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GEOG2062: China: the land and the people
Coursework: a research paper

Topic: the inter-relationship between the Chinese physical environment and population distribution

Introduction

Superficially, it seems to make senses that physical environment will affect the attractiveness of one place and therefore the number of people lives. And with concentration of population, the physical environment will be deteriorated as there are too many people using limited resources. It seems to suggest a strained relationship between physical environment and population distribution and each will have effects on each other.

Nevertheless, studies in recent years to investigate the inter-relationship between physical environment and population distribution found out that the above statement only over-simplified the real situation. Some believes that physical environment will alter the distribution of population and others argue there are other factors affecting population distribution. It is argued that “population distribution is a result of the influence of natural, socio-economical and historical factors¹.”

Besides discovering that increasing population is the principal threat to the environment because of the planet’s finite resources, there are two other new viewpoints about the inter-relationship: firstly, it is argued that people are not only consumers but producers and with advancement of technology, planet’s carrying capacity will be expanded² and the impact of population distribution on physical environment would be insignificant³. It is argued that dense population distribution will lead to force for improvement, stressing human ingenuity to overcome environmental challenges⁴ with improved technology. Secondly, some hold the view

¹ Hu, H. Y., 1992. *Ren kou fa zhan he sheng cun huan jing (Population development and living environment)*. Shanghai: Huatung shifan University Press. p. 46.

² Arizpe, L., Stone, M. P. & Major D. C. 1994. *Population and environment: rethinking the debate*. Westview Press. pp. 1-2.

³ Zhang Z. R., 1996. Linkage between population growth and air/water pollution in China. *Population growth and environmental issues*. Westport, Conn. p. 167.

⁴ Clarke, J. L., 1993. Education, population, environment and sustainable development. *International review of education*. 39(1-2): 55

that between population and environment there are many social, economic, technological and political factors, which play vital intervening roles⁵ in the inter-relationship between population distribution and physical environment.

Therefore the inter-relationship between population distribution and physical environmental can never been over-simplified. It involves complex relationship and interaction between different elements. And the inter-relationship can never be viewed in macro level if it is to be accurate. In the paper, we will examine the inter-relationship between the Chinese physical environment and population distribution of China. Firstly, we will define the terms in the paper. Secondly, we will give a profile on Chinese population distribution and physical environment and a summary on the inter-relationship between them. Thirdly we will come to the discussion on their inter-relationship and give an assessment on their interrelationship as well as the three comments given above.

Concepts and scope of study

The part of “concepts and scope of study” is very important to the answer of this paper, because in the previous literature concerning the inter-relationship between population and environment were unsatisfactory not only the author over-simplified and over-generalized, but also they have rarely defined what they mean by “population” and “environment”⁶. Different interpretation on these two terms will lead to different meaning and without uniformity in understanding, the paper is no way to continue and therefore it is a must to define these two words before having a satisfactory answer.

According to Clarke (1995), the author defined “population” as “generally it means the aggregate of people residing within an administrative or geographic area”⁷. And “population distribution” looks at where people are likely to residing within an area. And since this paper explore the situation in China, the “population distribution” thereafter will means “the concentration of people residing in China”.

For the term “environment”, Clarke (1995) pointed out that there are many kinds

⁵ *Ibid.*, p. 55

⁶ Clarke, J., 1995. Population and the environment: complex interrelationships. *Population and the environment: the Linacre Lectures, 1993-4*. Oxford University Press. p. 7.

⁷ *Ibid.*, pp. 7-10. However the author argued “population” is conceptually varied and there are still many different definitions based on different viewpoints.

of environment, such as physical/natural, geographical and ecological environment⁸. In this paper we will only focus on “physical environment”. Under Clarke’s definition, physical/natural environment means “climates, geology, soils, drainage etc” which have not been markedly changed by human impacts. And since in this paper we are talking about Chinese physical environment, the scale of discussion will only focus on national and regional level in China. Therefore arguments such as population distribution leads global physical environmental change such as greenhouse effects and warming temperature will be discarded, as it does not answer the question. And a too “micro-level” study of their inter-relationship such as giving a detailed analysis in the situation in Jiangxi province is also not desirable as we want to focus on the national and regional level, but not local.

For the time period of study, we are trying to discuss the inter-relationship using the most updated materials available. Therefore any data exceeding over 20 years ago are not preferable, as we want to give an updated account on their inter-relationship in the case of China.

A profile of China’s physical environment and population distribution and their inter-relationship

China’s physical environment

In this sector of the paper we will first discuss the physical environment of China. Using the definition of Clarke (1995), a description of climates, topography and water resources in China will be presented here.

Concerning the climates in China, it shows a great regional difference. Temperature distribution of China in recent years shows a great spatial difference in all months. See Fig 1. We can see spatial variation of temperature of China in January (winter) and July (summer). In winter months the mean temperature is as cold as –20 °C in western and northern China, and for southern China the mean temperature is about 15-20 °C. The basic reason for the spatial pattern is that during winter months cold air mass travel southwards from Siberia and with decreasing latitude as well as being blocked by mountain ranges in China, southern China enjoys relatively warmer winter. Therefore we can see great spatial contrast between northwest and southern China in winter in term of temperature.

⁸ *Ibid.*, p. 11.

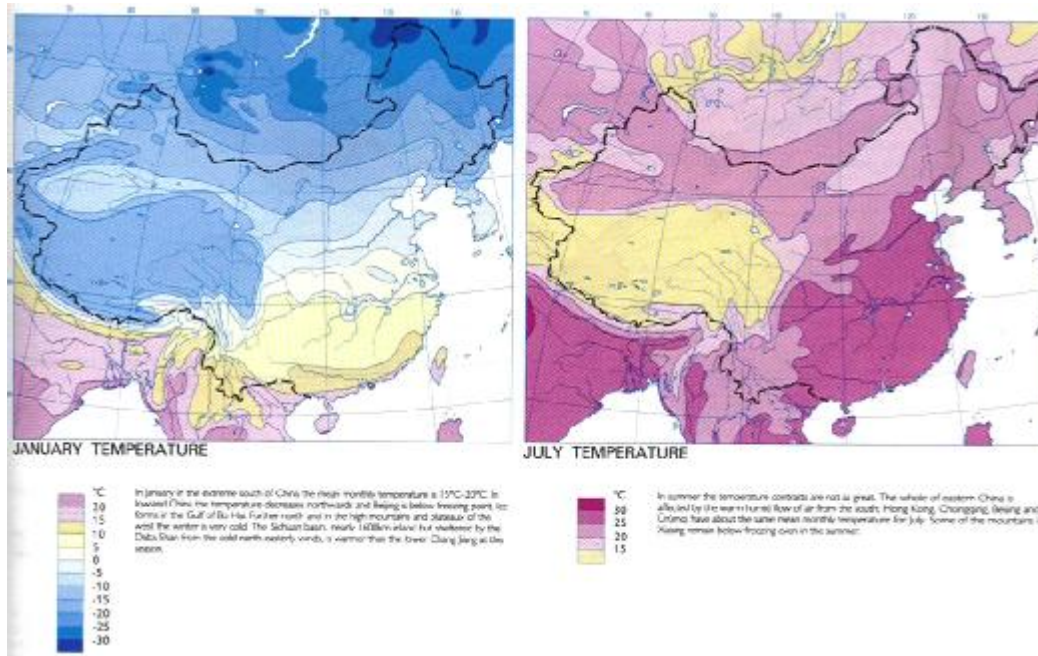


Fig. 1: The spatial variation of temperature in China in January and July⁹

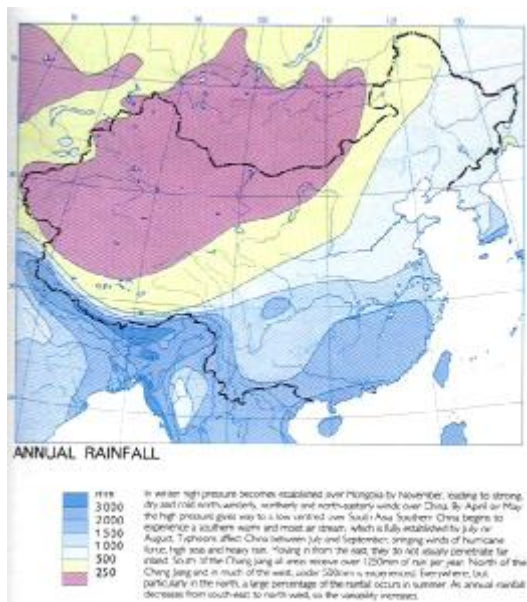


Fig. 2: The spatial distribution of annual rainfall in China¹¹

During summer months, eastern China enjoys monsoon climates which brings warm climates and this leads to temperature differences between west and east. Hong Kong, Beijing and Ürümqi have about the same mean monthly temperature for July while some mountains in Tibet remain below freezing even in summer¹⁰.

Concerning the rainfall pattern in China, it again shows spatial variation. Eastern China, due to monsoon climate as well as proximity to the sea, receive large amount of annual rainfall. Especially for southern China where typhoon is very common in summer.

Western China, on the other hand, receives few amount of rainfall in a year. The

⁹ Oxford/Philip. 1993. *New Comprehensive Atlas for Hong Kong*. Hong Kong Oxford University Press. p. 45.

reason for the low amount of rainfall is due to the high pressure and dry cold Siberian anticyclone formed in winter, and also due to the remoteness from ocean. This leads to semi-arid environment in western China. The spatial pattern of rainfall in China again shows west – east disparity.

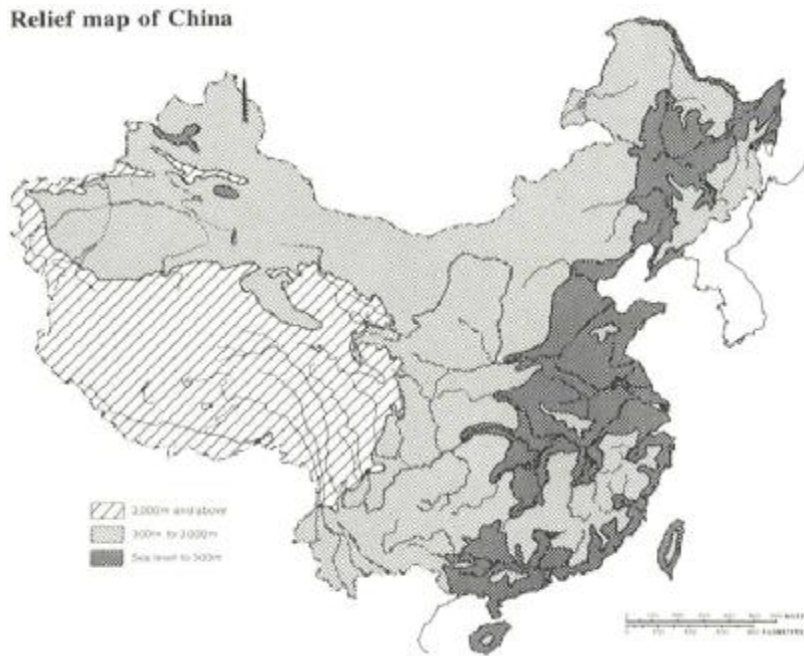


Fig. 3: Relief map of China¹²

Topography of China is shown in fig. 3. China has to be considered a mountainous country, with over 65 per cent of its land area comprising mountains, hills or plateaus¹³. Most of the flat land is found in eastern China. Plateaus, huge mountain ranges such as Kunlun Shan, Tian shan are found in western China (See fig. 4), with altitude of not less than 3000m. The relief map again shows disparity between western and eastern China.



Fig. 4: Major mountain ranges in China¹⁴

Availability of water again demonstrates disparity between the western and

¹⁰ *Ibid.*, p. 45.

¹¹ *Ibid.*, p. 45.

¹² Smil, V., 1984. *The bad earth: environmental degradation in China*. M.E. Sharpe, Inc. p. 215.

¹³ Leeming, F., 1993. *The changing geography of China*. Oxford: Blackwell. p. 12

¹⁴ http://afe.easia.columbia.edu/teachingaids/china/geog/M_Mt.htm .Assessed on: 9th Oct., 2001

eastern China. Western China is very dry; much of it is desert territory. It is marked by high evaporation rate with low amount of precipitation¹⁵ (See fig. 5). Water availability in west is scarce but abundant in the southeast with surplus in water availability. Eighty-one per cent of water resources are concentrated in the Yangtze River valley and down south¹⁶. Most of the major rivers and lakes are found in the east (See fig. 6). The mean annual run-off is high in the southeast China while very low in the west (See fig. 7). In term of water availability, this again shows disparity between east and west in China.

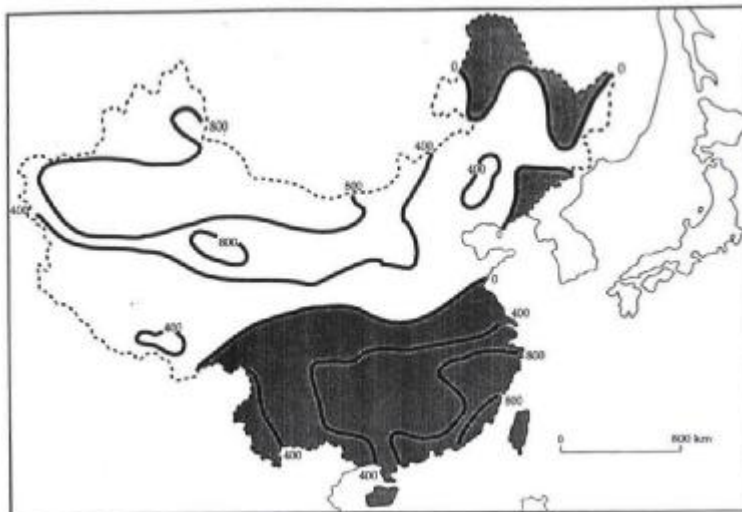


Fig. 5: Water availability by setting precipitation against potential evapo-transpiration (in mm)¹⁷. Shaded areas represent a surplus while unshaded represent deficit.

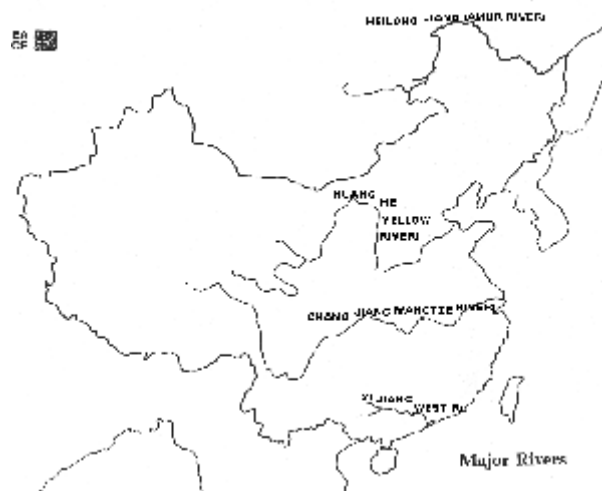


Fig. 6: Major rivers in China¹⁸

¹⁵ *Ibid.*, p. 13.

¹⁶ Zhang Z. R., 1996. *op cit.*, p. 168.

¹⁷ Leeming, F., 1993. *op cit.*, p. 18.

¹⁸ http://afe.easia.columbia.edu/teachingaids/china/geog/M_rivr.htm .Assessed on: 9th Oct., 2001.

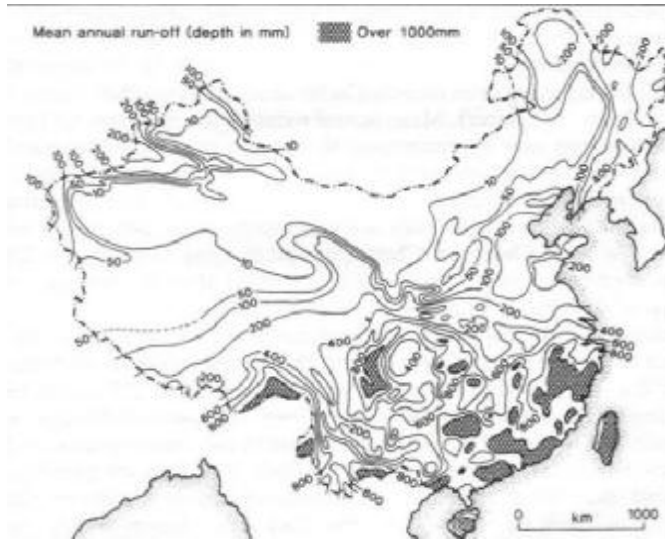


Fig. 7: Mean annual run-off (depth in mm) in China¹⁹. Shaded areas are over 1000mm.

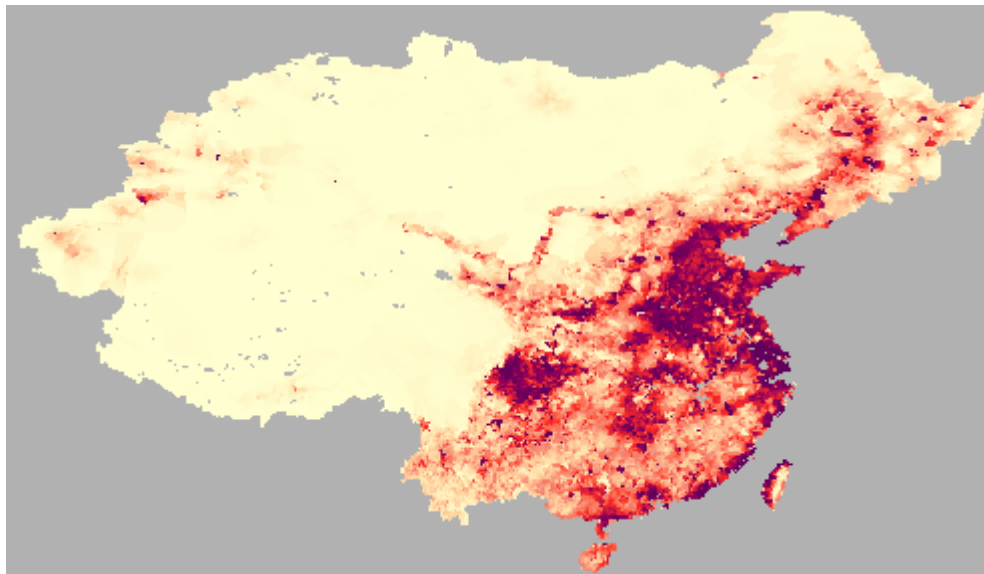


Fig. 8: The population distribution in China²⁰. Area with dark red indicates dense population distribution.

China's population distribution

Fig. 8 shows the population distribution in China and it is a clear fact that China's population distribution in China is uneven. Most of the population is concentrated in east and southeast part of China. They are likely to reside in the North China Plain (Hebei, Shandong and Henan provinces), Yangzi River Basin, the

¹⁹ Derbyshire, E., 1990. Environment: understanding and transforming the physical environment. *The geography of contemporary China: the impact of Deng Xiaoping's decade*. Routledge. p. 81.

²⁰ *China's Population in the 21st Century*. <http://www.gfeeney.com/present/rostock/rostock.htm>. Assessed on: 9th Oct., 2001

Sichuan Basin and Pearl Rivers delta²¹. Few of them are living in western China. See fig. 9 for the map drawn proportionally to the population size. It is found that over 94 per cent of population is living in the eastern part of China²². The population distribution of China again demonstrates west – east disparity.



Fig. 9: A map drawn proportional to population size of China²³.

Their inter-relationships

From the above we can conclude that both physical environment and population distribution show a west-east disparity in China. For the physical environment in term of the amount of annual precipitation, temperature in winter and summer, topography and water availability all indicate that there are spatial variation between eastern and western China. A similar case is found when talking about the population distribution in China, in which 94 per cent of Chinese people are living in the eastern part of the territory.

As such disparities are demonstrated in both physical environment and population distribution in China, can we assume there are some relationship between them? Previous studies have found out that when comparing China's topography map, rainfall pattern map with population distribution map, there are indispensable interrelationship among them. Area with sparse population distribution tends to be found in high altitude plateaus and mountainous area, such as Hei Mongolia and Xinjiang; in semi-arid desert with low precipitation lower than 250mm such as Tibet and Qinghai. On the other hand population tends to concentrated in southeast China with abundant precipitation over 2000mm²⁴.

The reasons for the above how physical environment affects population

²¹ Pannell, C. W., 1983. *China: the geography of development and modernization*. London: Arnold p. 103

²² Figures from the lecture. It is pointed out that 94 per cent of people living in eastern China which only accounts for 43 per cent of totally territory in China, while in the west, there are only 6 per cent of totally Chinese population occupying 57 per cent of territory.

²³ Jowett, J., 1989. China's population: an alternative perspective. *Geography Review* 3(2): 28.

²⁴ Hu, H. Y., 1983. *Lun Chung-kuo jen kou chih fen pu (Essays on China's population distribution)*. Hua-tung shih fan University Press. p. 61.

distribution can be explained by the followings: for topography, it is pointed out that relief has a great impact on the population distribution. With increasing altitude of 100 meters, temperature drops by 0.5-0.6 °C. Air pressure also drop with increasing altitude. Some people may be adversely affected by the low pressure in high altitudes. Freezing temperature and windy weather are also accompanied by high altitudes. In addition to the rugged relief and slope, it is unfavourable for further expansion of population. And this leads to low concentration of population²⁵.

In China, Hei Mongolia and Xinjiang are plateaus of high altitude and they suffer from this harsh physical environment. Therefore we can also see sparse population distribution in these areas. East and southeast China is area with low altitude. We can see there are many people living in areas with low altitude and flat relief such as Sichuan Basin and the North China Plain. It is attractive to people and therefore topography is affecting the population distribution in China.

Climates also affect the population distribution. In area of extreme climate, the population density is sparse. People tend to concentrate in area with warm, low altitude flat land which is close to the ocean. Sparse population density is usually found in area which is too hot or too cold²⁶. Place with warm weather and proximity to the ocean are usually affected by oceanic humid air mass and it brings large amount of precipitation. Humid and warm weather will leads to dense vegetation covers, and it will enhance the productivity of the land. It is favourable for yielding higher agricultural harvests²⁷. All these will attract people to reside and therefore climate is an important factor controlling the distribution pattern of population in China.

Eastern China is constantly affected by monsoon climates in summer and it brings warm weather with large amount of precipitation. In winter months though there are cold Siberian air mass from the north, southeast China still enjoy warmer winter as cold air mass is blocked by the mountain ranges. Therefore we can see a population pattern with majority of people living in eastern and southeast part of China. On the other hand, semi-arid desert with low precipitation and temperature throughout the year such as areas in Tibet and Qinghai is not favourable to agricultural development and therefore unattractive for people to reside.

²⁵ Hu H. Y., 1992. *op. cit.*, p. 51. Nevertheless it is also pointed out that there are still disadvantage of living in low altitude because it may suffer from wet and hot weather, bad drainage with flooding and there are concentration of pests and diseases.

²⁶ *Ibid.*, pp. 46-48.

²⁷ *Ibid.*, p. 48.

Proximity to water resources also affects population distribution. Water is vital for our life and therefore people tend to live where water is found. All big cities are built along rivers and lakes. Rivers and lakes provide water for domestic, production use as well as navigation, and it greatly affect population distribution.

Needless to say eastern China enjoy more stable source of water supply than the west. Most of the rivers and lakes are found in the east territory (fig. 6). Flooding precautions are also well enforced to guarantee the safety of people there²⁸. It is no wonder why in Yangzi and Pearl River Delta there are large amount of population. For the west there are no major rivers and lakes for the storage of water. In addition to low precipitation and high evapo-transpiration, no doubts people tend to reside in eastern China. Recently the Chinese government intends to develop the western China. However difficulties are found and one of the most severe problems is lack of water resource and it is very difficult for attracting population there.

Therefore population distribution in China coincides with its physical environment setting. In the east with good physical environment condition people tend to live there and in the west due to harsh physical environment, few people are found. China's physical environment leads to population distribution. It is no wonder that previous studies have drawn a line from Aihui in Heilongjiang to Tengchong in Yuunan (See fig. 10), which separate China into west and east. In the west of this line physical environment is harsh with sparse population distribution. Eastward of this line people are concentrated due to good physical environment setting.



Fig. 10: The line from Aihui to Tengchong splitting China into east and west²⁹

²⁸ *Ibid.*, p. 52.

²⁹ Leeming, F., 1993. *op. cit.*, p. 15. Modified.

Besides looking at how physical environment in China affects its population distribution, its pattern of population distribution also affect its physical environment. The basic theory for population distribution affecting physical environment is, as mentioned before in the introduction, “increasing population is the principal threat to the environment because of the planet’s finite resources”. It is pointed out that land have their carrying capacity. The densely populated area in southeast China is area with good physical environment, long development history and human settlement, economically advanced and therefore it has a greater impact on the environment³⁰. Dense population distribution worsens its physical environment through high level of economic activities and resource usage, and it exhausts its resources and with too much demand on land the environment will deteriorate therefore causing changes and problems in its physical environment.

China must support 22 per cent of the world’s population on only 7 per cent of the world’s arable land. China’s uneven population distribution further brings tremendous pressures on her local resources and environment³¹. This will increase the demand on services – food, housing, education, employment etc – which were needed to support the concentration of population³². In meeting these demands people adopt solutions such as intensive production and exploring natural resources. Nevertheless all these solutions seem to have one thing in common: deteriorating environment which result in worsening its own physical environment.

The dense population distribution in eastern China therefore has its adverse effects on its physical environment in many aspects. In western China, population distribution also has its adverse effects on its physical environment. It is pointed out that though the population density in western China is low, however it already exceeds the carrying capacity of the land. Hu (1992) pointed out that under the definition from United Nations, arid area should not be having population density exceeding 7 person per km², and 20 person per km² in semi-arid area. Nevertheless under the census of 1982 the population density for western China is 22 person per km²³³. It already exceeds the carrying capacity of the land in western China. Moreover most of the population is concentrated regionally in oasis where living environment is acceptable.

³⁰ Qu, G. P., 1992. *Zhong guo ren kou yu huan jing (China’s population and environment)*. Beijing: Chinese Environment Science. p. 177.

³¹ Zhang, Z. R., 1996. *op cit.*, p. 167.

³² Jowett, J., 1989. *op. cit.*, p. 26.

³³ Hu H. Y., 1992. *op. cit.*, p. 129.

So how population distribution affects its physical environment? Firstly, it leads to deterioration of land. Soil erosion takes place everywhere in China. See fig. 11. In order to meet the excessive demand from the locality, natural resources are excessively used. Soil erosion is one of the consequences of such action. The major causes of China's soil erosion are deforestation, cultivation on slopes, overgrazing and poorly managed industrial use. It is point out that humans are responsible for the severity of soil erosion. Removal of vegetation cover is the primary human-induced cause of soil erosion. Aside from exposing bare topsoil, it also increase the rate of evaporation which renders the topsoil less stable and aids aeolian erosion. Nutrient-rich soil particles are washed or blown away when erosion occurs³⁴, which results in deterioration of soil properties in southeast China. In northwest China, desertification is a result of excessive soil erosion and there is possible expansion to the southeast. Desertification already affects nearly 55 million people and 10 million hectares of pasturage, 3.9 million hectares of cropland, 4.9 million hectares of rangeland and 2,000 km of railway lines³⁵.

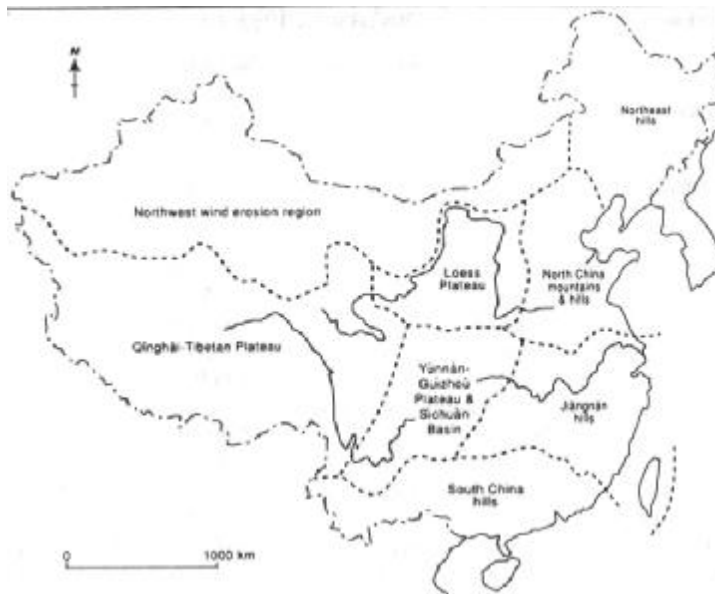


Fig. 11: Erosion regions in China³⁶. Note that soil erosion exists everywhere in China.

Pollution is also associated with China's population distribution pattern. Air pollution is one of the problems in eastern China. Coal is used in China as the major energy source and the discharge of smoke from coal burning is a main concern of air

³⁴ Edmonds, R. L., 1994. *Patterns of China's lost harmony: a survey of 1994*. Routledge. pp. 62-63.

³⁵ *Ibid.*, p. 105.

³⁶ *Ibid.*, p. 64.

pollution in China. Dense population distribution within cities over 1 million usually cause air pollution problems because public facilities such as housing, transportation are not keeping pace with city development in China³⁷. Overcrowding population prevents the ventilation of vehicle and industrial emission and air qualities deteriorate. It is no wonder that the concentration of gas emission in east and southeast China occupies most of the total national emission³⁸. See fig. 12(a) and (b). It shows a close correlation between the emission of carbon dioxide and the population distribution in China. With higher concentration of population it tends to have a higher level of carbon dioxide emission and higher level of air pollution, and vice versa.

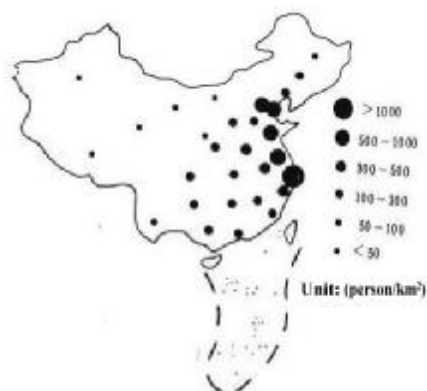


Fig. 12(a): Population distribution of China

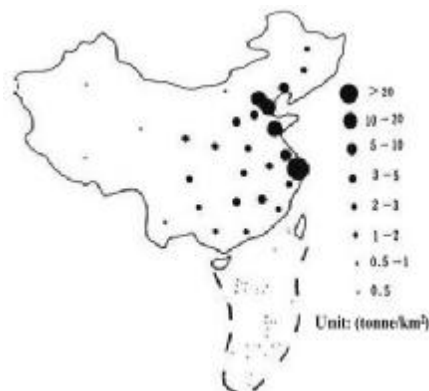


Fig. 12(b): China's spatial CO₂ emission³⁹

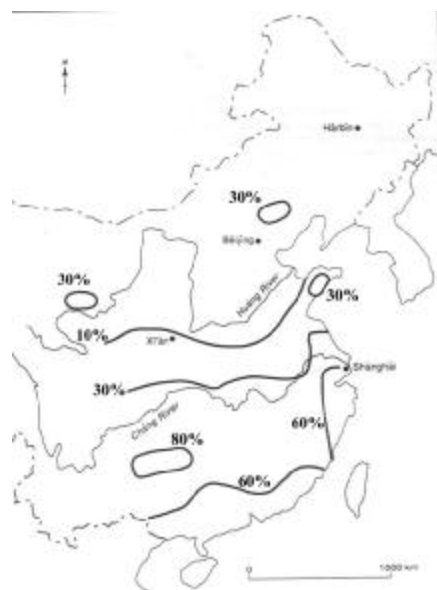


Fig. 13: Frequency of acid rain occurrence in eastern China⁴¹

With the problem of air pollution and carbon emissions, which is highly associated with population distribution, it is argued that pollution has suspiciously altered China's microclimates. It is pointed out that cities in northeast China have risen 0.2°C to 0.3°C in temperature and 1.0°C to 2.5°C higher in northern Xinjiang province. Relative humidity and average rainfall drops, with heavy rainfall concentration in early part of summer monsoon causing heavy floods of 1991⁴⁰. Excessive carbon mission also leads to formation of acid rain. See fig. 13. When comparing it with fig. 12(a) you will find out that area with

³⁷ Zhang, Z. R., 1996. *op cit.*, p. 170.

³⁸ Qu, G. P., 1992. *op cit.*, p. 176

³⁹ *Ibid.*, pp. 176-177.

dense population density are likely to have high occurrence of acid rain. It shows close relationship between change of climate and population distribution in China.

Population distribution also affects water resources in China. In a largely agricultural country like China, water consumption has a special link with population, in which it is to satisfy the growing need of food and other products for people⁴². Besides population distribution is related to level of water consumption and shortage problems, water pollution is also highly associated with it. It is pointed out that the amount of pollutants released is influenced by the population density and level of economic development in a particular area. Concentration of population and in eastern China affects China in which it faces severe river pollution problems since pesticides, organic wastes pollutants and domestic waste are discharged into rivers resulting in a rapid increase in both organic and inorganic water pollution⁴³. See Fig. 14 in comparison with fig. 12(a) to see the relationship between concentration of population and wastewater discharge causing water pollution. The higher the population distribution the higher level of wastewater to runoff takes place. In summary, the more population concentration in one place the more likely pollution problems will exist, and vice versa.

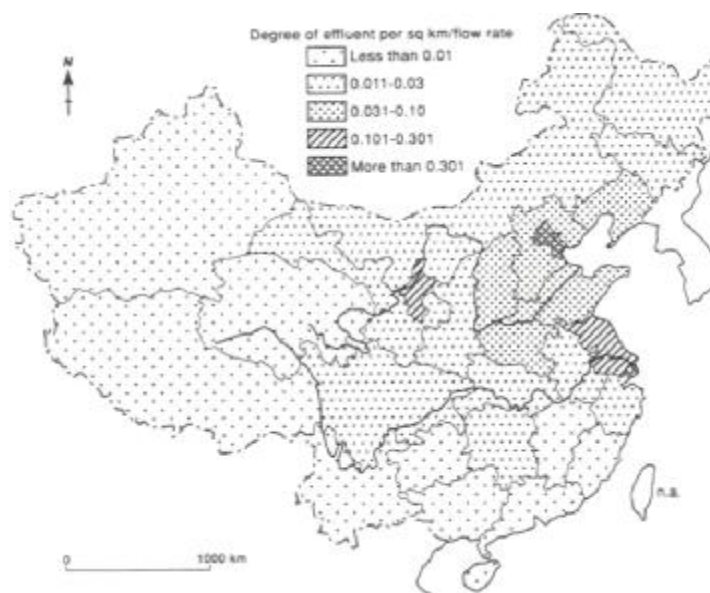


Fig. 14: The ratio of wastewater to runoff by provincial-level units⁴⁴

⁴⁰ *Ibid.*, pp. 220-222.

⁴¹ Edmonds, R. L., 1994. *op cit.*, p. 167.

⁴² Zhang, Z. R., 1996. *op cit.*, p. 168.

⁴³ Edmonds, R. L., 1994. *op cit.*, p. 133.

⁴⁴ *Ibid.*, p. 138.

To sum up, we can observe an inter-relationship between population distribution and physical environment in China in the most straightforward sense. China's physical environment affects the attractiveness of one place to reside therefore affect its population distribution. Dense population concentration in China will lead to physical environmental problems in term of deterioration of land, water, air and climates. Population distribution always shows a close linkage with physical environment problems, in which the denser the population distribution in one locality, the more severe the problem will be.

And this coincides with the teaching in the lecture. During lecture we are being introduced with fig. 15. It shows that climate, precipitation, soil, vegetation and farming, human society and landform actually form a cycle and change in either one of them will cause interaction with others. This matches with the above findings. Physical environment in China (climate, precipitation, soil and vegetation) will affect population distribution and its activities (vegetation/farming human society and landform/location) and the latter will again affect its physical environment.

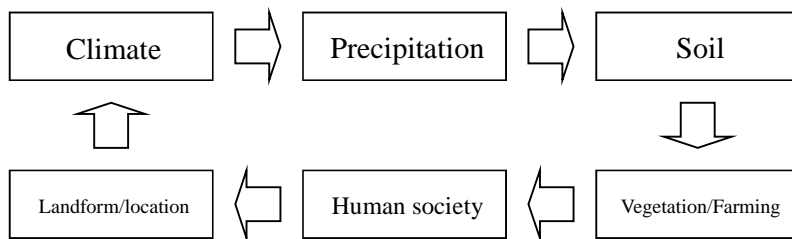


Fig. 15: The inter-relationship between physical environment and population distribution⁴⁵

Discussion: intervening factors

In the above a description on how population distribution and physical environment inter-relate to each other is given, and the above description, to a large extent, very theoretical and one-sided. For example, we have only described how physical factors affect population distribution. Other human factors which contribute to such pattern are discarded. We have also given an account on how population distribution relate to physical environment in China, other socio-economic factors are not considered. This commits the mistakes we try to rectify in the introduction: we have oversimplified the inter-relationship between them though a regional example of China is cited. In this part of the paper we will try to discover the intervening factors between them, and to assess to what extend these intervening factors important to the

⁴⁵ Figure from lecture.

understanding of inter-relationship between China's physical environment and population distribution.

There are other factors other than physical environment affecting population distribution in China. It is revealed that level of economic development and political factors also play a part in shaping population distribution in China. With higher level of economic development, industries have replaced agriculture as the major activities in cities. Industries further enjoy economic of scale as a result of agglomeration. There are better quality of living condition such as higher wages and benefit. This leads to concentration of industry and high population distribution which serves as labour force. This situation was witnessed in China in the last decade. Economic reform was carried out since 1978 and industrialization began. Many people came to east and southeast to look for jobs and better life. This leads to concentration of population in Eastern China in Yangzi Delta, Sichuan and North China Plain⁴⁶.

Level of technology also affects population distribution. It is argued that with the introduction of technology it leads to concentration of population in China. For example, with the rise of technology, transportation is improved and this has profound impact on the distribution of population in China. It leads to concentration of population in rugged areas. For instance, it is pointed out that in Sichuan of southwest China, the relief is rugged with mountains and valley. The population is low. But with the establishment of Chengkun Railway (成昆鐵路) and Chuandian Highway (川滇公路) which connect cities such as Dukou (渡口), Xichang (西昌), Miyi (米易) and Dechang (德昌), a linear pattern of population distribution is developed⁴⁷ along the transportation route. Technology can overcome physical environment which is unattractive to population settlement in China. Human factors also play a critical role.

However, from all human factors that affect population distribution, it is even more critical to remember that the Chinese government plays an important role in determining the population distribution in China. As we know that China is a communist state which exert tight control in every aspect of life, population distribution therefore, for a large extent, is a products of decisions made by the Chinese government. And population distribution changed once there is a change in policy of the communist government. It is pointed out that the relaxation of control over the past decade on population migration has greatly influenced the population distribution. In order to facilitate the economic reform and development in last 20

⁴⁶ Hu H. Y., 1992. *op. cit.*, p. 54.

⁴⁷ *Ibid.*, p. 54.

years in southeast China, the Chinese government had liberated the freedom of movement of its people. Movement from rural periphery to urban center was allowed and this results in population concentrated to three core areas of economic activity in the coastal regions of eastern China. These included primarily provinces of Hebei, Shandong and Liaoning, secondly Shanghai and thirdly Guangxi and Sichuan⁴⁸. Therefore in understanding the population distribution of China, we should not only focus on its physical characteristics, human factors especially government decisions play a very important role in it.

For the relationship on how physical environment is affected by its population distribution in China, we should also consider other human and physical factors which intervene the relationship.

For example, it is pointed out that the worsening of physical environment in China is a consequence of education. It is pointed out that the education level is very low in China with 180 million people aged fifteen and above who are illiterate or semi-illiterate, amounts to 22 per cent of total population. Twenty million of intellectuals only account to only 2 to 2.5 percent of the whole country⁴⁹. The low level of education results in low environment awareness, in which people in China ignore the consequences of concentration of population and its activities. They only concern about the short-term benefits, without long-term consideration of all interest in the society. This leads to serious degradation of its physical environment⁵⁰. Most importantly, it is pointed out that there is regional variation of literacy in China (See fig. 16), in which people living in rural periphery in northwest China are illiterate. The very low environment awareness further deteriorates its physical environment. For example, more serious form of soil erosion – desertification is witnessed in northwest China and the size of desert enlarge southward every year.



Fig. 16: Percentage of population over 15 years of age classified as illiterate or semi-illiterate in 1990⁵¹.

Technology level and socio-economic development in China also influence its

⁴⁸ Jowett, J., 1993. China's population: 1,133,709,738 and still counting. *Geography* 78(4): 407-408.

⁴⁹ Zhang, Z. R., 1996. *op cit.*, p. 166.

⁵⁰ Qu, G. P., 1992. *op cit.*, p. 179.

⁵¹ Jowett, J., 1993. *op cit.*, p. 410.

physical environment other than its population distribution. It is argued that “it is highly problematic to link figures of absolute numbers of people directly to environmental questions without considering the intermediate behavioral and technological factors⁵²”. Technology level can affect the quality of environment in one locality – whether can people eliminate pollutant before emission and discharge to air and river. Whether can people produce more efficiently and environmentally friendly without disrupting its physical environment. And this requires the support of technology in China⁵³. Socio-economically, it is also highly related to the behavior of the people. For example, what they consume and what they do, all have consequences on the environment. It is pointed out that even a small number of people can do tremendous harm on the environment, whereas one can imagine large numbers of people living environmentally friendly life-styles⁵⁴. Therefore in studying the relationship on how population distribution affects its physical environment, we also have to consider other human factors.

However, it is not only human factors, but also physical factors which affect physical environment in China. For example, it is mentioned that desertification in northern China is not solely caused by human activities. See fig. 17. It suggests that human activities such as deforestation, over-cultivation and overgrazing, mining and industrialization cause desertification in northern China. However, its physical environment settings also contribute to such problem. For example, it is suggested that wind blown sand dune encroachment, unpredictable precipitation and increasing aridity also cause desertification in China. Therefore in making the relationship on how population distribution affects environment, we also have to consider physical factors.

Cause	Area 1000 sq km	% of desertified area in north China
Human		
Overcutting of forests	56.0	31.8%
Overgrazing	49.9	28.3%
Excessive agriculture	44.7	25.4%
Misuse of water resources	14.7	8.3%
Industrialisation & urbanisation	1.3	0.7%
Physical		
Wind blown sand dune encroachment	9.4	5.5%

Fig. 17: Causes of desertification in northern China 1985⁵⁵.

⁵² Lutz, W., 1994. World population trends: global and regional interactions between population and environment. *Population and environment: rethinking the debate*. Westview Press. p. 56.

⁵³ Qu, G. P., 1992. *op cit.*, p. 179.

⁵⁴ Lutz, W., 1994. *op cit.*, p. 56.

⁵⁵ Edmonds, R. L., 1994. *op cit.*, p. 105.

The above are some intervening factors which may affect the inter-relationship between physical environment and population distribution in China. And other recent studies also find out something similar. Take a look at fig. 18(a) and (b). You can find out that recent findings also point out there are interaction between population and environment, and it is modified by a number of intervening factors such as the level and type of economic activities, technological development, cultural systems, etc.⁵⁶

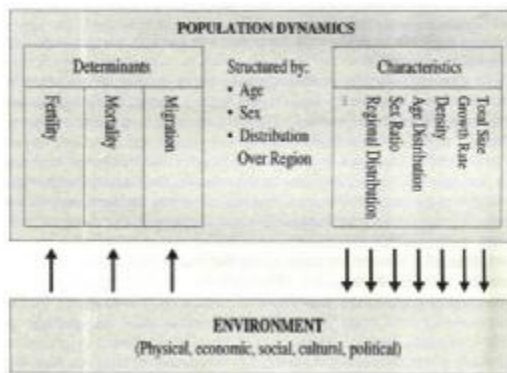


Fig. 18(a): Determinants and basic characteristics of changing population patterns⁵⁷.

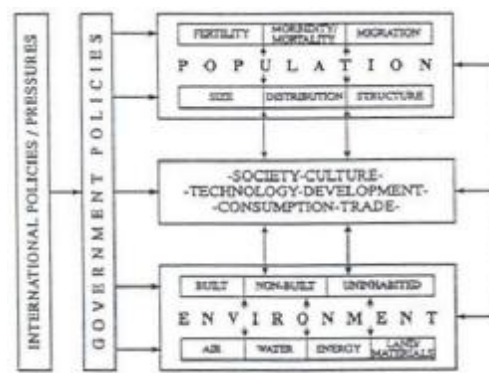


Fig. 18(b): Interrelationships between population and environment and the intervening factors⁵⁸.

Conclusion

In this paper we have examined the inter-relationship between China's physical environment and its population distribution. After giving a definition from previous scholars we are able to give some of their inter-relationship. For example, we conclude that warm and humid weather, smooth relief and reasonable level of precipitation attract population in southeast China and vice versa. And we find out that dense population distribution can deteriorate its physical environment. And in the case of China we can see a strong correlation that area with serious environmental problems it tends to have dense population distribution.

However, we have to be careful in dealing the inter-relationship between China's physical environment and its population distribution. There are also other intervening factors which determine both physical environment and population distribution. For example, population distribution in China is also highly associated with government

⁵⁶ *Population and the Environment: Modelling and Simulating this Complex Interaction.*
<http://www.demogr.mpg.de/Events/Workshops/popenviro.htm>. Access on 9th Oct., 2001.

⁵⁷ Lutz, W., 1994. *op cit.*, p. 43.

⁵⁸ Clarke, J. L., 1993. *op cit.*, p. 56.

policies and level of technology. Level of technology and other socio-economic factors also intervene on how population distribution affects its environment. And government influence is the most important intervening factors in their inter-relationship since China is a communist state. Therefore in the study of inter-relationship between population distribution and physical environment, we have to consider other factors as well. They intervene the relationship. Without considering other factors the study will be one-sided and superficial.

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