Evaluation of provision and requirement environmental sciences essay

Contents

Introduction

The situation of water scarcity in the world, particularly in many arid and semi-arid regions. (Notter, 2012). China, due to its huge population, has become an arid country, especially the northern region, which accounts for 1/3 of the total area of China, but has less than 20% of total national available water resources. (Yardley, 2007) The reasons for the severe situation of water shortage in this region is various, but majority is caused by lack of rainfall, vegetation deterioration and human activity. Consequently, many different preventions are taken in order to deal with this issue, such as desalination, water transfer, and water harvesting. This report will focus on the water shortage in the north of China and discover several causes of this issue, then try to list some ways to reduce the stress of water resources in this region. Furthermore, this report will evaluate and compare these methods by some aspects, such as cost, public acceptance and environmental impact, then find the most suitable prevention in this region.

Background

According to a report from Mays(2010), the total renewable water resources in the world is 4. 3219x1013m3/year, which is shared by the population of 6, 301, 463, 000 (Liang & Ma, 2004). Therefore there is at most 6, 859 m3 water to use for each person every year. However, the per capita water resource of China is only 2, 130 m3/person/year which is less than 1/3 of the world average, due to its large population of 1. 344 billion (Liang & Ma, 2004). It is widely accepted that the per capita water resource can be used as a parameter for a reasonable evaluation of water supply conditions.

(Water& Sarovar, 2008)Once a country’s available water resources drop below 1, 700 m3 per person per year, the country can be expected to experience regular water stress (Engelman & Leroy, 1993). This means China is facing a significant problem of water shortage. A hydrogeological survey based on geochemical and isotopic technology shows the available water resources in the arid region of Northern China has dropped to roughly 1, 000 m3/person/year, which is far from meeting people’s demand of daily life. (Ma, Wang& Edmunds, 2003)

Causes

This report will analyse three main reasons of water shortage in the north of China. Firstly, due to the geographic position, there is very little rainfall in Northen China. This region is far away from the ocean and the monsoon belt in, it also lack of large rivers and lakes. (Dai, Wang & Chou, 2003) This means there is not a sufficient source of precipitation in most part of this area. Secondly, as a result of the negligence of local residents, the vegetation in this area was damaged seriously in the past few decades. This led to a grievous decrease of rainwater storage capacity of the land, which irreversibly destroyed the ecological precipitation cycle in this region. (Bridge & Demicco, 2008)Thirdly, human activity, in particular excessive pollution and development of arable land associated a dramatic growth of population in the last 50 years, has led to a great amount of water resources eroded. This should also blame the Chinese government for ignoring the environmental protection while focusing on the development of economy.

Methods of provision

Desalination

The Beijing Desalination Plant in Tianjin, which is designed to reduce the stress of critical water shortage in the north of China, provides 200, 000 cubic meters of fresh water every day. Not only for the people living in the coastal cities, the desalinated water from analogous plants around the Bohai sea also transfers to the northwest region of Chian by tunnels. (Watts, 2011)

Water transfer

The South–North Water Diversion Project is a multi-decade infrastructure project in China, in order to divert water from the Changjiang River in the south to the Yellow River and Haihe River in the north, which will transfer 44, 800, 000, 000 m3/year of water from south to north. According to the government website (2013), the complete project is expected to cost $62 billion , and more than $34 billion have been spent until 2012.

Water harvesting

The Karez Well is a kind of traditional underground water harvesting system which was invented 2000 years ago in the northwest of China. It is shown on the local government website (2006), there are over 1, 100 Karez wells in Xinjiang Provence. From the underground water sources mixed with snowbroth and rainfall, fresh water is harvested by the wells, and stored in the tunnels with a total length of 5, 000 km. For this reason, the Karez Well System is also called " the underground great wall of China". (Guan, Jiang &Chen, 2005)

Evaluation of provision and requirement

This report will respectively analyse the requirement and evaluation of provision of the tree provision from the following aspects: the cost, public acceptation, and environment impact.

Desalination

This method of prevention has several benefication for the Northern China. Firstly, due to the new technologies, it is cheaper to use desalinated water. Every cubic meter of fresh water only costs $0. 75, compared to $3 for the South–North Water Diversion. Secondly, the crude water comes from the Bohai Sea, which ensures the continuous supply of water resource. (Fischetti, 2007) Meanwhile it minimises the risk of pollution and destruction of ecological environment. In contrast, water desalination also has positive impacts. In traditional opinion, people are more likely to accept freshwater than seawater as the source of water in daily life, due to their fears of safety. After all, the technologies of desalination are quite new and still need development.

Water transfer

Compared with desalination, water transfer is a more acceptable prevention of water shortage in China. (Page, 2010) Not only the domestic water, it also provides the irrigation water for the agriculture of the arid regions in the north of China. Moreover, large amounts of water being removed from the Changjiang River basin, will decrease the risk of flood for the Southern China in rain season. Therefore, the ecological environment of north and south regions will be both improved. (Ren, Liu& Chu, 2011)However, some people

have different opinions on this subject. Objectors think a huge waste of water resources through evaporation and pollution will be caused by the multi-decade process of construction , and it will create a large population of migration. Moreover, the huge cost of the project will shift to the consumers as a much higher price.

Water harvesting

The Karez Well system is different from the other two methods, it has a good mass base in the north of China, due to its long history and widespread use in this region. It stores and supplies the water through underground channels which can keep the water source away from the effect of weather and sand. Furthermore, the soil and sand form a natural Infiltration system, which makes the fresh water from the Karez Well clean enough to drink and irrigate farm land. (Verlagsgesellschaft-Wiesbaden, 1981) Additionally, the construction cost of a Karez Well is much cheaper, which is just $1, 000 per kilometre, because most parts of the system are based on the existing natural conditions. Nevertheless, the Karez Well also has its inherent defects which cannot be overcome, the most prominent of which is the limitation of district. Therefore the Karez Well is just convenient for those sparsely populated regions, due to its large requirement of land for underground channel network construction. Otherwise, due to the limitation of natural conditions, an arid region usually has a modest size of population. On this account, water harvesting could be the most widely suitable method of provision for water shortage.

Conclusion

In this report, three prevention for water shortage in Northern China are listed, which is desalination, water transfer and water harvesting. Moreover, these methods are compared by the three impacts of cost, public acceptance and environment. Overall, all these methods have both benefits and limitations, while different provisions are suitable for different regions. And water harvesting could be the most widely suitable method of provision for water shortage.

Recommendation

About water shortage, different regions have different situations. Concrete provision should be used for specific situations, which are related to the local economy, involvement and culture. Meanwhile, different methods also have different advantages and disadvantages, the best one still to be found out. At the present stage, water harvesting undoubtedly is the most widely suitable provision for the situation of water shortage in the north of China.