



A Set of Overall Plans to Promote Coordinated Economic and Social Sustainable Development in Mid-southern Liaoning Urban Agglomeration to Narrow Imbalanced Development Gap

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Abstract. Due to the widening gap of the economic development between regions that result in negative impacts of the economy, Mid-Southern Liaoning Urban Agglomeration should implement more efficient policies and seek effective administrative management system for rapid economic and social development. Besides imbalanced developments between regions in China, the superior economic systems of Shenyang and Dalian lead to imbalanced economic and social development within Mid-Southern Liaoning Urban Agglomeration. In order to catch up with the rapid economic growth of the national economy, a more efficient working plan framework should be taken and policies should be implemented to narrow economic development gaps.

Keywords: Mid-southern Liaoning Urban Agglomerations, Imbalanced development within an urban agglomeration, Imbalanced development between regions, economic and social development, integrated development

1 Introduction

The earliest urban agglomerations of China can be traced back to the 1980s when the central government of China officially announced the development of Yangtze Delta urban agglomerations. It has been manifested that urban agglomerations have become important driving forces for regional developments. With the belief that the mutual cooperation with cities and towns within an urban agglomeration can boost the economic and social development at a relatively rapid pace, the state Council of China has approved nineteen urban agglomerations so far. These nineteen urban agglomerations contributed 88% of China's GDP in 2022. (More than 19 city groups, which one is the strongest?, n.d.) Such statistics reveal that the global trend of using urban agglomerations as the core strategy for regional development plays an essential role in the economic and social development of China. With this, Mid-Southern Liaoning Urban Agglomerations, one of two urban agglomerations in the northeast part of China is regarded as an important heavy industrial base in China where each city has at least one

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core industrial bases, such as machinery industry and steel industry.[1] (*MBA*, n.d.) Mid-Southern Liaoning Urban Agglomeration consists of a total of ten cities, Shenyang, Dalian, Anshan, Fushun, Benxi, Yingkou, Dandong, Liaoyang, Panjin and Tieling.

1.1 Imbalanced Development Among Urban Agglomeration in China

Even if the development of urban agglomerations helped to boost the economic development of China as a whole and is beneficial for regional developments, gaps between one urban agglomeration with another can be significant. For example, the area of Mid-Southern Liaoning Urban Agglomeration is 81.5 km², [2] which is larger than the area of Pearl river Delta Economic zone, 55.4 km². [3] On the other hand, the GDP per capita of Pearl river Delta Economic zone, one of the measurements of the urban agglomerations development, is much higher than the GDP per capita of Mid-Southern Liaoning Urban Agglomeration. This example explains the phenomenon of development gaps among urban agglomerations in China and are the main manifestations of imbalanced and insufficient economic developments in China.

1.1.1 Development Gap of the North and South of China

Fortunately, even though the development gap of east, center and west of China still exists, after the nation's reform and opening, the gap has been narrowed to a large extent since 1978; however, the imbalanced development between the north part and the south part of China have raised heated debates. The south part of China which involves Yangtze River Delta Urban Agglomeration and Pearl river Delta Economic zone has experienced faster economic and social industrial development and growth than the north part of China which involves Jing-Jin-Ji urban Agglomerations and Mid-Southern Liaoning Urban Agglomeration. The core economic development of China has gradually moved to the south part of China. The greater rate of economic developments in the south part of China will end up exacerbating greater gaps between these two regions in China. Therefore, modifying and adjusting the policies of the north urban agglomerations, including Mid-Southern Liaoning Urban Agglomeration, should be priorities.

1.1.2 Development Gap of East, Center and West of China

Table 1. The GDP of China's East, West, Central and Central regions accounts for a significant proportion of the country's GDP (%)

| Region | 1999 | 2000 | 2001 | 2002 | 2003 | 2019 | 2020 |
|--------|------|------|------|------|------|-------|-------|
| East | 56.7 | 57.3 | 57.5 | 57.9 | 58.4 | 51.81 | 51.75 |
| Mid | 25.8 | 25.6 | 25.4 | 25.4 | 24.6 | 26.03 | 25.76 |
| West | 17.1 | 17.1 | 17.1 | 17.1 | 17.0 | 16.88 | 17.10 |

Table 1: The GDP of China's East, West, Central and Central regions accounts for a significant proportion of the country's GDP (%)

Source: Shanchuan website

Table 1 clearly reveals that there are large gaps among the eastern, mid and the western part of China, and it shows that the east of China has contributed the most to the total national GDP since 1999 while the western part of China has contributed the least. Such a large gap is a result of various factors, such as geographic locations, culture and climate. The development gap of the east, mid and west of China is less noticed by the public because there are no clear boundaries to clarify these three regions but issues caused by such a large gap cannot be ignored for more sustainable development.

1.2 Imbalanced Development Among Cities Within an Urban Agglomeration

In some urban agglomerations, there may also be imbalanced development between cities. Cooperation between two has promoted regional economic development, yet it also led to issues of uneven urban growth. Once two or more cities establish a long-term cooperative relationship, their connections with other surrounding cities may weaken, which is detrimental to balanced urban development.[4] This issue should also grab the attention of the central government in China because it will probably result in inequalities in the long term.

1.2.1 Imbalanced Development Among Cities in Mid-Southern Liaoning Urban Agglomerations

In the case of Mid-Southern Liaoning Urban Agglomeration, Shenyang and Dalian are the two “giant” cities that have the highest gross domestic product (GDP). Imbalanced economic growth between each city can be seen as different rate of increase in GDP in different cities in Figure 1.

Table 2. GDP by cities of the first six months in 2022 in Liaoning Province (Cities included in Mid-Southern Liaoning Urban Agglomeration are highlighted) [5]

| City | 2021 GDP (first half) | 2022 GDP (first half) | Real growth rate |
|----------|-----------------------|-----------------------|------------------|
| Dalian | 3632.4 | 3905.7 | 3.3% |
| Shenyang | 3303.6 | 3460.9 | 2.6% |
| Anshan | 879.6 | 889.1 | -0.7% |
| Yingkou | 660.2 | 656.4 | -3.5% |
| Panjin | 643.1 | 674.7 | -7.9% |
| Benxi | 417.6 | 429.0 | 0.1% |
| Fushun | 398.8 | 426.9 | 3.0% |
| Liaoyang | 387.3 | 393.7 | -1.1% |
| Dandong | 381.6 | 387.0 | -1.8% |
| Tieling | 322.4 | 331.3 | 2.8% |

Source: Liaoning Provincial Bureau of Statistics [6]

As show in table 2. For example, given that the GDP of Shenyang and Dalian are far ahead of other cities in Liaoning Province, when comparing the real GDP of the first

six months in 2022 with the real GDP of the first six months in 2021, Dalian and Shenyang are the ones that grow the fastest among other cities. On the other hand, the real GDP of the first half of 2022 in some smaller cities decreased instead, especially Panjin whose real GDP reduced 7.9% in the first half of 2022. Therefore, we can infer that development gaps between cities will get even larger, thus giving rise to inequality within the urban agglomerations.

1.3 Objective

The main goal of this paper is to investigate basic proper working plans and working directions to make the development of Mid-Southern Liaoning Urban Agglomerations more sustainable which gives rise to balanced development within this region and can also help to reduce the inequality between the South and North of China. Such problems to be solved are significant to study because imbalanced development restricts more sustainable development of a region and a country in the long run.

1.4 Methodology

In this paper, only secondary research will be used for analysis and I will focus on doing desk research by filtering information and knowledge from existing documents and data. The main sources of data are official governmental websites, news reports from both domestic and foreign publishers and journals released by scholars. For example, by reading the articles published by The People's Government Of Liaoning Province, I will understand the current working plans for the next three years. Such various sources of data will give me both quantitative and qualitative data for analysis.

2 Body

2.1 Existing Working Plan

Liaoning Province is now closely following the tenet of “One Metropolitan area, One Coastal Economic belt, Two Pilot Economic zones” where the metropolitan area refers to Shenyang and other six cities as well as one economic zone; the coastal economic belt refers to coastal cities in Liaoning Province such as Dalian and Danzhou; and two pilot economic zones are Liaoxi which joins Jing-Jin-Ji Economic Zone and Liaodong Green Economic Zone. Such tenets and development objective are the key working directions for the officials. It is also an innovative regional strategic practice and specific regional embodiment of combinations of Mid-Southern Liaoning Urban Agglomerations and the entire Liaoning Province. Such strategy enhances the bonds between the each city as a whole. Furthermore, together with the Fourteenth Five-Year Plan of China, Mid-Southern Liaoning Urban Agglomerations clearly understand and work towards the economic and social development visions and missions to achieve their goals.

For example, in order to launch more modern business operation models, the government would like to promote more economic activities that are being transformed by the Internet and World Wide Web technologies.[7]

2.2 Higher Level of Internal Development Within Mid-Southern Liaoning Urban Agglomerations

Emphasizing regional development by developing urban agglomerations has great effects on narrowing the development gaps among different parts of China because when adjacent cities work together as one whole part, smaller cities will take advantage of core cities' side benefits, especially when core cities are developing in a rapid pace.

2.2.1 Establishment of Regional Working Plan Coordinated Organizations that Specialize in Particular Areas

So far, there has not been any independent departments or organizations that are solely in charge of the development of Mid-Southern Liaoning Urban Agglomerations. All connections between cities and regulations regarding urban agglomerations in Liaoning Province are constituted by the government, a centralized organization leading all cities. Under the central governmental structure, there are different levels of management, which will lead to some potential issues that limit the efficiency of urban agglomerations. For example, an overwhelming workload may cause officials to "neglect" the importance of developing urban agglomerations by cooperating with other agglomerations and cities. Hence, it is highly recommended to establish special administration departments that are independent from the provincial governments, and each can specialize in a single aspect of management to ensure full labour inputs.

In business, specialization refers to the process of an organization concentrating its labor and resources on a certain type of production to be more efficient and create a comparative advantage for an economy. It entails focusing on a narrow area of knowledge or skill or activity. This concept may also be applied to an urban agglomeration where many independent departments specialize in one aspect to meet the requirements from the central government. Cities or provinces within that agglomeration will result in greater efficiency of allocations of resources, especially when each of them focusing on the production or provision of some specific goods or services.

This concept is being adopted by some urban Agglomerations by other countries like the United States. There is no centralized and authorized government for the Greater New York City Area which comprises five main cities: Bronx, Brooklyn, Manhattan, Queens, and Staten Island. [8] However, some established coordinated non-profit organizations like Regional Plan Association (RPA) which designs the economic and social development for the Greater New York City Area, including transportation, energy, housing, infrastructure and so on. Therefore, Mid-Southern Liaoning Urban Agglomerations may also learn from cases in other countries for their own needs and requirements.

For instance, besides achieving rapid urban growth and economic development, Mid-Southern Liaoning Urban Agglomeration is also pursuing more environmentally

friendly manufacturing production methods and better waste management so another approach is that the government may consider forming an independent non-governmental organization. It may give each citizen living in Liaoning Province an equal opportunity to represent the entire population so that the requirements and wants of these stakeholders who are affected by the pollution and wastes will be finely met. Members can be firms and any citizens. Furthermore, not only will such organization improve the overall efficiency, it can also ensure the participation rate of the general public, making sure all policies and actions from the government fulfill the interests of all stakeholders and ensuring the transparency of the decision-making processes. More engagement of the general public can therefore highlight democracy.

The second approach is to establish a body led by the provincial government, with relevant departments of the province taking the lead. According to the professional requirements of each field, a specialized regional coordinating body can be formed and it can use a committee system similar to the European Union to handle specialized affairs across different cities through consultation and voting.[9] Based on the comparative advantages or productive advantages of each city, the government can form IT groups, funding groups, science and technology groups, commercial groups and so on.

In addition to that, from “One Metropolitan area, One Coastal Economic belt, Two Pilot Economic zones” principle, Mid-Southern Liaoning Urban Agglomerations is working towards to these three goals. Therefore, the provincial government may consider to establish three new governmental organizations or departments which are solely working to coordinate and achieve these three goals. These three departments will formulate objectives to be achieved, working plans, policies to be implemented and proper assess criteria. Regular meetings among all these organizations are also very essential for ensuring the consistency and coordination.

2.2.2 Besides Shenyang and Dalian, Other Small Cities May Adopt Specialization

One of the strategies that Mid-Southern Liaoning Urban Agglomerations uses heavily relies on the two core cities, Shenyang and Dalian. The three-year action plan for regional coordinated development states and supports Shenyang and Dalian to take the lead in development, exploring and innovating higher and deeper industries and fields. Therefore, they can be the pioneer and the leader in high-quality development in the urban agglomeration, in the belief that urbanization effects and coordinated industrial development will accelerate the economic and social development of all cities in the urban agglomeration.

On the other hand, such strategy and action plan will accelerate imbalanced developments between Shenyang and Dalian and other smaller less developed cities in the short term because many policies that the government implements are specifically for accelerating the economic growth of these two core cities, rather than the whole province. Moreover, such strategy may also lead to big city disease which is defined as the situation where a megacity becomes plagued with environmental pollution, traffic congestion and a shortage of public services, including education and medical care.[10] When these happen to Shenyang and Dalian, it means that a large number of people from other cities or provinces migrate to these cities for living. This will increase the

general price level, including the housing price, which will end up with property bubbles. This may force local citizens with low income levels to leave the megacity to other lower-tier cities where the general price level and costs of living are much lower. Hence, in order to narrow the development gaps and prevent from this happens, other cities in Mid-Southern Liaoning Urban Agglomeration should also figure out proper management that fits local circumstances, such as taking into consideration resources availability, geographical locations.

The case of Mid-Southern Liaoning Urban Agglomerations is similar to the Frankfurt Metropolitan Area, the second largest metropolitan area in Germany. Germany does not develop large cities like Beijing and Shanghai, it takes one or more two cities as the core for that region, collaborating with other surrounding cities. The concept of related specializations and complementarity characterizes an interurban relationship based on the idea that “different settlements or regions can fulfill different and mutually beneficial roles, through simultaneously embracing the advantage of competition but also overcoming the associated disadvantages.”[11] Cities in the Frankfurt Metropolitan Area specialize in some particular product manufacture or production and service provision. For instance, Rüsselsheim is one of the members of the Frankfurt Metropolitan Area, and it is famous for the vehicle manufacturing industry while Mainz is known for universities. All in all, each city of the Frankfurt Metropolitan Area targets some specific products and services.

Mid-Southern Liaoning Urban Agglomerations can learn from this management development system because not only does it follow the principles which support Shenyang and Dalian as the pioneers, it also highlights the functions of other small cities which may assist Shenyang and Dalian for high-quality development and increase their own output at the same time.

In China, cities are divided into different tiers. Taking Fushun, a fifth-tier city as the example, it has abundant rich mineral and coal resources, water resources and land resources. The vast majority of the land is being used for farming. Specifically, the mine area in Fushun is 119.1406 km^2 . [12] With this, there is a great variety of mine resources, such as iron ore, copper mine, cement, limestone and so on. The regional plan association (Non-governmental organization) or the governmental organization may implement policies that attract more manufacturing firms to invest in Fushun, operating more firms and creating more job opportunities. Thanks to the abundant natural resources and manufacturing factories, the secondary industry has contributed the most to the real output. For further more sustainable development and a more modern living environment, the government should consider constructing infrastructures in rural areas to achieve urbanization because around 30.86% of the population are living in rural areas in Fushun now. Therefore, when supporting policies based on the abundant natural resources in Fushun are implemented and maximizing urbanization, the development gap between Fushun and Shenyang or other well-developed cities in the south part of China will be addressed.

2.3 Associating with Other Cities for Deepening Cooperation for Common Development, Mutual Benefits and Win-Win

Active cooperation with other regions or provinces will eliminate the limitation of the capacity in Mid-Southern Liaoning Urban Agglomeration and allow greater varieties of goods and services. Through cooperation and trades with other regions, Mid-Southern Liaoning Urban Agglomeration can accelerate the economic growth of more under-developed regions and enhance the link with southern cities as well.

2.3.1 Towards Inside: Haerbin and Changchun Urban Agglomerations

The Harbin-Changchun Urban Agglomeration is a typical inter-provincial administrative urban agglomeration between Harbin Province and Jilin Province in China, and also an important commodity grain base in China.[13] Together with Mid-Southern Liaoning Urban Agglomeration, the primary goals of these two urban agglomerations is to achieve Northeast China Revitalization and ensure national food security. On the other hand, in Table 3, either Harbin-Changchun Urban Agglomeration or Mid-Southern Liaoning Agglomerations does not stand out from the development potential ranking among all urban agglomerations of China. These indexes reveal that Northeast China is generally less developed than the southern part of China. Moreover, Harbin-Changchun Urban is even less developed. Hence, it is highly recommended to establish further and deeper cooperation for Northeast China Revitalization, mainly due to similar climate conditions, natural resources and common goals.

Table 3. Development potential of urban agglomerations of China in 2019

| Ranking | Urban Agglomeration | Development Index | Ranking | Urban Agglomeration | Development Index |
|---------|---------------------------|-------------------|---------|--------------------------------------|-------------------|
| 1 | Yangtze River Delta | 92.5 | 11 | Beibu Gulf | 66.8 |
| 2 | Peal River Delta | 91.3 | 12 | Harbin-Changchun | 64.3 |
| 3 | Jing-Jin-Ji | 89.6 | 13 | Central Shanxi | 62.3 |
| 4 | Chengdu-Chongqing | 87.7 | 14 | Qianzhong | 59.8 |
| 5 | Triangle of Central China | 83.8 | 15 | Hohhot Baotou | 59.4 |
| 6 | West Coast | 79.9 | 16 | Central Yunnan | 57.1 |
| 7 | Shandong Peninsula | 78.9 | 17 | Northern slope of Tianshan mountains | 54.2 |
| 8 | Central Henan | 74.2 | 18 | Lanzhou-Xining | 52.8 |
| 9 | Mid-southern Liaoning | 71.3 | 19 | Ningxia along Yellow River | 50.6 |
| 10 | Guanzhou Plain in Shaanxi | 67.9 | | | |

Source: Evergrande Research Institute

First of all, each urban Agglomeration can make the best use of their geographical locations, boosting the efficiency of exports and imports, which will eventually result in lower costs of transportation from regions to regions. Statistics show that Northeast China has high dependence on neighboring countries for exports and imports, and Russia is the largest exporting country for Northeast China. However, Northeast China is facing some challenges of low level of openness and appropriate layouts for the entire trading policies. In 1993, the volume of exports and imports of Northeast China accounted for 7.3% of China; however, by the first half of 2023, it only contributed 2.9% of the volume of exports and imports.[14] Such reduction of trading volume reflects a poor management system for exports and imports.

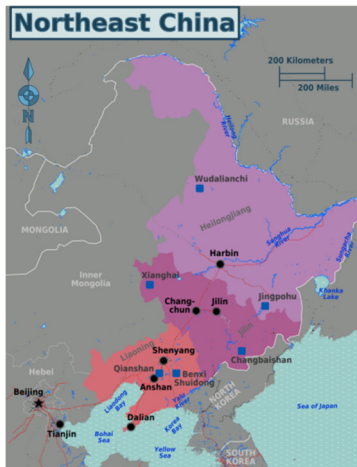


Fig. 1. Provinces of Northeast China (Source: Wikivoyage)

Figure 1 demonstrates the geographic locations of the three provinces of Northeast China and their neighbouring countries. Generally, the neighbouring countries of Mid-Southern Liaoning Urban Agglomeration and Harbin-Changchun Urban Agglomeration are other countries in Northeast Asia, such as North Korea, South Korea, Russia and Japan. However, it is argued that Northeast China does not make best use of its geographic locations because of the low development integration level with these neighbouring countries. For example, for the first half of 2023, the export and import trade volume of Heilongjiang to Japan, Korea and Russia is equivalent to 70.9% of the province's total export and import volume. However, the data of Liaoning Province and Jilin Province are 27.1% and 24.9% respectively.[15] This demonstrates that the location advantage of Northeast China, and thus these two urban agglomerations have not been effectively utilized yet. Even though the resources of coastal cities are abundant and rich in the Northeast, when it comes to the implemented open policies to other Northeast Asian countries, the lack of resource integration capacity, new platform for development and appropriate regulated management system. Therefore, it is undeniable

that designating a more suitable working plan that leads to more efficient resource allocation is key for the success of Northeast China Revitalization.

Moreover, at the same time, the Russia-Ukraine war has also shown Russia's increasing economic dependence on China.[16] Being affected by the war, some mobile vehicle manufacturers have officially suspended the exports to Russia; however, statistics reveal that the market share of imported automobile spare parts is approximately between 63% to 65%.[17] Russia also relax the trading policies for imports Hence, together with the geographic locations and relaxed trade policies, Mid-Southern Liaoning Urban Agglomeration and Harbin-Changchun Urban Agglomeration will experience rapid economic growth so that the development gap between the south and the north of China will be narrowed, leading to more sustained social development.

Secondly, in addition to the enhancement of international trade with neighboring northeast Asian countries to boost economic and social development, this cooperation will also enhance the link between Harbin-Changchun Urban Agglomeration and southern cities of China. For example, from Figure 1, Jilin Province and Liaoning Province (Mid-southern Liaoning Urban Agglomeration) are regions that must be passed for land transportation. This demonstrates that Liaoning Province is the most foremost regions connecting Northeast China and other southern cities together and the transportation hub area. Hence, strengthening the bond between these two urban agglomerations is also essential for the economic and social development of Harbin-Changchun Urban Agglomeration.

2.3.2 Towards Outside: Deepening Cooperation with Urban Agglomerations in the Southern China

With the steady progress of urbanization and gradual development and maturity of urban agglomeration, it is also necessary for different urban agglomerations to achieve complementary advantages through cooperation and ensure rational allocation of resources. Furthermore, the working plan and guidance of urban agglomerations are crucial for China's economic development. Mid-Southern Liaoning Urban Agglomeration, Jing-Jin-Ji Urban Agglomeration, Shandong peninsula Urban Agglomeration, Yangtze River Delta Urban Agglomeration and Peal River Delta Urban Agglomeration are the main coastal urban agglomerations of the western part of China. Since the primary and secondary industry in Mid-Southern Liaoning Urban Agglomeration is significant and important for China. Well-organized export supply chain with coastal urban agglomerations will strengthen the process of natural resource, manufacture and delivery to other countries.

In addition to that, most domestic brands and headquarters are located in southern cities of China, such as HUAWEI, Alipay, Bilibili and etc. Mid-Southern Liaoning Urban Agglomeration may implement more policies attracting investments from these domestic companies to open up branch offices in Liaoning Province, as well as investment from other countries. When more domestic and foreign companies invest in Liaoning Province, it can learn from advanced technology and equipment. Furthermore, as new firms set up in Mid-Southern Liaoning Urban Agglomeration, it enables new ideas and new skills to be transformed from one urban agglomeration to another. Such exchange of ideas and technology can result in greater productivity and efficiency, thus

benefiting the economic growth of both regions. In addition to that, Mid-Southern Liaoning Urban Agglomeration can also enhance policies to gather elite global talents. These measures include optimizing policies on developing talent and innovation of talent policies to create stimulating environments that can encourage innovation, especially for technology and scientific areas so that more talents can make more contributions to the economic and social development for Mid-Southern Liaoning Urban agglomeration. This can eventually narrow the development gap between the south and north part of China.

2.3.3 Set Up Regional Plan Association Organization for Coordination with Other Urban Agglomerations

Mid-Southern Liaoning Urban Agglomerations can form regional associated plan organization to coordinate the working plans of cooperation with other regions. Annual or regular meetings among regional working associations can be held where representatives of each urban agglomeration will have opportunities to hold speeches in order to pursue further cooperation and mutual progress of social and economic development. Such summit is mainly to achieve more efficient communications among different regions in China. Members participating the summit can be all regional coordination organizations that specialize in particular areas of one urban agglomeration, no matter if the organization is under the control of the government or not. In this summit, representatives of Mid-Southern Liaoning Urban Agglomeration can learn from successful cases of other regions, leading to greater integrated allocation of resources and rapid economic growth.

However, some may argue that the size of the summit or conferences can be so large that it is difficult to maximize the efficiency or fulfill all requirements and interests of all members. There are two forms of cooperation, one is the active-demanded collaboration formed by local organizations seeking the best partners based on their respective development goals, resources and working plan, and the other one is passive-demanded collaboration between relevant cities due to some public affairs to be handled.[18] It is hard to keep each members' voices heard summit, especially for the case of active-demanded collaboration when some would like to seek cooperation with others. Hence, efficient summit cannot be done without proper preparation in the preliminary phase and reasonable procedure of the conference.

2.4 Taking the Importance of Environmental Protection While Achieving Rapid Economic and Social Growth

The north-south difference in China refers to the differences between the southern and the northern parts of China due to geographical locations, landscapes and political and economic activities and developments and so on. When it comes to environmental protection, scientists argue that the air pollution level in the northern part of China is always generally higher than that in the southern part of China, which might be the reason of wide usage of coal.[19] More accurately, the map below demonstrates the carbon

emission level by provinces of mainland China. It clearly reveals that the carbon dioxide emission is even more severe in northern China than that of southern China, especially when it comes to the per capita carbon dioxide emission. Hence, while northern China implements more efficient policies to catch up with the rapid economic and social growth in southern China, the northern part including Mid-Southern Liaoning Urban Agglomerations should also control their pollutant emissions at a moderate level for more sustainable evolution in the long term.

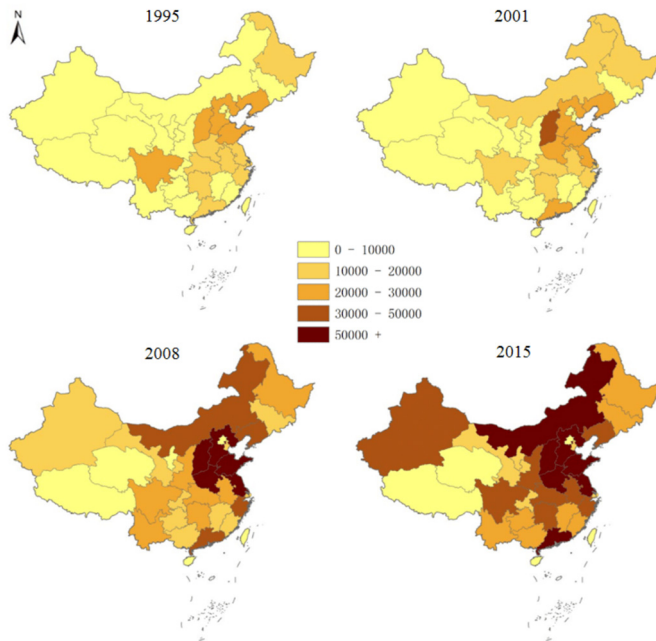


Fig. 2. Carbon Dioxide emission-socioeconomic nexus of China's 30 provinces [20]
(Source: Scholar Publications)

2.4.1 Integration of the United Nations Sustainable Goals with the overall plan of Mid-Southern Liaoning Urban Agglomerations

The United Nations defined seventeen interconnected sustainable development goals which highlights the environmental protections and social equality in order to appeal countries to make decisions and implement policies that take long-term sustainability into consideration so that they can achieve a better and more sustainable future for all and leave no one behind.[21] Promoting these goals can remind countries that using resources in an environmental-friendly way is vital for long-term sustainability and prosperity.

The fact is that even though the local government of Liaoning Province has regulated some policies regarding carbon emissions and strengthened ecological and scientific pollution control, it is inevitable to miss out on controls of some pollutants.

Table 4. Environmental Protection of Liaoning Province From 2016 to 2021 (Figures that increase over years are highlighted) [22]

| Wastage | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|----------------------|---------|---------|---------|---------|---------|---------|
| Industrial Waste Gas | 32804.3 | 50501.9 | 42666.9 | 43162.9 | 55096.3 | 66370.2 |
| Hazardous waste | 75.4 | 106.2 | 133.3 | 141.8 | 137.5 | 212.6 |

Source: Liaoning Provincial Bureau of Statistics [22]

As show in table 4. In theoretical research, when Mid-Southern Liaoning Urban Agglomeration has greater quantities of industrial products, the wasted pollutants should be much greater correspondingly without proper waste management programs. On the other hand, In Figure 2, from 2016 to 2021, most of the wasted pollutants discharge quantities are gas. Such progress suggests that the waste management in Liaoning Province can dispose most pollutants in general. However, the displacement quantities of some pollutants are steadily growing from 2016 to 2021, which showcases that the waste management has not been comprehensive to cover each pollutant.

Therefore, Mid-Southern Liaoning Urban Agglomerations should further closely follow the sustainable development goal of “Climate Action” to combat climate changes resulting from rising greenhouse gas emissions and other pollutants. Not only will this lead to more sustainable urban regional development, but also reduce the gap of the pollution level between the North and the South of China.

2.4.2 Industrial Transformation from an Old Industrial Base to Pursue Economic Resilience

As an old Industrial-based economy, Liaoning Province has made tremendous contributions to the national economy. Meanwhile, many resource-based cities have fallen into difficulties due to gradual depletion of resources and single industrial structure. [23] Even though cities in Mid-Southern Liaoning Agglomeration have a great amount of natural resources, it is important to notice that the vast majority of these resources are non-renewable, such as coal, crude oil, natural gas and other primary resources which need billions of years to form. Therefore, the heavy dependence on the extraction of natural resources and manufacture for economic and social development is not feasible, but by the time when all resources are used up in the long term, Mid-Southern Liaoning Agglomeration needs to form mature tertiary sectors to support the economic operations. For example, 73% of the overall GDP in Shanghai is from tertiary and quaternary sectors, which include financing services, real estates and so on.[24] To conclude, the servicing industry is an integral and indispensable part of social and economic development.

3 Conclusion

To sum up, this article discussed some feasible policies or actions that can be implemented and taken by Mid-Southern Liaoning Urban Agglomeration, mainly to pursue sustainable economic and social development and narrow the development gap between the southern and northern part of China. These include the establishment of regional coordinated organization specializing in particular areas, such as funding management group and environment protection group, specialization of cities of Mid-Southern Liaoning Urban Agglomeration based on resources availability, deepening the cooperation with Harbin-Changchun Urban Agglomeration to achieve Northeast Revitalization by strengthening the imports and exports with other Northeast Asian countries, implementation of policies attracting investment of both domestic and foreign companies and elite global talents, regular summits or conferences with other urban agglomerations to coordinate and seek partners for further cooperation and keeping UN sustainable development goals for the long-term economic growth and revolution.

Last but not least, Mid-Southern Liaoning Urban Agglomeration should take into consideration two essential factors when deciding on policies or methods to be used for further economic and social development: available resources and sources of finance. The government should develop industries which make best use of available natural resources and pursue allocative efficiency. Organization operations and implementations of policies require funds to support. Firstly, it can use concentrated funds from subsidies, transfer payment funds related to the regional coordinated development allocated by the Central Government of China. Moreover, each city can contribute a fixed percentage of respective GDP for a common funding pool. As the largest comprehensive heavy industry, Mid-Southern Liaoning Urban Agglomeration should establish a scientific and effective administrative management system including the innovative practices so that the construction of regional development of Mid-Southern Liaoning Urban Agglomeration and comprehensive and coordinated development of the economy can be promoted and boosted.

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