

Effective Coordination can Enhance Regional Resilience

-- The Cases of Hubei Province and New York State

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Abstract

This year the COVID-19 pandemic has spread around the world. When faced by the COVID-19 pandemic, each country and area has responded in its way to this public hygiene emergency. The theory of social-ecological resilience has been introduced to illustrate the responses when areas encounter disturbance. This article compares the reaction when facing COVID-19 of Hubei Province, China and New York State, the United States to examining the difference between the two area. To illustrate the processes, a three stages divisional method has been used to define when the event started and ended. The result of the comparison is that the effective coordination through the whole country of China made Hubei Province recovered sooner with less deaths than New York State, so it is concluded that effective coordination helps the improvement of regional resilience.

Keywords

Resilience, region, effective coordination.

1. Introduction

This year the COVID-19 pandemic has spread around the world. When faced by the COVID-19 pandemic, each country and area has responded in its way to this public health emergency. As we can see, the effects and outcomes are different. Why are some regions able to recover in a short time with a low death rate while others experience a relatively long time to restart their economies?

To answer this question, we introduce the concept of resilience – the ability of a city or area to absorb the stress of disturbance, recover to its original state and to evolve to a new state better able to resist the next emergency – into this public emergency to see through how regions get resilience and how it may be enhanced.

To illustrate the issue, we put forward two regions – the Hubei province in China which is the first region to take measures to face the COVID-19 and New York State in the United States which was very slow to respond under President Trump's federal government. Under different social and political contexts, two regions developed their strategies to respond. Some are the same, and others are different. The article will scrutinize what reinforces or weakens each of the regions' resilience capacity.

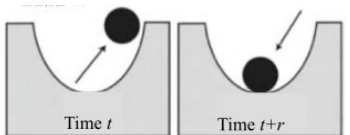
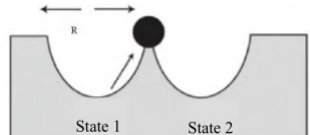
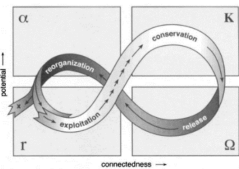
2. The Concept of Resilience

The environment surrounding our human is always under unexpected risk. For example, the earthquake in 2008 of Sichuan, China, came so suddenly that a lot of cities encountered severe loss. As the same, the terrorist attack brought New York City an unforgettable nightmare on September 11, 2001. No matter where the disasters came from natural or human causes, most of the destroyed areas had recovered from these undesired events, though the degree of difficulty and the time cost were different. This kind of ability is resilience.

To talk about resilience as a system, the first thing is that we have to know is the vulnerability of the system. It can't be avoided to expose our society into all kinds of external stress with different magnitude, frequency, duration, and areal extent of the hazard and the degree of sensitivity to which a system is modified or affected by different perturbations [1]. A system with more resilience won't be so vulnerable that the system would be destroyed at all.

The concept of resilient development has experienced three phases, from engineering resilience, ecological resilience to resilience of the social-ecological system. Engineering resilience focuses on the ultimate result of balance, while ecological resilience focuses on the development and evolution of the system when facing disturbance[2]. The social-ecological resilience sometimes called evolved resilience, emphasizes a complex adapting system which means a resilient system can learn experience from the hazard and adapt to the next disturbance[3]. A comparison of the three concepts shows in Table 1. So, the definition of resilience in this article is that ability of a system can absorb the stress of disturbance to keep a relatively stable state, and at the same time, it has the learning ability to reinforce its resilience.

Table 1: Comparison of three resilience concept [2, 4, 5]

Resilience concept	Engineering resilience	Ecological resilience	social-ecological resilience
Feature	Recovery time,	Buffer capacity	Reconstruction, Development
Focus on	Recovery, Steady state	Persevering, Disturbance resisting	Adaption, Transformation, Study ability
Context	Single equilibrium state	Multiple equilibrium state	Adaptive cycle, Integrated system feedback, Dynamic scaling interaction
Picture			

The attributes of a social resilient system are robustness, redundancy, rapidity, and resourcefulness, namely 4R of a resilient system which put forward by Bruneau[6]. Robustness is the ability that systems can withstand given level stress or demand without suffering degradation or loss of function; redundancy is referred that there is more than one key facility satisfying functional requirements in the event of a disruption; resourcefulness is the capacity to identify problems, establish priorities, and mobilize resources when conditions exist that threaten to disrupt some element, system, or other units of analysis; rapidity is the capacity to meet priorities and achieve goals on time to contain losses and avoid future disruption[6]. Robustness and redundancy refer to the quality and quantity of the most basic facilities of a social system. We would like to regard them as tangible facilities. Resourcefulness, however, is the intangible facilities of the system, which means the social organization – the ability to decide on how to allocate social resources. Rapidity is the reaction speed of the system when disturbance appears. In this article, 4Rs are used to evaluate the regions' resilience.

When encountered emergency, most risk management frameworks follow the formula that is recognition, analysis, decision, and action. To recognition what kind of risk will occur for a city and analyze what characteristics they have before the risk come, it makes it possible that

regions or cities can prepare advanced. When the risk comes, it is important to decide on what action should be taken rapidly to avoid more loss. Then, regions or cities will recover gradually after that. So, the process of an emergency includes the preparation advanced, the responding during the process, and the recovery after the event[7]. Following this formula, it is easy for me to identify the stages of each region when responding to the COVID-19 pandemic.

3. The Responding of COVID-19

This year (2020), all over the world has been influenced by COVID-19 pandemic. Each country has its strategy to cope with the pandemic. These measures can be divided into two classes. One is pausing the whole society and isolating every household strictly, while the other is taking the policy of herd immunity and just recommending people to stay at home. Although some regions have positive policies to respond, there are still a lot of people who lost their lives. The biggest difference among these regions is the coordination under a wider scale. Fleischhauer[8] thought close cooperation between administrative and political authorities could create resilient urban structures. So, we come up with a hypothesis that effective coordination on a larger scale will enhance the regions' resilience.

Figure 1 shows the countries used the isolation policy on April 1, 2020. We choose April 1 to illustrate because, following China, the pandemic outbreaking on a large scale in other countries are at the end of February. Most countries have not been into the emergent state until the end of March and few countries have gotten through their tough time. Until April 1, China was still in the highest isolation policy that all social events have been forbidden by force. China paused after January 23. Although the United States also took stay-at-home policy in most states, the enforcement was not strict. The following will analyze this in detail.

We just got the data of province in China and state in the US, so the following analysis is about region scale.

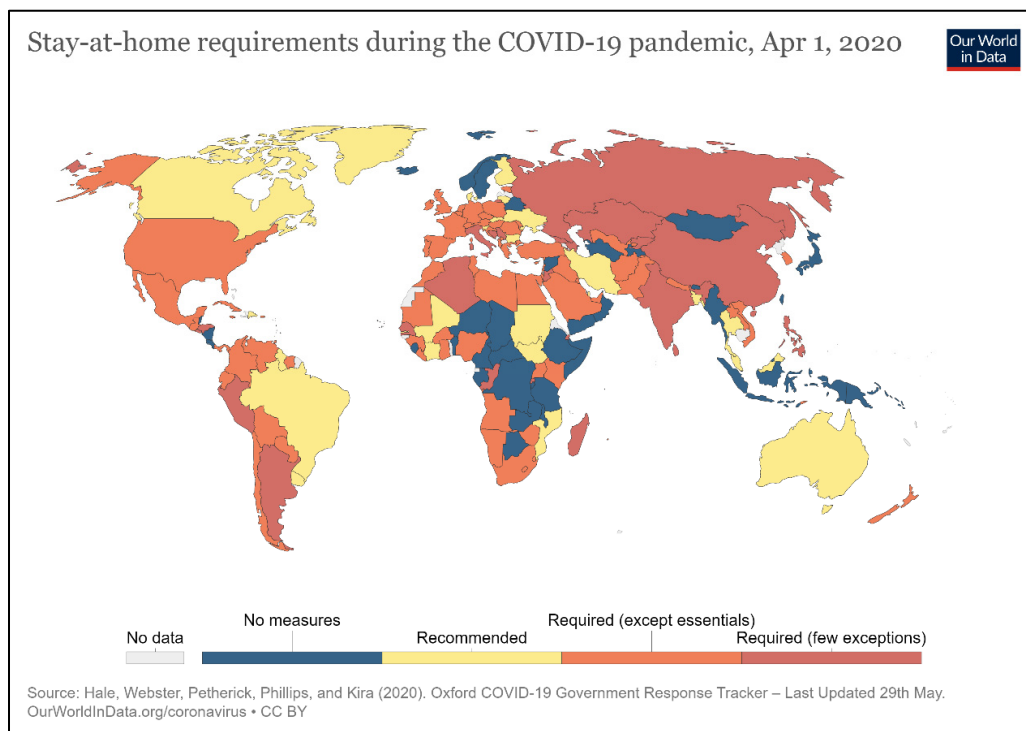


Figure 1: Stay-at-home requirements during the COVID-19 pandemic, Apr 1, 2020 [9]

3.1. Hubei, China

Hubei province was more severely affected by the pandemic than any other region in China. Until May 23, the total positive cases of China were 82,974 and total deaths are 4,634. The data of Hubei is 68,135 and 4,512 respectively. The data comes from the National Health Committee of the People’s Republic of China[10]. Figure 2 shows the pandemic data of Hubei and China. Hubei-P means the total number of Hubei’s positive cases. Hubei-D stands for the total number of Hubei’s deaths. China-P is the total number of China’s positive cases and China-D is the total number of China’s deaths. From the figure, we can see the positive cases and deaths of Hubei and the whole of China are almost overlap together. That means Hubei province was under the most stress of pandemic in China. Hubei’s most cases concentrated on its capital city Wuhan which total positive cases are 50,340, and deaths are 3,869.

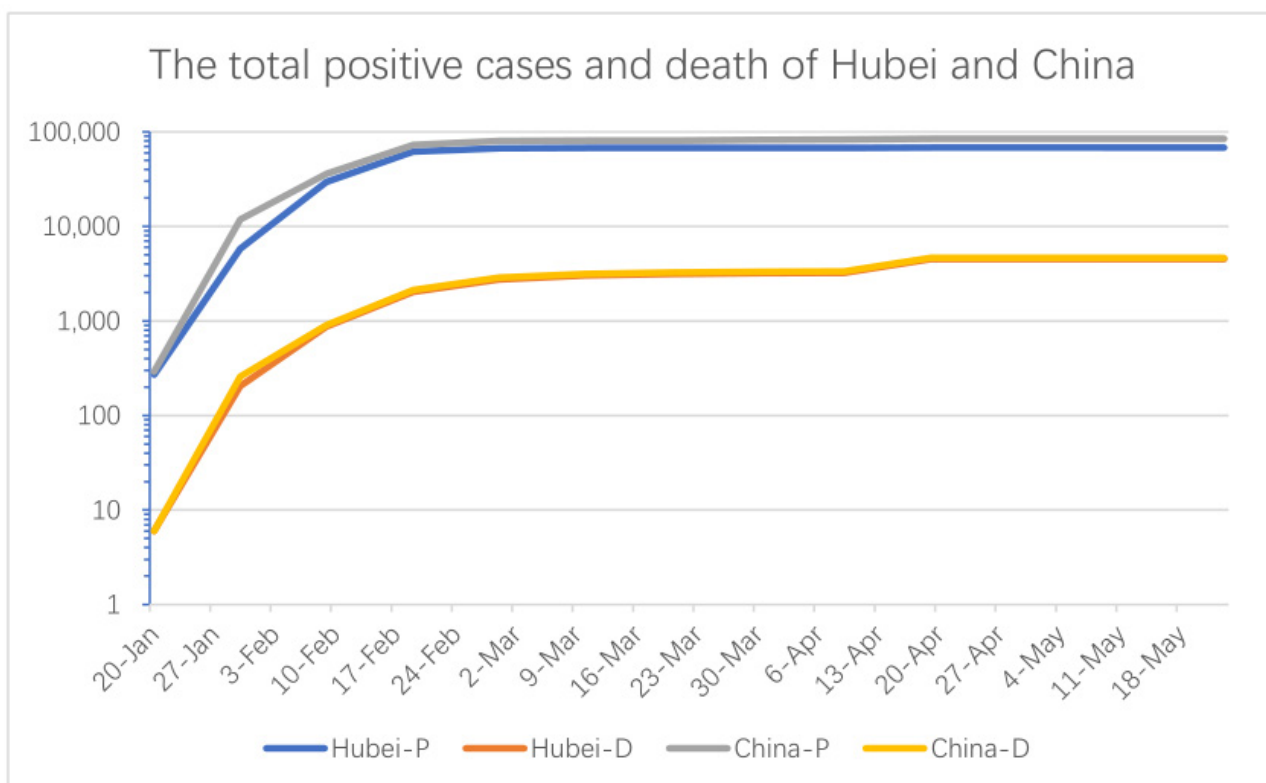


Figure 2: The total positive cases and death of Hubei and China [11]

We identified three stages of Hubei’s response to the pandemic. The first stage took 23 days starting from December 31, 2019, the finding of 27 positive cases, to January 23, 2020, when Hubei’s capital city Wuhan was closed. This decision of closing Wuhan was made in 3 days after the regular meeting of the State Council presided over by Premier Li Keqiang on which epidemic prevention experts Doctor Li Lanjuan suggested Wuhan must be strictly “closed down” (CCTV news). Although this order was issued by the Wuhan government, it was presumably under the direction of the central government. After the closure of Wuhan, most other cities in China had taken the same measures. From Figure 2, during the first twenty days, positive cases, and the death toll soared up, which put Hubei’s medical system under huge pressure.

The next stage was the responding stage. Following Hubei’s closure, the other province also took the closure policy. The total hospital beds of Hubei (2018) are only 281,500, while the population is 5,917,000 (National Bureau of Statistics of China). The situation of Wuhan became more severe. There were only 389 beds available in the hospital for infectious diseases in Wuhan[12] until February 1 of 2020. With increasing pandemic cases and lack of hospital beds and medical practitioners, the situation of Hubei was not easy. To alleviate the pandemic

situation, the Wuhan government decided to build new hospitals for infectious diseases. The construction project was leading by China Construction Third Engineering Bureau Company, a state-owned enterprise, with nearly 30 thousand workers. Things started to change when Huoshenshan Hospital came into use on February 2 and Leishenshan Hospital came into service on February 5, adding 2,500 available beds in total. Following that, more mobile cabin hospitals had been built and over 12,000 patients were treated[13]. Besides that, medical teams from other regions continuously arrived in Hubei alleviated the huge pressure of Hubei. From Figure 2, we can see the curves of the total positive cases and deaths of Hubei and China become flattered after February 3 and steadier after February 17. Then it came to the third stage - recovery. The restart of the country began on February 10, the reopen of Hubei was on March 11, and Wuhan’s closure had lifted on April 8.

3.2. New York State

Like Hubei, New York State (NYS) had the most positive cases in the US in the early time. Until May 23, the total positive cases of the US have been up to 1,635,760 and deaths are 91,941. The positive cases of NYS are 359,926 and deaths are 23,282. The data of NYS covered almost one-fifth of the US, but we have to note that the total death rate of the US is 5.6% and NYS is 6.4% while the total test rate of the US is 4.2% and NYS is 8.5%. In a word, NYS has a better medical condition and test capacity than other areas of the US. In Figure 3, US-P, US-D, NYS-P, and NYS-D stand for the total number of the US positive cases, US deaths, NYS positive cases, and NYS deaths. From Figure 3, we can see that the curve of NYS and the US come into a plateau at almost the same time, so to some extent, the data of NYS cases illustrated the situation of all the US. (Data comes from <https://covidtracking.com/data/us-daily>).

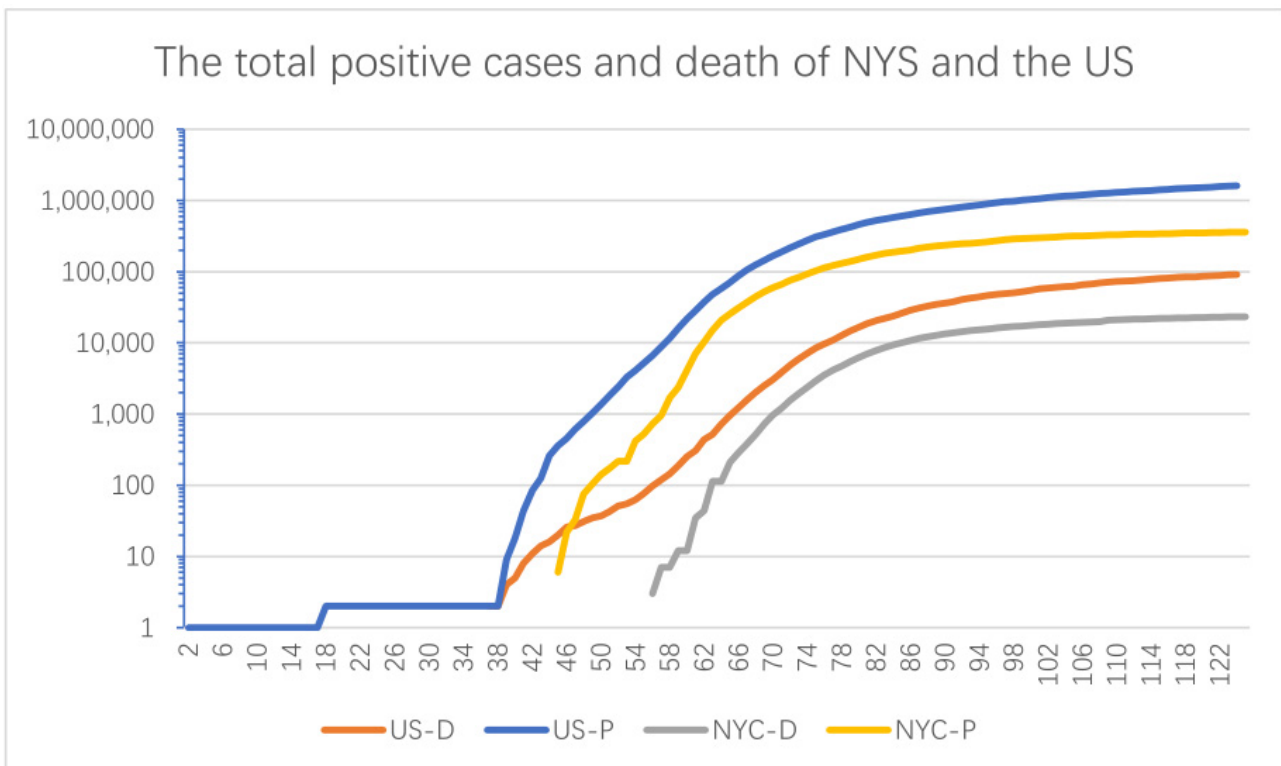


Figure 3: The total positive cases and death of New York State and the United States [14]

We also identified the action of NYS into three stages. The first stage started from the finding of the first confirmed positive case on March 1. Then, NYS took action to respond to the pandemic – closing public schools and joining up to the regional approach. On March 20, NYS Governor

Cuomo signed the “New York State on PAUSE” Executive Order. From that day, it came into the second responding stage. The second stage continued for about a month. In April 2000 hospital beds had been added; 500,000 test kits had been created; 1,000 ventilators had been donated and testing capacity had been doubled in NYS. From figure 3, in the middle of April, the speed of the confirmed positive cases and deaths started to become slower though the total number is still very high. In late April, NYS planned to restart and came into its last stage. NYS Governor Cuomo outlined a phased plan to re-open New York starting with construction and manufacturing on April 26. Five regions of NYS reopened on May 15. Following it, more regions reopened in late May. (Materials come from the New York State official website[15].

4. Conclusion & Discussion

We sorted the materials and drew the Table 2. There are other actions the countries and regions took like some economic policies that help the recovery of society, but we just write some more important for this article. From Table 2, we can see the difference clearly between the two regions about their resilience by the 4Rs rule.

Table 2: Comparison of Hubei Province and New York State [15, 16]

		Hubei Province	China	New York State	the US
Stage 1 Preparation	Date	Dec. 31 - Jan. 23	Dec. 31 - Jan. 25	Mar.1 - Mar.20	Jan.21-Mar.13
	Days	23 days	24 days	20 days	51 days
	Actions	-	Issue schemes	Close school; Increase hospital capacity; Organize regional coalition	Limit abroad return
Stage 2 Responding	Date	Jan. 24 – Mar. 11	Jan. 24 - Feb. 10	Mar. 21 - May. 15	Mar. 14 - May. 1
	Days	48 days	15 days	56 days	47 days
	Actions	Strict home isolation; Build mobile cabin hospitals; Get support from the whole country including test kit and facilities	The whole country is paused	Create more 1000 beds at Jacob K. Javits Convention Center; Apply for 1000 beds at USNS Comfort; Collect 500,000 test kits and 1000 ventilators	Recommend people stay at home; Subsidy people by economic way; Not uniformed action for each state.
Stage 3 Recovery		Hubei restarted at Mar. 11 Wuhan restarted at Apr. 8	The earliest restarting was at Feb.10	NYS restarted at May.15	The earliest restarting was in late April.
Total days		over 3 months	2.5 months	2.5 months	over 3 months
Total Positive Cases		68,135	82,974	359,926	1,635,760
Total Deaths		4,512	4,634	23,282	91,941

The first is about robustness. We choose the economic data Gross Domestic Product (GDP) and the annual revenue to indicate their robustness because there is no physical destruction of cities in this pandemic and the wealthier the region means there is more capital that the region can use to recover from the hazard. The GDP stands for the region's gross wealth and the annual revenue indicates the ability of the local government to some extent. The 2019 GDP of Hubei is 4,582 billion RMB (about 654.69 billion US dollars) and its annual revenue (2018) is 246.35 billion RMB (about 35.19 billion US dollars)[17]. The GDP of NYS is 1,751 billion US dollars and the annual revenue is 63.5 billion US dollars[18]. From the robustness aspect, NYS is better than Hubei. However, we also have to note the different regimes of the two regions.

As to the redundancy, hospital beds and medical supplies were the most needed during the pandemic. The beds of Hubei were under a large shortage. It took about 10 days of the power of the whole country to complete the work of getting more 2500 beds for patients. NYS did the same thing. Learning from the Chinese experience, it just took 7 days that NYS transformed its convention center into a mobile cabin hospital. In fact, there was a liner called USNS Comfort which should have received patients earlier on March 30, while it didn't receive COVID-19 patients until April 6. As for redundancy, NYS should have a better medical condition and have more resources at hand, but the slower responding makes the situation worse that so many people got ill that let the medical system was out at the elbows.

From table 2, it took 23 days for Hubei to take effective measures while it took just 20 days for NYS. To create a new cabin hospital, NYS took less time than Hubei. Indeed, NYS did good and timely work when responding to the pandemic. However, the total positive cases and deaths number of NYS is 5 times to them of Hubei. When we see the responding action of China and the US, we can find that China took actions after 20 days when the earliest positive cases were found, while it took over 50 days for the US. When NYS found its first positive case, the pandemic in the US had been already very serious. After 20 days, the NYS's governor issued the pause Executive Order. During those 20 days, there had been increased a lot of patients. In figure 3, we can see the curve of the total positive cases and death of NYS and the US the early March is nearly a vertical line.

The last R is resourcefulness which we think refers to the leadership of a region or the ability of the organization. Hubei and NYS both have excellent leaders and their organization are under planning. Hubei restarted after 48 days when it closed and NYS took a longer time (about 56 days) to reopen considering its worse situation. Hubei was under the order of China's central government and got support from the other provinces. NYS also united its surrounding states like New Jersey, Connecticut, and Pennsylvania to get a regional approach to combatting COVID-19 amid lack of federal direction. The leader of NYS realized the importance and necessity to respond to the pandemic on a larger regional scale.

Above all, we can see that both Hubei and NYS showed their resilience to COVID-19 and both tried their best to respond to this public health emergency. However, we also see that under different policy contexts, the results of the different countries are very different. There are still many patients in NYS. On the contrary, the patients of Hubei have reached zero for more than ten days. The difference between the two regions was caused by their different context. Hubei received support from the whole country and other areas had shut up too which means mobility of the pandemic was blocked. So, there wouldn't be more patients to come into Hubei to increase its medical pressure. What's more, the communication between Hubei and the central government was smooth. Although there was a regional approach for NYS and its surrounding states, the federal system makes the coordinating mechanism difficult. The federal government didn't give effective direction so that the coordination among states performed not so well and the mobility still flows from state to state. The communication between NYS and the US is not so smooth like Hubei and China that NYS has to compete with other states to get some resources to enhance its capacity to treat more patients. It is not an easy process for NYS.

The cases of Hubei and NYS have answered the hypothesis we put forward before. The coordination in the state's scale will enhance a certain region's resilience. Limited by the data, this study was just taken on a regional scale. So, further study can be taken under the scale of the city if the data of the city can be collected.

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