**IGCSE Geography Revision - River Environments – Case Studies**

1. **Case study of the rising demand for water in one country: China**

**Growing Demand for Water**

* The growing demand for water is underpinned by China’s continued industrialization with per annum GDP growth of 9 to 10%.
* Urban China and industry consume 180 billion cubic metres of water per year or over 20 per cent of the total
* Industry in China uses 3 to 10 times more water, depending on the product, than industries in developed nations.
* 40,000 gallons of water to manufacture a car and 60,000 gallons to manufacture 1 tonne of steel; presumably, the water requirements for such processes are even higher in China.

**Geography of water and Demographics**

* First, China has about 20% of the world’s population, but only 7% of its water resources to sustain it.
* Second, there is a stark regional north-south imbalance. Only 14.7% of the country’s water is distributed in the vast areas to the north of the Yangtze River, where the amount of arable land accounts for 59.2% of the national total, and the population makes up 44.4% of the total

**Agriculture**

* As global food prices soar, policies to encourage grain self-sufficiency will stimulate more grain agriculture, a very water-intensive practice.
* Increasing proportions of meat in Chinese diets will add additional strains on water.
* Twenty-five years from now, about half of China's water supply will be used for irrigation to feed its growing population
* 260 gallons of water are needed to produce 2.2 pounds of wheat and 3,380 gallons of water are needed to produce 2.2 pounds of beef.

**Management**

* Water authorities of Shenzhen are planning to use seawater to meet rising demand.
* The city will launch a number of seawater desalination projects in power plants and tourism resorts along the east coast during the next five years.
* So far this year, more than 30 Chinese cities, including Beijing, Shanghai and Guangzhou, have announced plans to increase prices for household water supplies by a range of 0.4 yuan ($0.06) to 1 yuan ($0.15) per cubic meter. The local governments have been pushing up prices, with a view of encouraging more recycling and efficient water use.
* The lower reaches of the Yellow river, which feeds China's most important farming region, ran dry for 226 days in 1997. Between 1991 and 1996, the water table beneath the north China plain fell by an average of 1.5 metres a year.
* To combat this, work has begun on China's biggest ever construction project - a massive scheme to channel billions of cubic metres of water from the Yangtze to the replenish the dwindling Yellow river.
1. **Managing the supply of clean water (dams and reservoirs; pipelines; treatment works) A case study of a dam or reservoir project: 3 –Gorges Dam and/or Kielder water**

**Kielder Water**

* Located in Northumberland in North England
* Construction began in 1975 and was finished in 1982
* It cost $250 million
* Over 1000 hectares of forest land was flooded
* The reservoir is 12km long
* It was built to supply growing industry and populations in the NE of England

**Impacts**

* It generates hydroelectric power to the value of $1.5 million
* It provides valuable water supply to avoid water shortage
* It develops recreation and tourism
* 1.5 million tress wee cut down and an Area of Outstanding Natural Beauty (AONB) was lost.

**3-Gorges Dam**

* Located along the River Yangzi at Sandouping
* Construction of the dam took place between 1994 and 2009
* It’s 185 meters high and has created and 2 km in width creating a 600km reservoir
* Its multi-purpose generating18 000 MW of electricity (10% of China’s need) and allows 10 000 tonnes ships to pass via locks. It also protects 10 000 people form flooding.
* It cost $20 billion
* Floods have killed over 300,000 people in the last 100 years.

 **Impacts**

* 1 million people will be displaced.
* The Chinese government says the dam will open up the Yangtze for large ships and also supply water to parched northern cities.
* Conservationists say that the accumulation of silt will cripple the reservoir and that all the areas dependant on it are in danger of pollution.

**A case study of a flood defence scheme: Leuven or York**

**Leuven**

**Location**

Leuven is located in Flanders 30 km to the East of Brussels

**Causes**

* Confluence of the 2 –Rivers, Dijle and Voer
* A history a severe floods with the last one in 1958.
* Intensive agriculture has led to deforestation of natural deciduous forest reducing infiltration
* Increased and poorly managed urbanisation speeding up run-off
* Alluvial rivers carry a lot of sedimentation which builds up in the city reducing the efficiency and capacity of the river
* Many tributaries feed into the rivers

**Management**

**The City**

* Flood spillways break the river into three channels
* 80% of the river is contained beneath the city.
* Resectioning and realignments speeds up flow close to the Arenberg Castle

**The Rural Urban Fringe(RUF) Egenhoven**

* This project cost €2 million
* It represents a combination of both soft and hard engineering
* A naturally landscaped diversion channel takes the water to a sluice gate and reservoir.
* The sluice gate allows water top pass into a reservoir
* The reservoir is low energy zones which causes the river to deposit sediment
* The reservoir is dredged every two years
* The sediment is later placed on local agricultural land
* The sluice will close to limit discharge above 19cumecs. Embankments prevent flooding to the side of the sluice gate
* 19cumecs represents the maximum discharge that Leuven can cope with
* Water floods back creating a shallow flood zone in a woodland area creating a safe wetland environment
* Flooding is less than 30 cm in depth and cover an area larger than 2km²
* The scheme is designed to prevent the 100 year flood event.

**York**

**Location**

York is located in Yorkshire in North England

**Causes**

* A large drainage basin 3000Km² with many tributaries
* Confluence of two rivers, The Foss and Ouse
* The removal of Peat and \forest which speeds up run-off
* The growth of York

**Management**

**The City**

* The Foss barrier was developed to isolate the Foss and the Ouse, at a time of flood with a moveable barrier. A pumping station was also constructed, allowing the normal flow of water from the Foss into the Ouse, but stopping water from the Ouse backing up into the Foss. A flood wall was also constructed to help separate the two rivers. The whole scheme was constructed in 1987 for £3.34mn.
* Between 1992 and 1993 flood walls were built to protect the shops on North Street
* At Lower Bootham and earthen embankment has been built with a concrete interior. Each house has a steel gate and wall near its front door
* A new system of flood barriers was introduced for a trial in 2008. These are temporary hollow plastic barriers, called ‘Aquabarriers’. They have holes in one side which allow water in and so increase their stability during the flood.

**Problems**

* The hard engineering has not benefited the environment. Further, despite all these works flood water does sill overflow the embankments, causing damage to homes, offices and factories. This happened in 2000, leaving the city with a clean-up bill of £1.3mn,