MULTI-PURPOSE RIVER DEVELOPMENT PROJECTS IN AFRICA

A multi- purpose project refers to a project set up to serve many purposes.

They are examples of how rivers can be fully used to yield benefits for that particular country. It involves a large and a man-made lake (reservoir) behind it.

Examples of multi-purpose river development projects in Africa

1) Aswan high dam on river Nile in Egypt.
2) The Volta river project(Akasombo dam)
3) Kainji dam on the Niger river in Nigeria
4) Kariba dam between Zambia and Zimbabwe on Zambezi river
5) CaboraBassa dam on the Zambezi river (Mozambique)
6) The Orange River scheme in South Africa.
7) Lesotho highlands water project.
8) Inga dam on Congo River in DRC.

A sketch map showing the major river dam projects in Africa.

KAINJI DAM PROJECT (NIGER DAM PROJECT)

The project is located in the northwestern part of Nigeria across the Niger River at Kainji. The project was opened in 1969 and lies in a remote, thinly populated and very poor part of Nigeria. The dam is 66 meters high and 55 meters long and has produced a manmade lake behind it, known as Lake Kainji (130 km long and 1300 km^2).

A Sketch map showing the location of Kainji dam project.

Objectives of the Kainji dam project

- To generate hydroelectric power (the main aim of building the dam)
- To control flooding of the Niger River.
- To promote irrigation, there by facilitating farming to increase food production.
- To promote the industrial sector

Factors which have favoured the establishment of Kainji dam project.

1. Presence of the Niger River with large volumes of water that is, sufficient water supply to generate power.
2. Presence of waterfalls –fast flow of water to turn the turbines and generate power.
3. Presence of a narrow gorge at the place (that is a narrow gap as the Niger River flows through a low line of plateau)—which increases the water pressure behind the dam to generate power.
4. Presence of a hard basement rock which offered a firm foundation for the construction the dam.
5. The sparse population of the area, allowing cheap /easy compensation of the displaced people.
6. The need to provide hydroelectric power for domestic and industrial use. Hence there was a large market for Hydroelectricity, which encouraged the establishment.
7. Presence of adequate/ large sums of capital for the construction and maintenance of the project from the government of Nigeria World Bank, Italy, Britain, USA, Netherlands.
8. Presence of skilled labour used in the construction of the dam project especially from abroad and cheap labor provided by nationals.
9. High level of technology used in the setting up of the project such as the use of large turbines to generate power.
10. Supportive government policy to develop the multipurpose scheme to promote economic growth such as by mobilizing funds for the construction of the dam project.

Contribution of the Kainji dam project to the development of Nigeria

1. Generated hydroelectric power for the country (the dam produces over half of the country's generation capacity) and this increases the standards of living such as through domestic use of power.
2. Promotion of the industrial sector due to the production of the hydroelectric power to run machines in industries and water used as a raw material.
3. The dam has controlled flooding of the Niger River since the huge reservoir holds back a lot of water; hence better living conditions especially in the delta zone.
4. Generation of employment opportunities for the people of Nigeria such as at the dam and the developed industrial sector—hence improving the standards of living/ increasing incomes.

5. Fishing has been promoted by the man-made lake (Lake Kainji) behind the dam, hence increasing people's incomes/ supplementing the diet of the people.
6. The depth of the water in the reservoir has increased navigation (water transport) yet the depth of the water in the Niger up –river from Lake Kainji has also increased navigation, thus promoting trade activities.
7. The project has promoted irrigation farming such as the **large sugar plantation at Bacita**, rice and vegetables, and this is also increasing food production and incomes.
8. Promoting of the tourism sector since the project is a tourist attraction, and hence generating valuable foreign exchange, which is invested in many sectors like education, health.
9. Promotion of urbanization/ development of urban centres such as Yelwa is a flourishing inland port, Abuja, and Ibadan, and hence the development ofassociated facilities like banks, schools.
10. Diversification of the economy by developing many economic activities in the region such as farming, trade, industries—hence increasing national income.

Problems created by the establishment of the Kainji dam project

1. Displacement of people by the formation of the Kainji lake reservoir. Many villages were submerged and over 60,000 people were displaced, hence costly relocation/ resettlement
2. *High costs of resettling and rehabilitating the displaced people –hence increased government expenditure.
3. Loss of grazing land since a large area formerly occupied by nomads was drowned by Lake Kainji.
4. The project has led to a decline in farming activities in some parts of the Niger delta, due to loss of silt which used to maintain fertility since it now settles in the lake and yet currents are eroding its edge.*(Salination causing infertile soils especially in the Niger delta zone and this limits farming activities).*
5. A large/vast would be cultivation land has been drowned by the reservoir lake, thus limiting farming activities.
6. Pollution of the environment due to development of the industries and use of farm fertilizersin the irrigated fields, which in turn reduces the quality of life.
7. The extension of perennial irrigation is resulting into stagnant water and this leads to the spread of water borne diseases especially bilharzia.

8. Decline in fishing industry at the coast due to loss of silt deposits now settling out in the lake, which would support plankton growth.
9. The delta has reduced in size as it is not receiving significant silt deposits, and hence currents are eroding the edge of the delta, and this limits coastal/delta activities such as tourism.
10. The reservoir lake is a barrier to easy communication in the area, since it occupies a large area.
11. The growth of urban centres is associated with various problems such as high crime rate, unemployment and overcrowding.

Steps being taken to solve the above problems

1. Resettling of the displaced people in other areas, with careful planning.
2. Getting/ acquiring loans to rehabilitate the displaced people such as through better housing.
3. Spraying using chemicals to control pests and diseases.
4. Improving medical services such as in hospitals to control water borne diseases.
5. Treating of wastes before disposal to control pollution. The government is also strengthening environmental laws to regulate careless dumping.
6. Regular dredging to remove the silt from the water body (de-silting).
7. Introducing of a ferry, lake steamers to ease communication around the lake formed.
8. Carrying out afforestation in other areas, to compensate for the destroyed vegetation in the reservoir lake area.
9. Strengthening the authorities / Enforcing of law and order to control urban-related problems such as the high crime rate.
10. Applying of artificial fertilizers/ manure to increase soil fertility in the delta zone.

ASWAN HIGH DAM PROJECT

This project is found in Egypt near the country's border with Sudan, and it is one of the biggest multipurpose river projects in Africa, together with Lake Nasser-the man-made lake behind the dam.

There are two dams at Aswan and both have power stations. The first dam was constructed in 1902 at Aswan to control flooding. But this was totally inadequate and in 1956 a new dam

was set up south of Aswan called the **Aswan high dam**. This Aswan high dam was completed in 1970. It is 3600m long and 111m high. At the top its 40m wide and its base is almost a km wide yet it is a very strong dam. Behind the dam is Lake Nasser (500kmlong nearly 150km into Sudan).

A sketch map showing the location of the Aswan high dam in Egypt

Aims for the construction of the Aswan high dam

- To control flooding along the Nile river (therefore when the original dam was inadequate anew high dam was put up)
- To provide water for irrigation (since Egypt is largely a desert country).
- To generate hydroelectric power
- To create a reservoir for water supply for domestic and industrial use.
- To improve navigation by increasing the water level of the Nile river.
- To create employment for the people.

Note: The dam was financed Russian capital and expertise, and Egyptian labour was used in great part.

Factors that favoured the establishment of the Aswan high dam project

1. Presence of the Nile River with large volumes of water that is, sufficient water supply to generate power.
2. Seasonal floods of River Nile which made it necessary to control floods by constructing a dam.
3. Presence of waterfalls –fast flow of water to turn the turbines for generating HEP power. (strong head of water/ force to turn the turbines)
4. Presence of a narrow gorge which offered a suitable site for river damming (and also which increases the water pressure behind the dam to generate power).
5. Presence of a hard basement rock, which offered a firm foundation for the construction the dam.

6. Little and unreliable rainfall, which necessitated storing of water for use during the dry season.
7. Vast/ large tracts of land to accommodate the reservoir / man-made lake upstream. This is due to the sparse population of the area, allowing cheap /easy compensation of the displaced people.
8. The need to provide hydroelectric power for domestic and industrial use. There was a large market for Hydroelectricity.
9. Presence of adequate capital/large sums of capital for the construction of the project from the government of Nigeria World Bank, Italy, Britain, USA, Netherlands.
10. Presence of skilled and unskilled/ cheap labour used in the construction of the dam project especially from abroad and cheap labor provided mainly by nationals.
11. High level of technology / modern technology used in the setting up of the project such as the use of large turbines to produce quality work.
12. Supportive government policy to develop the multipurpose scheme to promote economic growth such as by mobilizing funds for the construction and encouraging investors.

Benefits of the Aswan high dam

1. The dam has controlled flooding of the Nile in Egypt which used to threaten life in the lower Nile, since the reservoir holds back a lot of water.
2. The project has promoted irrigation, hence increasing cultivable land. This has increased food and cash crop production such as rice, cotton, maize, orchards, and wheat.
3. Generation of hydroelectric power which has promoted a number of activities such as trade/service sector.
4. Promotion of industrial development due to hydroelectric power and water supply such as the aluminium plant, grain mills.
5. Promotion of tourism development and hence valuable foreign exchange. The dam, lake Nasser and irrigated farmlands are all tourist attractions.
6. Promotion of urbanization such as as Luxor, Qena, and Cairo, and associated infrastructural development such as banks, commercial buildings and roads.
7. Fishing has been developed due to presence of Lake Nasser behind the dam, hence increasing incomes of the people.
8. Lake Nasser and the dam also supply water for domestic and industrial use for example water is a raw material in industry.
9. Diversification of the economy by developing many economic activities in the region such as farming, trade, industries—hence increasing national income.

Problems caused by the Aswan high dam project

1. Has led to the displacement of many people who used to live in the area now covered by Lake Nasser and hence expensive resettlement.
2. The project has led to expensive resettling of the displaced people (the nomads). They had to be given double hectorage of their former land/ increasing government expenditure.
3. Pollution of the environment due to many industries setup in the region.
4. It has led to a decline in farming in some parts of the upper Nile delta region, due to the loss of silt which used to maintain soil fertility as it now settles out in Lake Nasser.
5. Decline in fishing industry at the coast due to loss of silt deposits now settling out in the lake, which would support plankton growth.
6. Due to loss of water through evaporation and irrigation, the fresh water in the soil near the mouth is being replaced by salty/saline sea water and some rendered unfit for cultivation.
7. The extension of perennial irrigation is resulting into spread of diseases especially bilharzia due stagnant water.
8. The delta has reduced in size as it is not receiving significant silt deposits, and hence currents are eroding the edge of the delta, and this limits coastal/delta activities such as tourism.
9. Resulted into urban related problems in the developed towns such as high crime rate, traffic congestion.
10. The manmade lake is a barrier to communication in the area around it, since it occupies a large area.

Steps being taken to solve the above problems

1. Resettling /re-locating of the displaced people in other areas.
2. Getting loans to rehabilitate the displaced people.
3. Treating of industrial wastes before disposal. The government is also putting up environmental laws to regulate pollution.
4. Applying of artificial fertilizers/ manure to increase soil fertility in the delta zone.
5. Regular spraying with chemicals to control water borne diseases.
6. Improving medical services to control water borne diseases.
7. De-silting of the lake and canals through regular dredging.
8. Introducing of a ferry, lake steamers to ease communication around the lake formed.

9. Strengthening policies and law enforcement to control urban related problems.

THE AKASOMBO DAM PROJECT (VOLTA RIVER PROJECT)

The Akasombo dam project was opened in 1966 and was built across the Volta River where the river passes through a narrow gorge. The project was funded by Ghana, USA, Britain, and the World Bank.

Objectives of the Akasombo dam project

- To generate hydroelectric power especially for smelting aluminium and other industries.
- To control and regulate the flow of river Volta which was characterized by seasonal fluctuations in the water level.
- To improve inland water transport / navigation.
- To improve agriculture through providing water for irrigation.
- To store water for industrial and domestic use.
- To create a lake behind the dam to act as a fishing ground and a tourist attraction.

Note: The Volta dam complex includes a power dam and station on the west bank and a flood control dam and saddle dam on the east bank. Lake Volta is the man-made lake which has developed behind the dam.

Ghana has also developed other dams such as:

- Bui dam project on black Volta
- Kpong dam near Akasombo dam

A sketch map showing the Akasombo /Volta river project

Factors which have favoured the establishment of the Akasombo dam project

1. The seasonal fluctuation of river Volta and therefore the need to regulate the flow such as controlling of flooding during the rainy season.

2. There was need to generate hydroelectricpower , to replace thermal which was consuming a lot of foreign exchange through oil imports.
3. Presence of a narrow gorge (deep narrow valley) for easy construction of the dam.
4. Presence of river falls—hence fast flow of water to turn turbines.
5. Presence of a hard basement rock which provided a firm foundation for the construction of the dam.
6. Presence of a large /extensive land behind the hills due to sparse population, which could accommodate a large reservoir behind the dam.
7. Presence of adequate capital to establish the dam provided by Ghana, World Bank, Britain.
8. High level of technology employed to put up the project, provided by especially Britain and USA; such as use of large turbines to generate power.
9. Presence of skilled labour used in the construction and maintenance of the dam project.
10. Presence of a large market for power in the area and surrounding countries, which encouraged investment in the dam project.

Problems resulting from the establishment of the Akasombo dam project

1. Resulted into displacement of many people from their land, since many villages were drowned by the lake water.
2. Led to high costs of resettling the displaced people and disruption of families.
3. Pollution of the environment due to development of many industries such Aluminium smelting at Tema.
4. Resulted Loss of agricultural land since large areas were covered by the lake water.
5. The lake formed effectively divided Ghana into two providing a barrier to east-west communication.
6. Loss of biodiversity –vegetation and animal life when setting up the dam project.
7. Decrease in the delta size due reduced silt deposits and this negatively affects costal/ delta activities such as tourism.
8. Resulted into urban related problems such as slum growth, unemployment and high crime rate.
9. Siltation of the lake which necessitates constant dredging which is expensive.
10. Reduction in farming activities in the delta region due to loss of fertile alluvial soils.
11. Stagnation of water leading to water leading to water borne diseases such as bilharzia.

KARIBA DAM PROJECT

The Kariba dam is located on the Zambia—Zimbabwe border on River Zambezi.

Factors which favoured the establishment of the Kariba dam project

1. Presence of a permanent river with waterfalls, hence fast flow of water to turn the turbines.
2. High volume of water in River Zambezi, hence sufficient water supply for generating power.
3. Presence of a narrow gorge called Kariba—that enabled construction of the dam.
4. Existence of a hard basement rock which provided a firm foundation for constructing the dam
5. The need to control the seasonal floods of the river, by regulating the volume of water.
6. Presence of a wide valley to act as the reservoir for water behind the dam.
7. Availability of adequate capital provided by governments of Zambia and Zimbabwe to set/construct the dam.
8. Presence of skilled labour that helped in the construction of the dam.
9. Increased demand for hydro-electric power, due to growing population, the Zambian copper belt and the mines in Zimbabwe—encouraging dam construction.
10. High level of technology employed when constructing the dam such as the use of large turbines.
11. Supportive government policy towards the construction of the dam in order to develop the region such as by providing power.
12. Presence of raw materials such as rocks used in the construction of the dam.
13. Extensive/large tracts of land available for the dam project/ to be occupied by the reservoir due to low population density

Benefits of the construction of the Kariba dam

1. Provision of adequate power for the mining industry in Zambia and Zimbabwe.
2. Provision of hydroelectric power for industrial and domestic use.
3. Rive r flooding has been controlled, since a lot of water is held back in the reservoir lake, hence improving the quality of life.
4. It has provided employment opportunities to the people of the area, thus increasing incomes/ improving the standards of living.
5. Generation of government revenue through taxation of the dam project and workers' incomes, and hence supporting the provision of social services.

6. Has led to the growth of towns /urbanization such as Lusaka and Harare—with associated facilities.
7. It has led to the reduction in the price of energy, since it reduced the importation of coal for power.
8. Promotion of the tourism sector, since the project is a tourist attraction. This generates foreign exchange to Zambia and Zimbabwe.
9. Promoted international cooperation between the governments of Zambia and Zimbabwe, hence more trade contacts.
10. Lake Kariba created behind the dam has promoted fishing activities, thus increased incomes of the people.
11. Lake Kariba is also used for navigation /water transport—hence promoting trade activities.
12. Promoted environmental protection / reduced deforestation for fuel energy, since more people use hydroelectricity.

Problems which resulted from the construction of the Kariba dam

1. Displacement of many people from their land, since a large area was downed by the lake (due to back ponding of water to form Lake Kariba).
2. Led to high costs of resettling of the displaced people and disruption of families.
3. Pollution of the environment due to the development of the industries in the area.
4. Led to loss of agricultural land since a large area/the valley was covered by the lake.
5. Resulted in urban-related problems such as high crime rate, prostitution, and slum growth.
6. Lake Kariba is a habitat for mosquitoes and snails which are disease causing vectors /pests.
7. Loss of biodiversity –vegetation and animal life when setting up the dam project.
8. High costs of establishment of the project, hence diverting resources from other sectors.
9. The lake is a barrier to communication between Zambia and Zimbabwe, since it occupies a large area.
10. Loss of fertile soils behind the dam/in the man-made lake, hence limiting agricultural production.

CABORA BASSA DAM

CaboraBassa dam is located on river Zambezi in Mozambique, and it was completed in 1975.

A sketch map showing the location of the Kariba dam and the CaboraBassa dam

Factors which favoured the establishment of CaboraBassa dam

1. Presence of the Zambezi River with waterfalls/ fast flowing water to turn turbines.
2. The need to control the fluctuations of the Zambezi River such as controlling floods during the rainy season.
3. Presence of a narrow gorge (called Quebrabasa) for easy construction of the dam.
4. Existence of a hard basement rock which offered a firm foundation for constructing the dam.
5. Low population density of the area, hence availing extensive/ large tract of land to be occupied by the reservoir lake.
6. Availability of adequate capital to set up the dam provided by the governments of Portugal and South Africa.
7. Presence of a large market for hydro-electric power in South Africa and Mozambique (local and foreign)—hence encouraging the dam project.
8. High level of technology employed when setting up the dam such as the engineering technology to fix the turbines.
9. Presence of skilled labour to construct and maintain the dam project.
10. Presence of raw materials such as rocks used in the construction of the dam.
11. Supportive/favourable government policy to promote economic growth by the multi-purpose scheme such as by financing the project.

Contribution of the CaboraBassa scheme to the development of Mozambique

1. Provision of power for industrial and domestic use—hence better standards of living.
2. Hydro electricity is exported to South Africa, hence earning Mozambique foreign exchange.
3. Facilitated development of inland water transport by the man-made lake behind the dam—hence enabling trade activities.
4. Provision of water for irrigation, hence supporting crops like cotton, sugar cane, rice among others.
5. The man-made lake behind the dam has also promoted fishing activities, hence increasing people's incomes.

6. The tourism sector has been promoted, since the dam project (dam and lake) is a tourist attraction—hence generating foreign exchange.
7. Provided employment opportunities to the people of the area, hence increasing incomes/ improving the standards of living.
8. Floods of River Zambezi have been controlled by the reservoir created which holds back a lot of water.
9. It has promoted development of towns such as Tete, Blantyre, Moatize and Zobue—with associated facilities.
10. Generation of government revenue through taxation of various activities supported by the dam project, and the revenue supports the provision of social services.