agencies will be restricted to data collection, regional planning, coordination of prefectural programs, and administration of national programs of financial assistance to the prefectures and local agencies. The prefectures legislatures will be responsible for water legislation to guide water development projects in each prefecture. Prefecture agencies can

This model has a major advantage is that water law matters can be tackled by each prefecture which is eminently qualified as a representative body of the people living within the prefecture. The disadvantages is that the country is divided by prefectures which do not correspond to the river basins.

## 7-2. ALTERNATIVE II: MODEL BASED ON RESOURCE GEOMETRY

The TVA as a model institution for water resources was presented in Chapter 4. It will be possible to base the administration of water resources in Congo, exclusively on regional river basin authorities. However, the simultaneous presence of prefectures agencies in competition with regional river basin organizations for water resources planning and development will not allow the proper functioning of this model.

The activities of the prefectures in this arrangement will be limited to water legislation and the administration of the water rights law. In addition, prefectural agencies will be created which will be organized to perform other roles such as water supply to cities and rural areas. These roles will be implemented by the local water user organizations.

The advantage of this alternative institutional model of water resources administration is that the natural unity of the river basin is preserved in all administrative operations such as data collection, planning, and development. The disadvantage is that a countrywide system of water resources administration based on river basin agencies stem from the fact that equitable administration of water law and water allocation functions require some degree

of political representation which, strictly speaking, is not provided by an executive agency like the TVA.

### 7-3. ALTERNATIVE III: MIXED INSTITUTIONAL MODEL

This mixed strategy approach has proved to be very satisfactory because the conditions -- hydrological, economic, and social-- are not the same throughout the country. A study has found that no one institutional arrangement can be prescribed to be applied uniformly throughout the whole country, and actually recommended that this diversity be preserved. Each area is also free to experiment and choose the institutional arrangement which it feels is best suited to its circumstances.

The slow pace of development in the Tennessee Valley region led to the creation of the Tennessee Valley Authority in the United States in 1933 in order to bring development to the area. Consequently, the existing situation in the United States is such that different areas apply different strategies to water resources administration.

Actually, a study of all alternative institutional arrangements for water resources development in the United States has revealed that this mixed strategy is the best approach to water resources administration. The study could find no one particular institutional arrangement suitable in all places at all times (U.S. Water Resources Council, 1967).

The advantage of this alternative model is that different institutional framework for water resources administration are available for different areas to consider which is best

suited to its circumstances. This potential choice increases the probability that whatever arrangement is chosen by a particular area will be more appropriate.

This study has demonstrated a crucial need for new directions for water resources administration in Congo. It is predicted that, if the national government adopts its present approach of decentralizing the country in all areas, a mixed strategy approach to water resources administration will yield good results.

This approach to water development is to be highly recommended in any country, despite the tendency for several national governments, especially in Congo, to impose one institutional form throughout the country.

## CHAPTER 8

### CONCLUSION

The previous chapters adequately demonstrate the need for a clear and comprehensive water policy and plan in Congo. If Congo's water problems are not solved, economic stagnation is inevitable; and there is little reason to hope that the present administrative apparatus of the country will be more effective in the future than it has been in the past. So long as the responsibility for water resources administration is in the hands of a large number of government organizations, each pursuing its own particular program free from effective control by either the legislative or executive branch, real progress is unlikely.

Congo does not possess an adequate institutional capacity for solving several aspects of water resources problems. Instead of designing and building local institutions capable of dealing with water problems, Congo has two options. Primarily, it will be necessary for Congo to find solutions by engaging experts from foreign water institutions. This option of over-reliance on foreign experts to conduct virtually all tasks associated with water resources administration postpones indefinitely the day when Congo will be capable of initiating and carrying on water development projects on its own. Secondly, the cost of finding solutions to water problems will be prohibitive unless institutions are established locally which will

be capable of resolving water problems as they emerge. It is recommended that efforts be made to establish the means for Congo to manage its water resources by itself as much as possible.

What is needed is some means by which the water problem can be considered in all its ramifications, and a policy developed which will adequately consider all needs and all possible solutions.

One of the models discussed in this study will be adopted to attain this end, and there is a good chance that the structure adopted from the United States would be effective in necessarily Congo. There are, however, some basic principles that seem to apply at the national, prefectural, and local levels. The national government must consider and balance all needs and interests: water supply for irrigation, municipal and industrial purposes; flood control; quality and salinity control; power generation; preservation and enhancement of fish, wildlife and recreational resources; drainage, waste disposal and so on.

The national level should concentrate on creating the prefectural water agencies and discharging their responsibilities. Also the national level should help the prefectures in establishing water institutions at the lower level of government in order to provide water service delivery to the majority of the people.

At the prefecture level, each prefecture should so organize its water resources administration that it can approach its water problems on a comprehensive basis. The exact

- Collection and analysis of basic data;
- Study of water resource needs of the prefecture;
- Preparation of plans to meet the needs;
- Development of water resource facilities;
- Administration of laws governing the use of water and of laws governing pollution;
- Conduct of an extensive educational program to acquaint the public with the water needs, problems and resources of the prefecture.

Some prefectures may wish to assign all the functions enumerated above, as well as other responsibilities in this area, to one agency. If these functions are divided among two or more agencies, prefectures should make provisions for insuring close coordination among the various agencies. Likewise, there is need for coordination between water resource agencies and other agencies concerned with natural resources.

At the local level, water resources administration will be implemented through districts and PCA (Administrative Control Post) agencies and will deal primarily with drainage, water supply, or wastewater treatment. Much local water administration will be a result of national and prefectures delegation of powers.

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