



# COVID-19 WUHAN GUIDANCE PAPERS

EMERGING EXPERIENCES ON  
RESPONDING TO COVID - 19  
IN CHINESE CITIES  
AND TOWNSHIPS

**UN HABITAT**  
FOR A BETTER URBAN FUTURE



Wuhan Land Use And Urban Spatial  
Planning Research Center



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CITIC General Institute of Architectural Design and Research Co.,Ltd



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公众环境研究中心



China Women's Development Foundation

# **COVID-19 Wuhan Guidance Papers**

## **Emerging Experiences on Responding to COVID-19 in Chinese Cities and Townships**

**UN-Habitat China**

in collaboration with

**Wuhan Land Use and Urban Spatial Planning Research Center  
Wuhan University**

as well as

**CITIC General Institute of Architectural Design and Research Co., Ltd.,  
Institute of Public & Environmental Affairs, and  
China Women's Development Foundation**

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**UN**  **HABITAT**  
FOR A BETTER URBAN FUTURE

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## Foreword

We are currently passing through the most critical global health and socio-economic crisis of the century, which has transformed the way we live, work, travel and socialize. The world's cities are generally taking measurements to contain the virus and its adverse effects reacting quickly to this urban humanitarian crisis to protect their population. Yet, the COVID-19 pandemic is also presenting us with an opportunity to learn from the different measures taken, share experiences and together build more resilient societies.

UN-Habitat is supporting both national and local governments to help them prepare for, prevent, respond to and recover from the COVID-19 pandemic. A response plan, key messages and guidelines had been developed to support regional and country-level action in regard, cities, housing, informal settlements, public spaces, urban transport and mobility, water, sanitation, hygiene, gender and social inclusion. Moreover, UN-Habitat is leveraging networks of partners on the ground, bringing together mayors, governors, transport and utilities providers, urban NGOs, women's and youth groups, and slum-dweller community organizations.

COVID-19 is a wake-up call to apply what we had learned over the years about urban and territorial planning, which has developed into a multisectoral discipline. It is now commonplace to consider environmental, social, health and well-being as key determinants when planning cities. UN-Habitat in partnership with the World Health Organization is taking upon one of the main challenges today; to ensure that urban and regional leaders have the knowledge and guidance to integrate health and well-being into their planning processes. Integrating health in urban and territorial planning, sourcebook is the latest joint publication that provides the health dimension in the practice and implementation of urban and territorial planning. It is designed as a tool to assist national governments, local authorities, planning professionals, civil society organizations and health professionals, by helping to improve planning frameworks and practice through the incorporation of health.

China has good and efficient systems in place to fight against epidemics. China has set in place strict containment measures which have been proved to reduce the spread of the disease, managed to reduce the public health crisis and economic impact of the COVID-19 pandemic. The presented working papers summarize specific measures for infection prevention and control of the disease from Wuhan experience. The working papers for COVID-19 control provide evidence-based strategies that could be replicated in other countries.

UN-Habitat and Wuhan city have a longstanding collaboration in 2018 UN-Habitat and Wuhan Municipal People's Government hosted the Wuhan Placemaking Week "Remaking Places-Transforming Cities: Shaping Better Public Space", convened by the Wuhan Land Resources and Planning Bureau, and implemented by the Wuhan Land Use and Urban Spatial Planning Research Centre (WLSP) and the Wuhan Planning and Design Institute (WPDI) and place makers of all backgrounds to re-imagine the future of Chinese cities.

These working papers are the latest result of the close and longstanding collaboration between UN-Habitat and Wuhan. We encourage you to make use of this papers, learn from the experiences so that together we can fight and control the health and economic crisis and, in the end, improve our urban environment, our health and well-being through the realization New Urban Agenda and the Sustainable Development Goals, so that we can build back better and leave no one and no place behind.

# Introduction - Quickly Understanding COVID-19 and its impact on cities and communities

## COVID-19 and essential precautions

The Coronavirus Disease 2019 (referred to as the COVID-19) is named COVID-19 by the World Health Organization (WHO). It is the same as the pathogen that causes severe acute respiratory syndrome (commonly known as "SARS"). SARS and COVID-19 are both caused by the coronavirus, but the two are not identical. At present, COVID-19 has spread over 210 countries and regions and is already causing close to 700,000 deaths (early August 2020).

The main sources of infection of the COVID-19 are patients with coronavirus infection and patients carrying the coronavirus. The zoonotic origins of coronavirus disease in 2019 has not yet been identified.

The main route of transmission is through respiratory droplets and close contact. In a relatively closed environment, there is a possibility of spreading through aerosols when exposed to high-concentration aerosols for a long time. Since novel coronavirus can be isolated in faeces and urine, it should be noted that faeces and urine can cause aerosol or contact transmission for environmental pollution. (Diagnosis and treatment plan for the novel coronavirus pneumonia, the National Health Commission of People's Republic of China (Trial version 7))

The population is generally susceptible, but the elderly and those with underlying conditions (such as high blood pressure, cardiovascular disease, lung disease, cancer, and diabetes) are at higher risk of developing severe illness.

The incubation period refers to the time between the infection of the virus and the onset of symptoms. Most estimates of the incubation period of COVID-19 are 1-14 days, usually around 5 days. Rare existing cases in the incubation period exceed 14 days.

The most common symptoms of COVID-19 are fever, fatigue, and dry cough. Some patients may experience pain, stuffy nose, runny nose, sore throat or diarrhoea. These symptoms are often mild and appears gradually. Some infected people have no symptoms and no discomfort. Most infected people (about 80%) can recover without special treatment. About one-sixth of those infected are seriously ill and have difficulty in breathing.

There are currently no specific drugs for COVID-19, vaccines are in development. The currently effective protective and prevention measures recommended by the World Health Organization mainly include:

- Wash hands frequently
- Maintain social distance
- Avoid touching eyes, nose and mouth
- Maintain good respiratory hygiene habits
- If you have fever, cough and difficulty in breathing, please seek medical attention as soon as possible
- Stay informed and follow the medical staff's recommendations

## General impact on cities and communities in China and globally

### *City Economy*

In order to prevent and control COVID-19 pandemic, various countries have adopted "locking down cities" measures to increase restrictions on population movements, which has caused heavy damage to the service industry, especially retail, leisure, hotels, entertainment and transportation industries that require physical interaction. As these industries account for more than a quarter of total employment, as corporate revenues decrease, the unemployment rate may increase substantially, thereby further transforming the supply-side shock of the economy into a larger demand-side shock. At the same time, workers returned to the city, factory

resumption was delayed, enterprises stopped production and reduced production, and short-term investment in manufacturing, real estate, and infrastructure construction basically stalled.

### *Reduced Urban Transportation*

Urban rail transit is the backbone of public transport in large cities and the main mode of transportation for people to travel daily. It can easily become a channel for epidemic transmission if it is inadvertently, leading to serious consequences of large-scale, multi-regional and group cross-infection. During the “lock-down period” in Wuhan and other cities in Hubei Province, public transportation in the city was suspended, so as to effectively curb viral infections. The operation of urban buses, subways, ferries and long-distance buses in Wuhan is suspended. Except for anti-epidemic vehicles, vehicles for transporting daily necessities, and special vehicles such as firefighting, emergency rescue, sanitation, and police vehicles, all vehicles are prohibited from passing. Other areas of Hubei have also achieved epidemic prevention and control and take into account the overall consideration of traffic security, greatly reduce the flow of people in the city and the possible spread of viruses.

At present, urban traffic in many countries in Europe, Asia, and North America is declining significantly, especially public transportation.

### *Urban Communities: Staying at home and challenges for slum residents*

The COVID-19 pandemic has now become a truly global phenomenon, with 2.6 billion people (one-third of the world’s population) currently living in some kind of blockade. Cities and towns have taken measures to control the new pneumonia epidemic. Residents are restricted to go out, which may have an adverse effect on the mental and physical health of residents. A tense stay at home environment, especially small and crowded housing in informal settlements, social and protection networks have been damaged or under tremendous pressure, and access to services has also decreased. These have exacerbated the risk of violence on women and children and the vulnerable.

In order to reduce the burden on tenants and landlords in certain situations, countries around the world have changed their real estate policies. In Europe, several countries including Britain, Germany and France have suspended evictions. Countries such as the United Kingdom and Italy are providing temporary mortgage relief. The government urged European banks not to cancel arrears. In some parts of Asia, some landlords provide temporary rental rebates and rental discounts. At the same time, some countries (such as Singapore) are considering passing legislation to protect commercial tenants who cannot pay rent within six months.

The COVID-19 pandemic will hit the world’s most vulnerable people. It is estimated that 1.8 billion people, that is, more than 20% of the world’s population, lack adequate housing. This includes the one billion people living in informal settlements and slums worldwide. These areas are densely populated with inadequate household water and sanitation, little or no waste management, overcrowded public transport and limited access to formal health care facilities. In addition, they suffer from a lack of basic services, secure tenure and adequate housing.

Many slum residents work outside the formal sector with unstable incomes and minimal savings. They will lose their livelihoods as cities shut down with no chance of any social benefits. The pandemic is threatening the ability of residents in informal settlements to pay rent. In addition, those who are homeless or living in grossly inadequate housing often suffer serious health problems

Without adequate housing, it is impossible to maintain sufficient social distance and good hygiene habits, and the world will be at risk of contracting fatal diseases.

### *Smart governance tools for city life and education*

First, the state has restricted social behaviour. Some restrict the activities of citizens and non-citizens. Governments in various countries have also closed schools and unnecessary enterprises, and implemented or encouraged social isolation, allowing people to leave their homes only for absolute necessity. Although



the maximum number of people allowed varies from country to country, many countries prohibit gatherings. Countries are increasingly recommending that people wear protective device, including masks, when going out to public areas.

With the increasing number of “human-to-human” empirical cases, the community as the space-based city's smallest governance unit has become the most important link in local epidemic prevention and control.

Smart city is a city model that realizes the interactive induction between digital city and physical spatial-temporal city and connects the interaction between the city's system and people's needs and services, and comprehensively improves the efficiency of resource allocation and utilization.

Smart governance is mainly reflected in the following aspects: the timely release of information; the use of a smart monitoring system to carry out real-time monitoring and early warning of the risk points of crowds such as business operations.

In the process of pandemic prevention and control, the application of information technology such as the Internet and big data has provided efficient prevention and control work in terms of timely information release, real-time risk monitoring, online communication and collaboration, trend analysis and judgment, and remote medical assistance.

We need more flexible technology and infrastructure to cope with changes in demand caused by differences in remote work and commuting methods. This may also bring new innovations and solutions in the fields of commercial real estate, education, information technology, human resources, telecommunications and energy.

Because of COVID-19 pandemic, numbers of children and adolescents who cannot go to school keeps rising. Many countries have announced or implemented school suspension measures to slow the global spread of the pandemic. According to a UNESCO report, more than 130 countries so far have implemented national suspensions, resulting in 80% of students globally unable to continue their studies. In addition, several countries have implemented local suspensions to prevent or curb the COVID-19 pandemic. If these countries also implement national level suspensions, the number of children and young people who cannot go to school will increase by tens of millions.

UNESCO urges all regions to actively plan distance learning solutions during school suspensions. School children are now massively adopting distance working practices already. This will have long term implications.

# 1. Community Management Approaches

## 1.1 Introduction

The following paper is based on different approaches and decisions taken during COVID-19 pandemic in Wuhan. The paper gives clear recommendations in different areas where community management was needed. It starts highlighting how to and why forming a social consensus by unifying guidance and information disclosure is key for an effective management, giving examples on how to popularize the knowledge of the pandemic prevention and control to the populations and how to use community leaders to transmit this in a trustable way to the local and rural communities.

The paper continues with recommendations in more specific context such as how to effectively manage and control quarantine facilities in a comprehensive and with the necessary preventions in place such as real-time inspection and monitoring and the overall testing to expressing how to improve the hierarchical diagnosis and treatment and emphasizing on “life first” giving clear recommendations what Local governments should be improving.

Moreover, the paper brings a territorial perspective on how to prevent and control COVID-19 in the context of rural-urban linkages, the more board and environmental aspect, the agricultural and the living supplies logistics. The paper is limited to Chinese context and in particular Wuhan experiences as is base in the knowledge of the Wuhan Land Use and Urban Spatial Planning Research Center to set up the recommendations and in turn the recommendations might need to be contextualized to a specific context.

The valued lessons learnt from the Wuhan Land Use and Urban Spatial Planning Research Center not only set up the base for this paper but for future work to be develop under this umbrella. UN-Habitat defines governance as “the political and administrative management of places that involves partnerships (formal or informal) between governments at different levels but also the private sector and civil society organizations and in its last publication on urban health “integrating health in urban and territorial planning” which acknowledge the differences in the national governance structures, with four main typologies recognizing: centralized unitary states; decentralized unitary states; regionalized unitary states; and federal states determining the many ways that UTP operates on the ground and highlights governance arrangements as one of the 12 key elements for health equity accepting health equity audit of all planning policy and promotes both top-down and bottom-up and more participatory governance.

Building from this moment, the initiatives taken, the community commitment and the robust governances’ decisions that fight the pandemic but also impact our health and well-being in a longer term that also builds environmental health shall remind in place. This paper is the first step to understand these initiatives and take them to the next steps which is build health equity through community management.

## 1.2 Applicable Chinese Institutional Framework

The State Council of P.R. China established the Joint Prevention and Control Mechanism for COVID-19 led by the National Health Commission of the P.R. China with a total of 32 member ministries and commissions. The working groups under the Mechanism includes pandemic prevention and control, medical treatment, scientific research, publicity, foreign affairs, logistics support respectively, which are headed by the leaders of relevant ministries and commissions.

Provincial and municipal departments of civil affairs guide professionals and volunteers in communities to

participate in prevention and control, earnestly perform the duties of supervisors, and strengthen entrance and exit management, personnel allocation, material security, and protection capabilities. Provincial and municipal health commissions guide community prevention and control, and maintain close contacts with professional health institutions and urban- rural primary medical institutions. The Centers for Disease Control of provinces and cities guide communities to clean and disinfect public places and track close contacts. During the period of COVID-19, the Ministry of Housing and Urban-Rural Development of the P. R. China guaranteed residents' daily needs for water, gas, and heating, and focused on the cleaning and sanitation of urban roads and public facilities, disposal of domestic waste, collection and transportation of domestic waste, and provide daily safe service for communities.

### **1.3 Basic Requirements for Prevention and Control in Urban and Rural Communities**

#### *Forming a Social Consensus by Unifying Guidance and Information Disclosure*

Governments at all levels should strengthen centralized and unified guidance, formulate strategic guidelines based on the needs of pandemic prevention and control, collect the public health information and pay attention to patient privacy protection, continuously provide accurate pandemic information to the public, and improve the public awareness of social responsibility to allow them actively participate in pandemic prevention.

#### *Classified Quarantine Control, Comprehensive Prevention and Control*

Local governments in the "High-risk areas" of the pandemic should suspend all intercity transportations (public/private, passenger/ cargo) channels to isolate the source of the pandemic; other areas should conduct flexible prevention and control based on the pandemic situation, and implement graded traffic control.

#### *Real-time inspection and monitoring, and Overall Testing*

Local governments should use up-to-date technology to dynamically investigate and monitor the pandemic situation to achieve the principle "early detection, reporting, isolation, and early treatment" and "overall testing and isolating" to reduce the rate of infection and mortality.

#### *Improving Hierarchical Diagnosis and Treatment, and Emphasizing on Life First*

Local governments should improve the hierarchical medical treatment system, classifying and treating patients with mild, moderate and severe illnesses and suspected patients, keeping in mind of the treatments *and emphasizing on life fist*.

#### *Allocating Aid Materials to Ensure Life Resources*

Local governments, in collaboration with international or local rescue organizations, should reasonably allocate materials and goods to ensure that the medical resources and necessities can be supplied normally.

### **1.4 How to Organize Prevention and Control in Urban and Rural Communities**

Urban and rural communities refer to specific areas formed by people of a certain volume with similar social consciousness, social customs, social organization models, main production and living patterns. Based on the

overall prevention and control requirements, each community combined with its own characteristics to provide targeted prevention and control guideline.

*Establishing an Urban Hierarchical Transmission Organization System*

Regarding city as a unit, combined it with the division of local administrative levels, the pandemic prevention and control institution was established at different levels to clarify and guide the key points of pandemic prevention and control within the administrative region, and to maintain information exchange between the prevention and control institutions at all levels. At the same time, based on the local pandemic situation, the prevention and control institutions at all levels formulate local pandemic risk rating assessment criteria, and conduct local pandemic risk rating assessment, or pandemic situation classification, to help the pandemic prevention to work accurately.

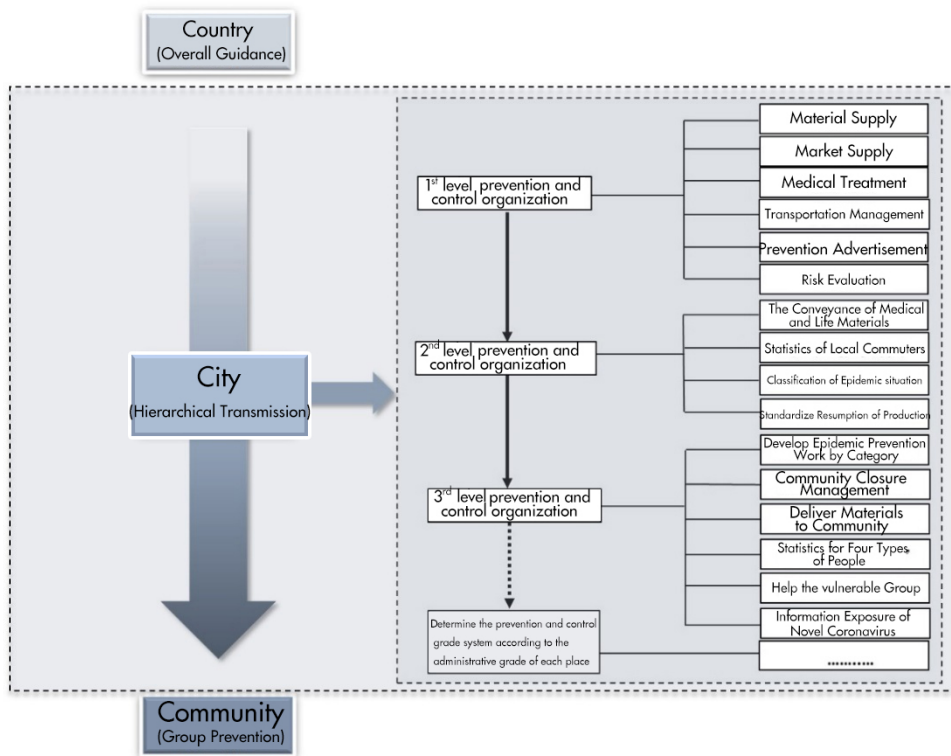


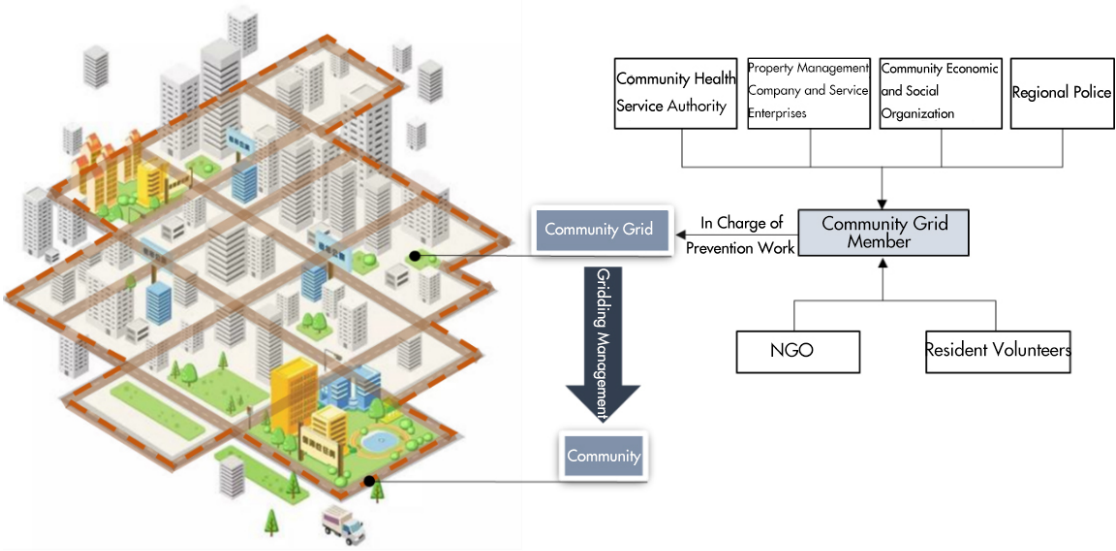
Figure 1. Schematic diagram of urban hierarchical conduction organization system

*Establishing Group Prevention and Control System for Communities*

It should divide community to grids, regarding administrator of the community grid as the core, and establish community prevention and control organizations with relevant partners.

According to the actual situation, the community can be divided to several community grids according to the requirements, and the administrators of community grids in charge of the community pandemic prevention work, focusing on the entrance and exit control, screening of community pandemic, household supplies and vulnerable groups aid.

**It should fully contact the public, encourage social forces and non-governmental organizations to form a temporary prevention and control group.** Also encourage non-governmental organizations to cooperate with community grid administrators to complete the work such as delivering household supplies, aiding vulnerable groups, and advertise pandemic prevention; encourage volunteers to help residents with daily necessities; provide mental support to prevent residents' anxiety; accompany and educate those who live alone and other work to improve public awareness of self-service.



Remarks: According to the actual situation, communities in various countries can appropriately adjust the relevant organizations involved in community prevention and control

Figure 2. Schematic diagram of community group prevention and group control organization system

**1.5 Main Points of Prevention and Control in the Urban and Rural Communities**

**1.5.1 Preventing Group gathering and Cross Infection**

*Close Public Entertainment Places and Restrict Gathering Activities*

Close cinemas, theatres, bars, gyms and other crowded places, it should restrict or cancel non-essential group gatherings such as rallies, fairs, concerts, garden festivals, religious activities, and banquets.

*Strengthening the Prevention and Control for Public Service Places*

For public service places that must be operated, such as train stations, airports, docks, farmers markets, shopping malls, supermarkets, hotels, and airtight vehicles such as cars, trains, and airplanes, it should take measures such as disinfection, ventilation, and current limiting. People who enter or exit must be required to measure their body temperature and wear a mask to avoid cross infection.

### *Encourage Self-quarantine at Home and Promote the Way of Work at Home and Distance Teaching and Learning.*

To encourage less contact and gathering, and request residents to do self-quarantine at home except medical treatment, pandemic prevention, and necessary agricultural production. As for public service organizations and enterprises, flexible work ways can be conducted such as remote work, go to work avoiding the peak hours, and work in rotation; delaying start time of school according to the pandemic situation of all cities, suspend all offline courses replaced by distance teaching and learning. To encourage 14 days self-quarantine at home policy after cross-regional travel.

#### **1.5.2 Community Close Management**

Regarding the community as a basic unit, to combine the severity of the pandemic situation in each cities and rural villages, and implement closed community-level management flexibly.

##### *Closed Unit*

Closed management is conducted for relatively independent, densely populated space units such as residential communities, complete and contiguous residential neighbourhoods, apartment buildings, and rural villages. People should reduce unnecessary outdoor activities except related activities such as medical treatment, pandemic prevention, and necessary agricultural production.

##### *Entrance and Exit Control*

Each community maintains 1-2 entrances and exits. Entrances are monitored by the committee working staff and volunteers all day long. Residents and outsiders must register their information and be measured their body temperature when they must go out or enter.

##### *Community Disinfection*

It should do high-frequency disinfection to public areas (pavement, fitness facilities and environmental landscape, public toilets, etc.), clean the ventilation opening of public areas, strengthen air ventilation in closed spaces such as underground garages, and record and disclosure the disinfection records. It should also classify and recycle the used masks, household garbage and other garbage, and cut off the spread of the disease source.

##### *Responsible Subject*

The community can recruit volunteers to participate in closing management. For those communities which have property management, the property management staff are responsible for entrance and exit control and community disinfection; for old communities or communities without property management, volunteers are organized to be in charge of the access control and disinfection; for those communities which cannot set up access management points, the grid administrator of the community is responsible for supervision and management.

### **1.5.3 “Four categories of People” Investigation**

"Four categories of people" refers to confirmed patients, suspected patients, patients with fever who cannot be excluded as infected, and close contact of the confirmed patients.

Community police, religious groups, and volunteers of covered community make comprehensive investigation and registration management of the "four types of personnel" by telephone or face-to-face inquiry, self-examination and self-report. The community should report its supervising authority the screening situation of “Four categories of people”.

When the body temperature is found to have exceeded 37.3 degrees Celsius (98.6 degrees Fahrenheit), the person needs to be registered in his or her community where they are located immediately. After being screened, classified, and sent to quarantine/isolation places or designated hospital for treatment by the community medical center.

### **1.5.4 Screening for Asymptomatic Infections**

Asymptomatic infection refers to those who have no relevant clinical symptoms (such as fever, cough, sore throat, etc.), but are positive for nucleic acid test or antibody test of respiratory tract specimens.

Based on the actual situation of different countries, it should choose a certain proportion of samples in high risk areas of the pandemic. Investigations and epidemiological analysis of asymptomatic infected persons should be conducted for inbound passengers, close contact of confirmed cases and asymptomatic persons who have been confirmed, and those whose travel history and living history with continuous transmission of COVID-19 cases, and key areas and populations with special requirements

The nucleic acid testing is the primary choice for testing, serological testing can be selected if nucleic acid testing has been done

Due to the high risk of transmission of asymptomatic infections, it is necessary for the patient to receive isolation and medical treatment immediately when they are found. Patients with asymptomatic infections need to be focused on medical observation for 14 days, and they are not allowed to be released until they acquire twice negative nucleic acid tests results. Those in close contact of asymptomatic infection also need a 14-day isolation for medical observation.

### **1.5.5. Transferring and Isolating the "Four categories of people" and Asymptomatic Infected Persons**

#### *Classification of Transferring and Isolating*

- Early receiving and treatment of confirmed patients. Patients with critical condition are sent to designated hospitals for medical treatment. Mild patients who cannot receive treatment from designated hospitals will be sent to certain areas (including "Makeshift Hospitals") for isolation and treatment.
- Classification treatment and quarantine observation for suspected patients. For the suspected patients, the patients with critical condition are admitted to the hospital for treatment, and the mild patients who cannot be admitted to the hospital should be sent to certain area for 14 days quarantine. If the result of the test for patients is negative, but have clinical symptoms which consistent with the new coronavirus pneumonia are still treated as suspected patients.

- Patients with fever were isolated for observation. For patients with fever who cannot clearly exclude the possibility of infection, are treated as the suspected patients with 14 days quarantine observation, but separate them from suspected patients to prevent cross infection.
- Close contacts of suspected patients need quarantine observation. The close contacts of the confirmed patients are subject to quarantine observation (14 days) like confirmed patients.
- Asymptomatic infected people and their close contacts are observed in 14 days quarantine.

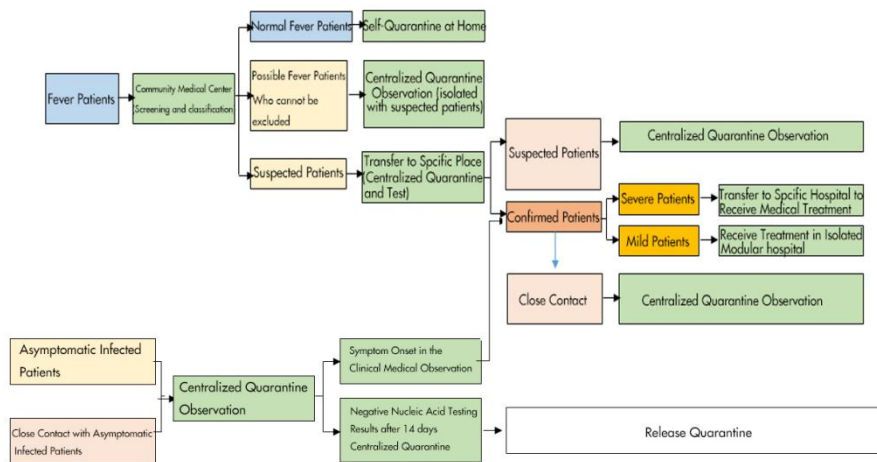


Figure 3. Schematic diagram of classification and isolation of “four types of people” and asymptomatic infected people

### *Delivery Vehicle Safety Protection*

The community is responsible for dispatch the delivery vehicles, the community workers and police in the community jointly undertake the delivery of "four categories of people" and asymptomatic infected people. After finishing the deliver, the vehicles, drivers and accompanies should be thoroughly disinfected to prevent cross infection.

### **1.5.6 Establishing Pandemic-free Community**

Establishing pandemic-free community is an accurate measure to achieve grading prevention and control in different regions, which helps to coordinate pandemic prevention and control and economic and social development and build foundation for the subsequent resumption of work and production.

The standard of pandemic-free community is that there is no new "four types of people" and asymptomatic infected people in the 14 days before. In addition, it also includes standards such as publicity guidance, closing management, investigation, disinfection, supply security, and organization and etc.

### **1.6 How to Support Living Supplies to the Community**

#### **1.6.1 Organization and Management**

#### *Living Supplies*



The relevant departments should coordinate to recommend delivery companies, supervise the quality and price. The community and relative companies are responsible for material supplies, delivering household supplies from the supermarket to the community.

*Medical supplies*

The municipal government should help enterprises to purchase medical supplies for communities, which could be sold in limitation if necessary.

**1.6.2 Distribution Network**

It should establish a three-level linkage network of cities, communities, and volunteers implement the "designated sites + delivery" household supply mode through the method of "guiding organizations coordinating, community taking responsibility, and volunteers delivering resources to the each household" .

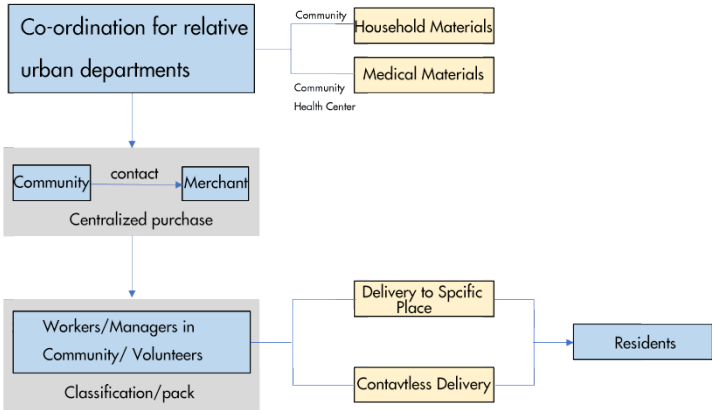


Figure 4. Schematic diagram of material distribution

**1.6.3 Advocating "Contactless Consumption" and "Contactless Delivery"**

It should make good use of Internet technology to fully popularize “contactless consumption”. The advanced Internet + logistics and e-commercial platform can support all steps of supply ordering, distribution and payment during the pandemic. Citizens can purchase online and receive goods offline through mobile phones, and goods can be delivered through property custody, volunteer delivery, fixed sites handover, self-pickup and other methods at different period of time. And the merchandise sales can not to be paid by cash with contactless delivery.

In areas where Internet consumption is underdeveloped, the community is responsible for contacting merchants to carry out centralized purchasing, classifying and packaging of household materials, and deliver them to the community in contactless method to avoid the risk of being infected.

## **1.7 How to Protect Vulnerable Groups**

### **1.7.1 Life care**

It should take care of the elderly, orphans, disabled, low-income, poverty etc., and provide them with caring services such as delivering food, medicine, living supplies, to ensure the basic needs of residents.

For the elderly who cannot take care of themselves and if their children or relatives are in isolation or are receiving treatment, the relevant elderly care service agencies needs to provide professional services.

For orphans and children whose parents are in isolation or are receiving treatment. Child caregivers should make efforts to know their physical condition, offering the necessary pandemic prevention supplies. Child caregivers also need to provide the necessary household supplies when the child (up to 14 years old) has to self-quarantine at home.

For those really in need, community workers should regularly contact and comfort them online, urge the guardians to provide life care services, help them to take care of their own health, and ensure that the people in need are treated well especially when they are sick.

### **1.7.2 Rescue Protection**

It should provide settlement and rescue for homeless people in the community.

## **1.8 How to Organize the Disclosure of Pandemic Information**

### **1.8.1 Releasing of pandemic information timely, comprehensively and transparently**

*Establishing a daily news release system and publish pandemic information the first time.*

Relevant national and local government departments at all level should hold press conferences to report the latest developments in the pandemic situation and pandemic prevention and control promptly and comprehensively, and fully respond to public concerns from domestic and abroad.

*Starting the daily report system of pandemic data to provide accurate and comprehensive information in time*

At the national level, on the official website and other government platforms, daily notifications of new confirmed cases, new cured cases, close contacts who were released from medical observation on that day, new severe cases, new death cases, new suspected cases, treatment in isolation, severe cases, total reports of confirmed cases, total cures, total deaths, existing suspected cases, total close contacts, close contacts who are still under medical observation, and asymptomatic infections later released. At local level, the relevant data of lower-level administrative management units should be published with reference to national statistical standards.

*Using and Real Time Updating the "Pandemic Map" in Real Time to Publish Emergency Response Information.*

It should make use of the "Pandemic Map" based on big data technology to mark the specific location, distance, number of people of the spread of pandemic through the name, address and location of the community. And adjust the level of emergency response and prevention alarm system in order to facilitate the public to prevent infections more effectively and stop the spread of the coronavirus.

### **1.8.2 Provide Demands-oriented Life Service Information**

It should release demands-oriented information, such as purchase information of daily supplies, anti-pandemic materials, general medicines and other supplies, transportation and travel information, and information on medical treatment services other than COVID-19, so that to “Response to all demands from the residents”

### **1.8.3 Popularizing the Knowledge of Pandemic Prevention and Control**

#### *Publishing Specialized “Guidelines for Prevention and Control”*

Relevant state agencies should promptly release general prevention guidelines for common use, travel, family, public places, public transportation, medical observation at home, etc. to eliminate the doubts and confusions from personal and family protection, medical observation at home, rational medical treatment, psychological consulting, etc. to help the public understand protection skills and methods effectively.

#### *Issuing Authoritative Opinions and Professional Advice*

Local governments should organize scientists and scientific research institutions to release authoritative opinions and professional recommendations on scientific prevention and control through press conferences, media interviews and on the basis of research, and promote the popularization of simple and effective public protection measures such as wearing masks, washing hands, and regular ventilation to improve the level of scientific protection.

#### *Carrying out Psychological Assistance*

The local government should organize experts to strengthen psychological adjustment and establish positive attitudes of residents by adding psychological assistance hotlines, online consultation, and online public welfare lectures for pandemic response, which can also help residents to alleviate anxiety and fear, and guide them to maintain a normal work and regular life. At the community level, the targeted psychological assistance services are provided to confirmed patients and their families, quarantined people, anti-pandemic medical workers and other special groups.

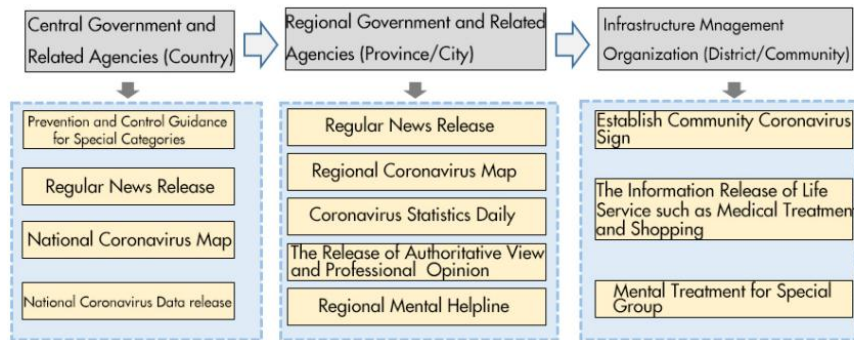


Figure 5. Responsibilities of pandemic information disclosure at all levels of governments

## 1.9 How to Organize Prevention and Control of Rural Communities Quickly

### 1.9.1 Advocating Autonomy Management in Rural Community

All countries should give full play of the autonomous management of rural communities in accordance with their national conditions. It is recommended to regard neighborhood, settlements or parishes as the basic units for prevention and control, and follow the general measures for prevention and control of urban and rural communities mentioned in 2.3-2.6 to carry out prevention and control in rural communities.

### 1.9.2 Rural Community Medical Assistance

Refer to 2.3.4 "Four categories of people" in the previous article for classification. In addition, those who are close contacts with suspected or confirmed patients need to immediately stop agricultural production and start isolation and observation. Those who are capable of living alone can choose home observation, and the registration management should be done by a dedicated person.

Rural communities with sufficient resources can build or rebuild one or more treatment sites in open areas with better traffic and sanitation conditions to carry out medical observation, pre-testing and triage, centralized admission or referral for rural medical and health institutions and medical personnel.

### 1.9.3 Environmental Cleanliness Management in Rural Communities

#### *Environmental Improvement in the Village*

It should organize villagers to ventilate and clean the house at all round, and putting the farm tools reasonably. It should guide villagers to clean and disinfect key areas such as manure pit, colony, and garbage ponds, treating sewage drains, and protecting drinking water sources.

#### *Centralized garbage collection and classifying*

It should set up household garbage cans and medical garbage cans in public places and concentrated residential areas.

The household garbage should be put into separate categories and cleaned regularly. The medical waste disposed on a regular basis, and the daily garbage should be cleared every day with bio-safety disposal. Each rural community should set up at least one medical waste bin with obvious signs. Medical wastes should be incinerated or deeply buried for bio-safety after disinfection; garbage containers be transported to waste treatment plants for centralized disposal in communities with sufficient resources.

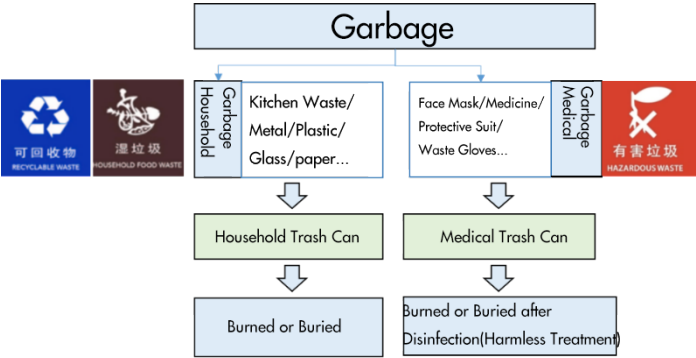


Figure 6. Schematic diagram of garbage classification

*Rural Toilet Disinfection*

It should strengthen the ventilation and sanitation management of public toilets, post hygienic notices, place soap and sanitizer, and hire a person to disinfect and clean regularly to avoid the spread of viruses through the fecal-oral route

*Keeping Water Clean*

After using agricultural machinery and equipment, touching poultry or livestock, and going outside to work, farmers should use running water and soap to clean their hands. In areas without running water or flowing water, it is recommended to set up hand-washing tents in open and ventilated public places, and hiring a person to provide clean water and disinfection supplies at regular intervals. At the same time, it should be kept the hand-washing tents ventilated and public hygienically.

**1.9.4 Agricultural Production and Protection during the Pandemic**

*Agricultural Production Safety*

It should avoid adopting group-type production, and trying to adopt decentralized and staggered production. Personal protection must be done when working and air circulation in the workplace should be maintained. Countries or regions with sufficient resources can use "contactless farming" such as UAV.

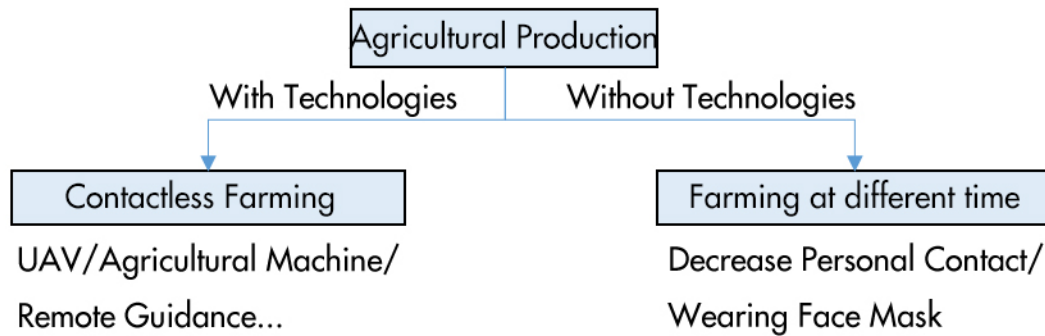


Figure 7. Schematic diagram of agricultural production

### *Livestock Breeding Management*

It should be disinfected and eliminated the sources in key places such as rural breeding farms and slaughterhouses to reduce the risk of zoonosis during COVID-19 pandemic.

### **1.9.5 Control of Public Places in Rural Communities**

#### *Closing Temporarily*

The high risk areas should temporarily close the public areas such as public bathing places, barber shops, restaurants and hotels, retail markets, sports grounds, libraries, movie theatres until the pandemic risk will decrease.

#### *Opening Restrictively*

In low risk areas, the peak hour avoiding, current-limiting, outdoor transaction should be carried out to arrange the business hours of open-air markets, pharmacies and other living service places reasonably with keeping them ventilated and disinfected.

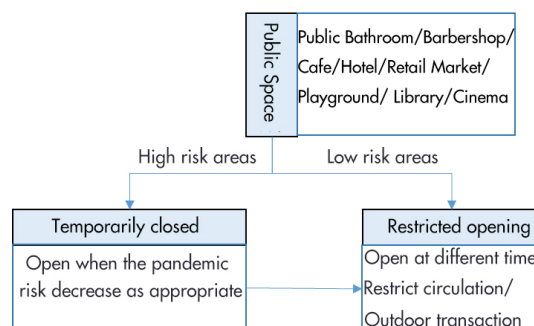


Figure 8. Schematic diagram of control in public places

### **1.9.6 The Dissemination of Prevention and Control of Rural Communities**

Respecting the regional culture and social customs of the rural areas in various countries, it is recommended to use the popular and easy-to-understand way to disseminate and educate the villagers, such as displaying the signs and slogans, hand-washing posters, and pandemic prevention knowledge broadcasting. Communities with sufficient resources can release notices or flyers to every family.

## 2. Non-hospital spaces for care and isolation

### 2.1 Introduction

The following paper is based on different non-hospital spaces that were built for care and isolation while during COVID-19 pandemic in Wuhan. The paper gives clear recommendations in key different aspects that shall be considered when building and or adjusting a non-health facility to serve as one or to serve as isolation facilities.

The paper gives clear recommendations regarding “makeshift” of buildings or existing infrastructure that can be temporarily display to receive the confirmed COVID-19 patients with mild symptoms at the lowest cost, in the fastest way, with big adaptability, big coverage (in terms of beds) and that complies with all the requirements from the World Health Organization Guidelines and the National Health Commission of the P.R. China Guidelines. First starts with the classification of medical treatments and continues with the spatial location and its architecture layout, including diagrams of the desirable people both, health cares and patients’ movements and both, in and out of the facilities.

Moreover, the paper also covers the “temporary isolation sites” which are used to centrally accommodate suspected COVID-19 patients and close contacts with a history of contact with confirmed patients through protective isolation facilities to prevent the risk of coronavirus spreading. Explains what kind of buildings can fit this demand, how to convert these palaces to temporary isolations sites, design requirements, the maintenance and the post pandemic use of this facilities.

The paper recommendations are based on the Chinese context and in particular Wuhan experiences but following the guidelines and recommendations from the World Health Organization and the National Health Commission of the P.R. China. In turn the recommendations can be applicable elsewhere but are based as is base in the knowledge of Wuhan Land Use and Urban Spatial Planning Research Center and CITIC General Institute of Architectural Design and Research Co., Ltd. which are limited to the China context.

The value lessons learnt from Wuhan Land Use and Urban Spatial Planning Research Center and CITIC General Institute of Architectural Design and Research Co., Ltd. not only set up the base for this paper but for future work to be develop under this umbrella. UN-Habitat supports countries on localizing global guidelines into cities and to make us of inspiring cases to be replicated. The pandemic has highlighted the necessity of flexible and adaptable spaces needed in cities, these paper is a first step of UN-Habitat along with partners to re-think on urban morphology and to re-think on how to build better public services that can be used in emergencies situations across the spatial urban continuum.

### 2.2 Applicable Chinese Institutional Framework

The Ministry of Ecology and Environment of the P.R. China, collaborated with the Ministry of Housing and Urban-Rural Development of the P.R. China and other ministries to organize the expertise from management, scientific research, and industry to intensively issue a series of targeted management regulations and emergency technical plans, covering solid waste, sewage treatment, drinking water, and environmental monitoring and other related emergency responses related to the pandemic environment. Taking Hubei Province as an example, the Department of Housing and Urban-Rural Development of Hubei Province, in conjunction with Central-South Architectural Design Institute Co., Ltd., and CITIC General Institute of Architectural Design and Research, compiled and released the "Technical Requirements for the Design and Conversion of Makeshift (FangCang) Care Centers." The Department of Commerce of Hubei Province is responsible for the guarantee



of living materials in the isolation centers (including the Makeshift (Fangcang) Care Centers), and give them the priority.

### 2.3 Classification of Medical Treatment System, and Principles of Location and Layout

#### 2.3.1 Classification of Medical Treatment System

It should establish a four-level medical treatment system for designated hospitals, makeshift hospitals, isolation sites and community medical centers. "People in Four Categories" are treated by category.

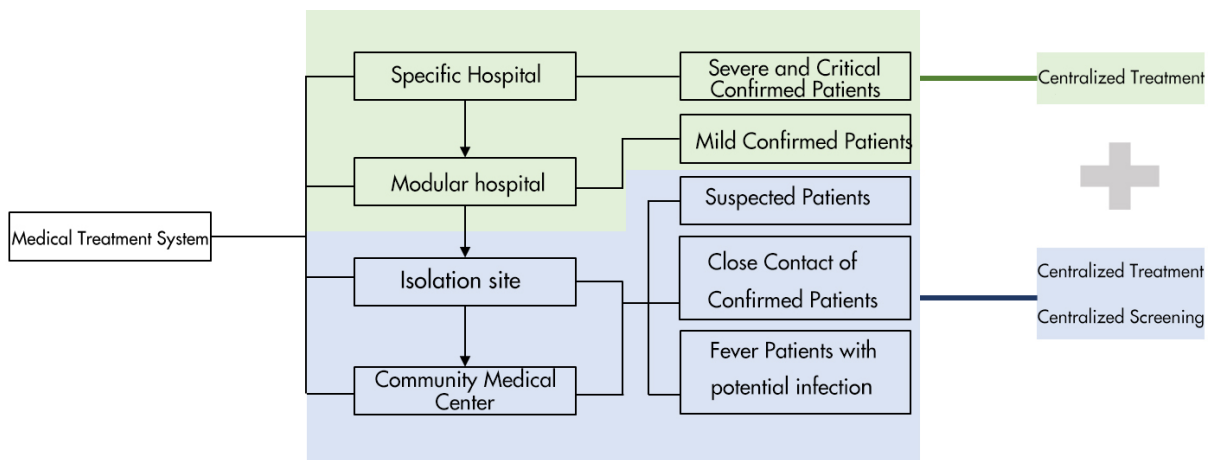


Figure 9. Schematic diagram of the four-level medical treatment system

#### 2.3.2 Principles of Location and Layout for Medical Facilities at All Levels

##### *Designated Hospitals*

- Construction of new temporary specialized hospital. The location of such new hospitals should be: (i) in the outskirts of the city to avoid densely populated areas, and there should be convalescent facilities near the plot that can temporarily undertake some functions of the new hospital; (ii) close to external transportation, around an hour's drive to the urban area, and for the convenience of medical supplies delivery; (iii) selected plots should be in regular shape with complete land use, which is easier for the planning and layout of medical buildings; (iv) selected land should be reserved urban land for medical use with pre-reserved treatment facilities for waste water and medical waste disposal, located in downwind areas of prevailing wind direction of the city. The internal space of the building should be divided into five functional areas: receiving area, medical treatment area, ward area, living area and logistics support area, and; the number of beds is generally in the range of 100-1000 beds. It is recommended to adjust the construction needs and scale according to the needs of the epidemic situation.

- Renovation and conversion of existing hospitals. Renovate and upgrade the internal space of the existing large-scale Grade 3A hospitals, pulmonary specialized hospitals and infectious disease hospitals. There should be a separated treatment space for respiratory infectious diseases, which is separated from other serious basic disease areas, forming "three areas (clean area, semi-contaminated area, and contaminated area), two passages (medical staff passage and patient passage) and buffer room. At the same time, the hospital is only available for patients with fever, screening fever patients, and the rest of the clinics are temporarily closed.

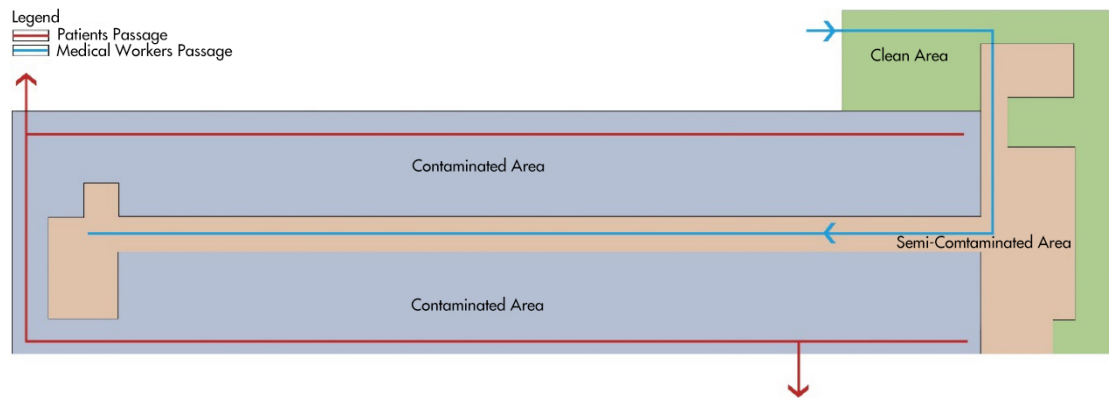


Figure 10. Schematic diagram of the spatial organization of the "Three Areas and Two Passages"

### *Makeshift (Fangcang) Care Centers*

Makeshift (Fangcang) Care Center emphasizes the renovation and conversion of existing buildings at low cost in a short period of time. Local authorities should consider the actual situation to select a batch of suitable buildings for potential conversion into makeshift hospitals, in accordance with the following principles: (i) single or multi-story large and medium-sized convention centers, gymnasiums, and unoccupied college dormitories can be considered as public building for potential renovation; (ii) the location should be close to COVID-19 designated hospitals, avoiding crowded areas, and the building and its auxiliary venue should be centralized and independent, with a distance of 20-30 meters from the surrounding buildings; (iii) the external transportation should be convenient and the internal communication should be unhindered; (iv) the land should have a separate space for harmless processing equipment for contaminated items, the existing municipal utilities can be reconstructed as needed, and emergency exists , fire extinguishing equipment, and driveway for fire trucks should meet relevant standards and specifications, and; (v) the interior of the building should be re-partitioned according to the needs of sanitation and epidemic prevention, to ensure that the number of care beds in a single bed area does not exceed 42.



Figure 11. Reality photos of the bed partitions in Makeshift Care Center in Wuhan

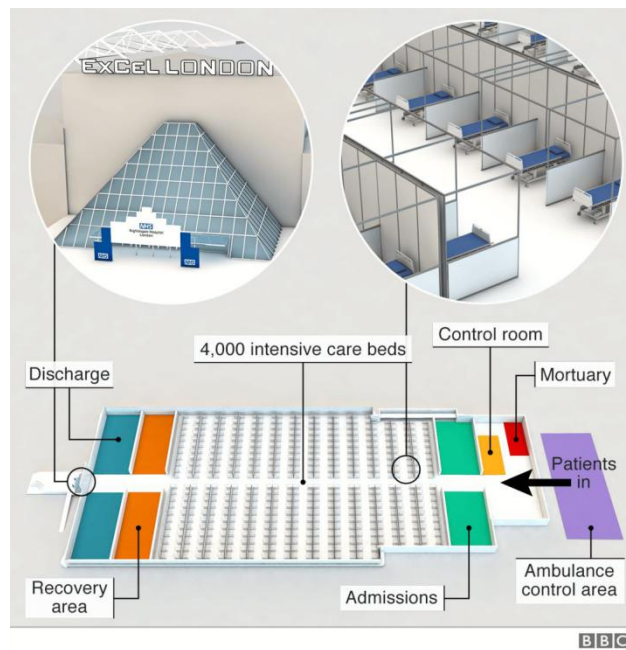


Figure 12. Internal functional areas of a Makeshift Care Center in London

### *Isolation Sites*

Hotels, training centers, and college dormitories with independent air-conditioning systems and toilets and without risks in the use of water and power utilities can be used as centralized isolation sites during the epidemic to address the receiving and treatment of fever patients, suspected patients, and people with close contacts to suspected patients or confirmed patients.

### *Community Medical Center*

It should make good use of community medical centers to screen and classify patients with fever in the

community. For patients who need to go to the fever clinic, the community will organize and send them to designated fever clinic for treatment; while for the patients who do not need to go to the fever clinic, the community will be in charge of the service for the residents' observation at home.

## **2.4 Makeshift Care Center**

### **2.4.1 The Purpose and Significance of the Makeshift Care Center**

A Makeshift Care Center is a temporary place to receive the confirmed COVID-19 patients with mild symptoms, converted from existing buildings in the shortest time and at the lowest cost.

The conversion and deployment of a Makeshift Care Center are fast and adaptable, and it can quickly expand the number of beds to treat and isolate the confirmed COVID-19 patients.

### **2.4.2 What Kind of Building Can Be Converted to a Makeshift Care Center**

In order to ensure the quick partition of internal space of the building, buildings with good facilities and basic fire-fighting conditions can be selected, such as convention and exhibition centers, gymnasiums, large factories, warehouses, etc.

### **2.4.3 How to Convert a Makeshift Care Center**

A Makeshift Care Center consists of medical functional units, ward units, and technical support units. It uses materials that can be assembled to form functional units and infrastructure that meet medical needs in a short time. At the same time, considering the privacy and psychological needs of patients, it forms a humanized space design.

### **2.4.4 Design Requirements for Makeshift Care Centers**

The design and conversion should follow the principle of safety first.

#### *Requirements on Building Selection for Conversion*

- The building to be converted should be a single-story or multi-story building.
- The site shall be remote from densely populated urban area such as residential area, kindergartens, schools, etc. Also, it shall be remote from storage site of inflammable, explosive, poisonous and harmful gases. Warning board shall be placed outside the Makeshift Care Center, while the green belts between existent building and its surrounding buildings shall be at least 20 meters. An isolation distance of at least 30 meters shall be maintained if there are no green belts.
- Buildings to be converted shall have parking lots and turnarounds at the entrance to allow fast drop-off and pick-up for emergency vehicles, and the site should be surrounded by adequate security facilities. Spaces for temporary medical facilities and relevant waste water treatment shall be available onsite. Buildings with proper equipment and good condition of fire prevention such as exhibition center, stadium, big factory, warehouse, dormitory, where internal space can be easily and quickly partitioned are highly recommended.

- The plane layout, structure form, height, HAVC, water supply and drainage, power supply and distribution, telecommunication, fire-fighting and other supporting utilities and indoor facilities should meet the basic requirements of a Makeshift Care Center.

#### *Requirements on Makeshift Care Center Conversion*

- In principle, the conversion into a Makeshift Care Center should be limited to indoor functions and site facilities only.
- The converted buildings shall be used as a Makeshift Care Center after conversion until the end of requisition, and shall not be used for other purposes.
- The converted Makeshift Care Center shall meet the demand of local department of hygiene and health, department of disease control and onsite medical staff.

#### *Requirements on Plane Layout and Partition Isolation of The Building*

- The plane layout of the building should be in compliance of “THREE AREAS AND TWO PASSAGES” (contaminated area, semi- contaminated area, clean area; medical staff passage and patient passage). Medical staff passage shall be separated from patient passage, while clean area shall be separated from contaminated area. Enough spaces shall be allocated for plant facilities and patients’ activities.
- The contaminated area is the treatment area for confirmed patients, including hospital bed area, observation and treatment room, disposal room, room for contaminated items, and rooms for patients to proceed hospital discharge and admission. Clean area includes dressing rooms, pantry room, duty room and warehouse. The semi-contaminated area refers to the area between clean area and contaminated area, which includes places where could be potentially contaminated by patients’ blood or body fluid, such as medical staff office, treatment room, nurse station, medical device treatment room, internal walking passage, etc. Passages for medical staff and patients shall be separated completely.
- Two rooms shall be placed between clean area and contaminated area, namely entrance and exit passage room. Entrance flow is Dressing Room I - Dressing Room II - Buffer Room, which allows medical staff to put on protective gears before entering contaminated area from clean area. Exit flow is buffer room - isolation clothing undressing - buffer room - protective clothing undressing - bathroom - dressing room, and medical staff then enter clean area from contaminated area. The toilet passing room should be separated for male and female.
- Obvious signs or isolation strips should be set in each area. Area for hospital beds shall be divided into sections where each section contains no more than 42 beds. Also, female patients need to be separated from males. Two emergency exits shall be in place for each area, and the distance from anywhere in the area to the nearest emergency exit should be no more than 30 meters. Fire evacuation passage shall be available between sections, with a width of at least 4 meters in open and broad space. Indicating signage shall be available on the ground of internal passage between section and emergency evacuation passage. Partition materials shall be anti-inflammable with surface easy for cleaning, and with a height of at least 1.8 meters. Hospital beds equipped with bedside tables shall be parallel for the convenience of medical staff with at least 1.2 meters in between. In case of double-row beds, at least 1.4 meters shall be remained between ends of close beds. In case of single-row beds (very rare circumstance), at least 1.1 meters shall be remained between bed end and the wall.
- The number of people accommodated on each floor or large space after the conversion shall be determined according to the evacuation width of the existing evacuation stairs and safety exits, and the net width of the evacuation staircase or safety exit of large space shall be calculated and determined according to the local fire protection specifications.
- Toilets for patients and medical staff should be set separated. Patients should use temporary toilets. Special passages should be established between the temporary toilets and the bed area. The toilets can be configured according to the standards of 20 males per squatting pot and 10 females per squatting pot, and

the toilets should be at the downwind of the building and away from cafes and water supply points. The original toilets and bathrooms in the building are only for the use of healthy medical staff and logistics support personnel.

- Barrier-free design: The main entrances and exits and internal medical passages shall be equipped with the barrier-free passages to access all medical departments, in a width necessary to ensure the moving sickbeds and accompanying staff to pass at the same time.
- The entrance for patients shall be equipped with rooms for storage of personal belongings, disinfection and security check, men's dressing room and women's dressing room, etc. Disinfection and packing areas should be set up at the exit for patients to be transferred to another hospital or recovered patients to be discharged. Emergency rescue treatment room, treatment room, pantry room, linen room, hot water room, filth cleaning room and temporary storage room for domestic waste can be allocated near the ward zone (the filth cleaning room and temporary storage room should be close to the exterior wall and the sewage outlet). Infusion preparation room (pharmacy), pharmaceutical warehouse, sterile warehouse, and pantry room, rest room for duty staff, office and other rooms can be set up in the medical and nursing clean area.
- A large rest area should be set up near the bed area for patients to exercise properly, watch TV, borrow and read books or chat. For areas with religious needs, prayer areas can be offered.

#### *Requirements on Structure Safety*

The buildings shall be evaluated in the aspect of safety before conversion into Makeshift Care Centers, to avoid any potential safety hazards. In the design stage, under the circumstance that the service load may exceed the original design floor live load, the structural designer shall review the relevant load data and take corresponding measures according to the review results.

#### *Requirements on Ventilation and Air Conditioning*

- The air inlet and exhaust systems should be set according to the set clean area, semi-contaminated area and contaminated area. The airflow direction should be from the clean area → semi- contaminated area → contaminated area according to different pressure gradients. The clean area should use natural ventilation. When natural ventilation is not available, mechanical ventilation should be provided. Semi-contaminated and contaminated areas should be dominated by mechanical ventilation.
- Natural ventilation flow should be no less than 60 liters per second per person. The frequency of mechanical ventilation should be more than 6 times / hour or the ventilation flow should exceed 40 liters / second • person.
- The ventilation and air-conditioning system of the ward area should be a direct-flow air supply and exhaust system, close the return air valve, and supply fresh air. The exhaust air flow should exceed the air supply flow. The inlet of the exhaust fan should be equipped with a removable plate type high-efficiency filter. The air outlet should not be higher than 0.5 meters from the ground, and the air supply and exhaust ventilator should be operated continuously.
- The setting of supply and exhaust fans (inlets/outlets) should form a reasonable airflow channel. The airflow process should be short and cover all ward areas to facilitate the rapid discharge of contaminated air. The fresh air inlet shall be maintained clean and the exhaust discharge should be in high altitude. The horizontal distance from any air inlet should exceed 20 meters or the vertical distance should exceed 6 meters.
- When the medical staff enter the contaminated area from the clean area, the air supply shall be set at no less than 30 times/hour in the "Dressing Room I", D300 short ventilation ducts shall be set in each adjacent compartment, and the air shall flow from clean area to contaminated area. When the medical staff return to clean area from the contaminated area, the air exhausting shall be set at no less than 40 times/hour in isolation clothing undressing room, D300 short ventilation ducts shall be set in each adjacent compartment, and the air shall flow from clean area to contaminated area.

- Each isolation ward area should be equipped with several air purifiers with sterilization and disinfection functions. Intake and exhaust ventilators and air filters should be equipped with monitoring and fault alarm devices.
- Exhaust ventilators should be installed in bathrooms, toilets and garbage rooms, with a frequency of air ventilation higher 12 times/hour, and high-efficiency filters should be installed at the inlet of exhaust fans.
- The condensate in the air conditioner in the contaminated area should be collected and discharged into the medical waste water treatment system in the hospital. Exhaust air filters should be disinfected onsite by professionals and then treated as medical waste.
- When using the original ventilation and air conditioning system, before the system starts running, the air filter should be cleaned or replaced, the heating (surface cooling) coil should be cleaned, and the air duct should be disinfected. During the system operation, the air filter should be cleaned and disinfected from time to time, and the air supply and return vents of air conditioner in the room should be cleaned and disinfected frequently.
- A certain number of mobile oxygen cylinders should be provided to meet the oxygen demand of patients.
- Ventilation and air conditioning systems and flammable and explosive materials should meet the requirements of corresponding firefighting regulations, and in normal operating conditions.

#### *Requirements on Electric and Intelligent Management*

- The power supply capacity of the converted building should meet the power demand load for new functions after the conversion, and the additional power distribution lines of the conversion should meet the requirements of sensitivity protection.
- The distribution boxes and controllers of the site should be kept away from the contaminated areas and placed in a special room, if possible.
- It is advised to adopt standard product packages for ventilation equipment controllers, and keep them under centralized control at the nurse station (duty office).
- When possible, each bed should be provided with 1-2 220V, 10A single-phase sockets and table lamps; for sites without sufficient conditions, multiple groups of single-phase power socket boxes can be set in the surrounding area of the large open room, which is convenient for patients to charge their mobile phones. When possible to provide electric blankets, a separate power supply circuit should be provided for the electric blankets, with a centralized and time-period control to mitigate hidden danger of fire.
- In order to reduce the glare effect of ceiling lights, it is advised to add lamps with opaque lamp shade or indirect lamination options on the peripheral walls of large open room or poling lamp on the ground if possible.
- For additional lighting and socket circuits, the residual current protector should be set with operating current value in 30mA.
- Wireless network access should be provided and ensure full coverage of 4G or 5G networks. Wireless APs should be added to achieve full WIFI coverage, when resources are sufficient.
- Additional ground luminaries, power socket circuits and weak-current circuits should be installed with metal conduits (slots). It is advised that layout of conduits (slots) should avoid personnel and logistics passages. Necessary measures should be taken when it's impossible to avoid them.
- In medical places and other places that need to be disinfected, ultraviolet sterilization lamps or air sterilizer sockets are required. Ultraviolet sterilization lamps should use specific switches with special signs, which could not be parallel to those of ordinary lamps. If ultraviolet sterilization lamps are used in places with human presence, it is advised to adopt indirect lamps or lamps with adjustable irradiation angles.
- Auxiliary (partial) equipotential bonding should be provided in medical equipment rooms, shower rooms or toilets with bathing functions.
- Nurse stations (duty room) should be equipped with a one-touch alarm button which is linked to the hospital security system. Nurse stations should allow for the power supply of high-power appliances and it is advisable to have two sockets circuits for power supply.
- It is advisable for rest areas for patients and nurse stations to be covered by video surveillance.

- The wiring of weak current and intelligent systems for renovation can be replaced by wireless solutions when wired wiring is impossible to be implemented.
- The information management system after renovation should share the corresponding information as required by the management department.
- The broadcasting and information-distribution systems need to be equipped with public broadcasting systems. It is acceptable to make use of old ones in the original sites and to connect the wiring port into nurse stations. Temporary broadcasting systems which adopt the scheme of distributed wireless networks are also acceptable.

#### *Requirements on Fire-fighting Facilities*

- The original fire-fighting facilities and equipment shall be in normal operating conditions. It is necessary to ensure that the automatic fire alarm and fire linked control system, fire emergency lighting and evacuation indication system are in normal operating conditions. Evacuation indication signs on the ground shall be clearly set and visible. The original safety exits meet the requirements and shall be kept clear.
- The number of fire extinguishers should be configured according to the standards for the place with critical hazard level, and fire extinguisher shall be implemented in accordance with local fire protection regulations.
- Gas fire extinguishing devices should be installed in the rooms for valuable equipment, medical records and information center (network) machine room.
- A fire hose reel or portable fire faucet should be installed in Makeshift Care Centers without indoor fire hydrant system, and the layout should meet the requirement that at least one jet of water can be delivered to any part on the same plane.
- Each medical staff in the medical care and medical laboratory work areas should be equipped with a filter type fire-fighting self-rescue respirator, which should be placed in a conspicuous and easy-to-access location in the Makeshift Care Center.
- The nurse station should be equipped with a miniature fire station, and the storage capacity of mobile high-pressure water mist should be 100L.
- Ensure the reliable operation of the automatic fire alarm and fire linked control system when the conditions allow.

#### *Requirements on Water Supply and Drainage*

- The water supply systems should be equipped with break tanks and disinfecting equipment. Water supply systems should consist of break tanks and pumps. When it is practically difficult to adopt break tanks, the hazard level of backflow pollution of the water supply system should be analyzed, and the following requirements should be met:
  - ◆ When the risk of backflow pollution is relatively low, and the water supply pressure meets the requirements, reduced-pressure type backflow preventers should be adopted for water supply systems to prevent backflow pollution;
  - ◆ When the risk is relatively high, break tanks should be adopted.
- Water supply pipes and sanitary ware in toilets and bathing areas should not be connected directly, instead there should be air isolation or backflow preventer equipment in between. Certain measures should be adopted in the domestic water supply system to prevent pollution induced by siphon backflow and back-pressure backflow in pipes.
- It is advisable that centralized supply systems with air source heat pumps be adopted for domestic hot water supply in bathing areas. When electric water heaters are adopted, safety devices should be provided.
- Each ward should be provided with a separate drinking water supply point, which should provide direct



drinking water with normal temperature and hot water. Hot water can also be supplied by bottled water dispensers.

- When the temporary mobile toilet is installed with pipe drainage, it should be collected separately from the drainage in the bathing area, and the ventilation pipes of the drainage system should be set independently.
- Air-conditioning condensate in the hospital should be collected centrally by area, drained indirectly, and treated together with sewage and waste water from various areas.
- Plugs should not be used in wash basins.
- The drainage system shall adopt technical measures to protect water seal from damage.
- The drainage in the bathing area should be collected by a sealed pipeline system, and disinfected before being discharged into the outdoor sewage system.
- The drain pipes should be sealed with non-shrinkable, non-combustible and dust-free materials.
- The outlet of vent pipe on the drain pipes must be equipped with high-efficiency filters or other reliable disinfection equipment, and keep good ventilation conditions around. The outlet of vent pipe on the drain pipes shall not be connected to the exhaust pipe of the air conditioning and ventilation system.
- Washing and disinfecting facilities should be equipped for ambulance parking spots. Washing and disinfecting wastewater should be discharged into the sewage system and the outlets should be treated with water seals. The depth of water seal should not be less than 5 cm, and the use of movable mechanical valve to replace the water seal is strictly prohibited.
- The rainwater in the canopies of the temporary outdoor bathing area should be disinfected and discharged into the sewage system.
- The domestic sewage in the temporary mobile toilets and bathing area must be disinfected before discharged. The faeces, vomit, sewage and waste water, which are discharged from ward must be sterilized and disinfected. Direct discharge of ward sewage, medical waste water and ward waste without disinfection or treatment is strictly prohibited.
- Infectious solid waste and various chemical waste liquids shall not be disposed and dumped into the sewer.

#### **2.4.5 The Regular Maintenance of Makeshift Care Center**

The Makeshift Care Center shall be equipped with a reasonable number of medical staff and management personnel to meet 24-hour medical services and logistics services.

Medical services include regular ward checking, which is 3 times a day (for body temperature measurement, blood pressure measurement, and medical condition check), medication prescribed by the doctor, examination arrangements (nucleic acid test, blood draw, CT scan, etc.) and emergency treatment.

Logistic services consist of equipment maintenance (including water supply, drainage, ventilation and air conditioning equipment, electrical and intelligent equipment), security services, cleaning services, domestic and medical waste cleaning, food and daily supplies delivery, cultural needs securities (book lending and disinfection) , and psychological counselling (including psychological counsellors, etc.).

#### **2.4.6 Post-pandemic Use of a Makeshift Care Center**

All the spaces in Makeshift Care Center should be sterilized, disinfected and closed after finishing using. After the epidemic ends, the site will be tested, and the temporary facilities will be demolished after a comprehensive safety assessment to restore the original functions.

## **2.5 Temporary Isolation Sites**

### **2.5.1 The Purpose and Significance of Temporary Isolation Sites**

Temporary isolation sites are used to centrally accommodate suspected COVID-19 patients and close contacts with a history of contact with confirmed patients.

Sending the susceptible people to specific sites through protective isolation can check and cut-off the suspected source of the infection and prevent the risk of coronavirus spreading.

### **2.5.2 What Kind of Building can be Converted to a Temporary Isolation Site**

The buildings can be used as temporary isolation sites include hotels, training centers, nursing homes, university dormitories and others near the community.

### **2.5.3 How to Convert a Temporary Isolation Site**

The renovation of temporary isolation sites should follow the layout design principles of "three areas" (contaminated area, semi-contaminated area, and clean area) for existing buildings to ensure the separation of doctors, patients, and the separation of clean and contamination. At the same time, in order to avoid contacting others and prevent cross-infection by quarantined personnel as much as possible, the temporary isolation site adopts the method of providing single rooms and ensures that the rooms are equipped with independent water supply, drainage, power supply and distribution, ventilation and air conditioning system and communication information and other facilities .

### **2.5.4 Design Requirements of Temporary Isolation Sites**

#### *Requirements on Building Selection for Requisition*

- It is advised to select a multi-story building or a detached building. In special cases, a high-rise building is also acceptable, but it should be completely separated from other buildings.
- Temporary isolation sites should be selected in the downwind direction of the area, away from primary and secondary schools and gathering places for children and the elderly. The green belts between existent building and its surrounding buildings shall be at least 20 meters. An isolation distance of at least 30 meters shall be maintained if there are no green belts
- For existing buildings selected as temporary isolation sites, the plane layout, structure form, height, power supply and distribution, telecommunication, fire-fighting and other facilities should be in conditions for basic use; rooms for quarantined people should be equipped with independent toilets; the building should have independent water supply, drainage and ventilation and air conditioning systems, and; there should be spaces available for setting up temporary medical and domestic solid water treatment and disposal facilities. There should be an ambulance parking and turnarounds area in front of the building.
- During the period from renovation till the end of requisition, the building shall only be used as a temporary isolation site, and shall not be used for other purposes.

#### *The Requirement of Layouts*

- The plane layout of the building should meet the requirements of "three areas" (contaminated area, semi-contaminated area, and clean area). Medical staff passage shall be separated from patient passage, while clean area shall be separated from contaminated area. Spaces for quarantined people are restricted to their rooms except public passages when addressing check-in and check-out procedures. Each quarantined person should live in a single room.
- The contaminated area is a living area for quarantined people, including public passages, isolation rooms, disposal rooms, room for contaminated items, and the processing room for quarantined people check-in and check-out. The clean area includes staff dressing rooms, pantry room, duty room and warehouse. The semi-contaminated area refers to the area between the clean area and the contaminated area, which could be potentially contaminated by patients' blood or body fluid, such as medical staff office, treatment room, medical device treatment room, internal walking passage, etc.
- Two rooms shall be placed between clean area and contaminated area, namely entrance and exit passage room. Entrance flow is Dressing Room I - Dressing Room II - Buffer Room, which allows medical staff to put on protective gears before entering contaminated area from clean area. Exit flow is buffer room - isolation clothing undressing - buffer room - protective clothing undressing - bathroom- dressing room, and medical staff then enter clean area from contaminated area. The toilet passing room should be separated for male and female.
- Temporary isolation sites should have two or more evacuation stairs, the staircase should a closed staircase and have direct access to the outdoor on the ground floor.
- Evacuation instruction figures and charts and safety exit signs should be added in temporary isolation sites.
- Obvious signs or isolation strips should be set in each area. Each area should have 2 emergency evacuation exits, and the distance from anywhere in the area to the nearest emergency exit should be no more than 30 meters. Partition materials shall be anti-inflammable with surface easy for cleaning.
- The number of people accommodated on each floor after the conversion shall be determined according to the evacuation width of the existing evacuation stairs and safety exits, and the net width of the evacuation staircase exit shall be calculated and determined according to the local fire protection specifications.
- Barrier-free design: the main entrances and exits and internal passages shall be equipped with the barrier-free passages to access all sections, in a width necessary to ensure the moving sickbeds and accompanying staff to pass at the same time.
- The entrance shall be equipped with rooms for storage of personal belongings, disinfection and security check.
- A separate elevator or staircase to deliver contaminated items shall be set up in the temporary isolation sites. It is suggested to convert cargo elevators in the original buildings into such elevator for contaminated items, and the entrances for people should be separated from those for contaminated items.

### *Requirements on Structure*

In the process of design and renovation of temporary isolation sites, a safety assessment shall be carried out for the buildings used for conversion, to avoid any potential safety hazards. In the design stage, under the circumstance that the service load may exceed the original design floor live load, the structural designer shall review the relevant load data and take corresponding measures according to the review results.

### *Requirements of Ventilation and Air Conditioning*

- A room without fresh air system and cannot open windows for natural ventilation should not be used for quarantine.
- The flow of natural ventilation in the room should be no less than 60 liters per second per person, and the frequency of mechanical ventilation should be more than 6 times / hour.
- When the room is equipped with a spilt air conditioner, the windows should be opened regularly for ventilation, and the bathroom air exhaust equipment should be operated continuously.

- When the air conditioner in the room is a fan coil unit (multi indoor unit) + fresh air system, the fresh air system should be operated at the maximum fresh air flow throughout the day, and the bathroom exhaust air should be operated continuously, and the exhaust air flow should be higher than fresh air flow.
- The rooms should be equipped with ultraviolet disinfection lamps or high-efficiency air purifiers in sterilization-type.
- When the public area is equipped with an all-air air-conditioning system, the return air valve should be closed; full fresh air operation should be used, and; an exhaust ventilator should be installed or the smoke exhaust ventilator in the area should be used for exhaust. The exhaust air flow should exceed the air supply flow, and the inlet of the exhaust ventilator should be equipped with a removable plate filter with high-efficiency.
- The fresh air intake should be maintained clean and the air exhaust should be set at high altitude. The horizontal distance from any air intake should exceed 20 meters or the vertical distance should exceed 6 meters.
- When the medical staff enter the contaminated area from the clean area, the air supply shall be set at no less than 30 times/hour in the "Dressing Room I", D300 short ventilation ducts shall be set in each adjacent compartment, and the air shall flow from clean area to contaminated area. When the medical staff return to clean area from the contaminated area, the air exhausting shall be set at no less than 40 times/hour in isolation clothing undressing room, D300 short ventilation ducts shall be set in each adjacent compartment, and the air shall flow from clean area to contaminated area.
- Before the operation of ventilation and air conditioning system, the air filter should be cleaned or replaced, the heating (surface cooling) coil should be cleaned, and the air duct should be disinfected. During the operation of the system, the air filters should be cleaned and disinfected from time to time. The return air vents and fan coils (multi indoor units) of the air conditioners in the rooms should be cleaned and disinfected regularly, and the condensate plate of the air conditioner should be kept clean.
- Requirements on Electrical and Intelligent Management
- The continuous service time of standby power supply of the emergency lamps and emergency evacuation indication signs in the temporary isolation site shall be no less than 1 hour.
- It is advised to set special sockets for ultraviolet sterilization and disinfection lamps or air sterilizers, and controlled by special switches with special signs, which could not be parallel to those of ordinary lamps. For places with human presence, it is advised to adopt an ultraviolet sterilization lamp with indirect irradiation or adjustable irradiation angle, to avoid light irradiating to human eyes directly.
- Computer network wiring: according to the requirements of internal and external networks, the distribution points of the integrated wiring system can be increased appropriately. In areas where wired wiring is impossible for implementation, a wireless AP can be added with a WIFI solution as replacement.
- Information management: The hospital information center should share the corresponding information as required by the superior management department.

#### *Requirements of Fire-fighting Facilities and Driveway*

- Temporary isolation sites with an area of over 1500 square meters on any floor or over 3000 square meters in total shall be provided with automatic sprinkler systems and automatic fire alarm systems.
- The original fire-fighting facilities of the building, such as automatic fire alarm system, automatic sprinkler system, indoor and outdoor fire hydrant system, smoke prevention and exhaust facilities, emergency lighting and evacuation indication signs, fire extinguishers and other fire-fighting facilities and equipment should be repaired to normal operation.
- Temporary isolation sites shall be equipped with building fire extinguishers according to standards for places at critical hazard level.
- Temporary isolation sites should have circular fire lanes or fire lanes along their two long sides. Temporary isolation sites which are converted from high-rise buildings should also be equipped with ascending operation site for fire trucks, and windows for fire rescue, etc.

### *Requirements on water supply and drainage safety*

- The domestic water supply system should reserve emergency chlorine disinfection equipment at the water supply equipment site to ensure the residual chlorine in the domestic water supply. The chlorine disinfectant concentration can be increased to enhance the disinfection and sterilization effect if necessary.
- The water supply and hot water systems in the isolation area should be set separately, and anti-backflow measures should be taken; the indoor and outdoor sewage systems (including vent pipes) should be set separately and cannot be shared.
- The inspection wells for outdoor drainage should be sealed, and vent pipes should be set and the exhaust gas in outdoor drainage pipes should be discharged to the roof and disinfected; the existing outdoor sewage pipes should be systematically checked and upgraded, and damaged pipes should be replaced; the foundation of pipes should be reinforced and anti-seepage membrane should be laid within the coverage of pipelines.
- The indoor and outdoor drainage pipes used in the contaminated area should be connected by anti-seepage and anti-leakage methods such as hotmelt; all the handles on the door should be removed or disinfected regularly.
- An outdoor fire hydrant system should be set up; for a single or multi-story building with a single building volume of over 5000 cubic meters, an indoor fire hydrant system is advised.
- Sewage and waste water treatment facilities in temporary isolation sites should be upgraded as necessary. The height of the water seal under the wash basin should exceed 5 cm, and should be hermetically connected to the sewer. The floor drains in the toilet should adopt special sealed ones with pollution prevention measures. Sewage and waste water should be treated with two-stage strengthened disinfection. The primary disinfection treatment should be followed by secondary biochemical treatment. After another disinfection, the waste water shall be discharged into the municipal waste water pipeline, and then being treated by the urban waste water treatment plant and discharged after meeting the standards.
- The disinfectant is dosed twice, and the referenced chlorination dosage (in available chlorine) of the pre-sterilization process is generally 30-50 mg / L. The referenced chlorination dosage for effluent processed by waste water treatment station is generally 15-25mg / L. During the operation, the chlorination dosage should be determined according to the level of residual chlorine and the actual experiments for water quality and quantity. The retention time of disinfection tank needs to be prolonged, the contact time of chlorine disinfection should be no less than 120min, and the residual chlorine concentration needs to be increased. If the site conditions are limited, sewage and waste water should be collected separately, and should be sealed and transported to the waste water treatment station before disinfection.
- The condensate water of centralized air conditioning system should be collected by area, and the condensate water of the spilt air conditioners should be collected or discharged to the floor drain in the bathroom, and should be disinfected together with the sewage and waste water discharged from various areas.

#### **2.5.5 Daily Maintenance of Temporary Isolation Sites**

Temporary isolation sites shall be equipped with a reasonable number of management personnel to provide 24-hour logistics services.

Logistic services consist of regular body temperature measurement , which is 3 times a day, contacting medical services according to the situation of quarantined personnel, equipment maintenance (including water supply, drainage, air conditioning equipment, electrical and intelligent equipment), security services, cleaning services, domestic and medical waste cleaning, food and daily supplies delivery, cultural needs securities (book lending and disinfection) , and psychological counselling (including psychological counsellors, etc.).

### **2.5.6 Post-pandemic Utilization of Temporary Isolation Sites**

All the spaces in the isolation site should be sterilized, disinfected and closed after finishing using. After the epidemic ends, the site will be tested, and the temporary facilities will be demolished after a comprehensive safety assessment to restore the original functions.

## 3. Using QR apps and big data in tracking and mapping

### 3.1 Introduction

The following paper is based in the use of big data and QR apps as an effective response to COVID-19. The use of technological approaches to trace the path of the disease transmission, to better understand the trend of the pandemic situation and the projected model in a specific context. And to assist in pandemic prevention and control, releasing and reducing exposure to risk.

The paper covers the monitoring of population mobility based in big data, the propose and significance of using this resources, what are the basics set ups needed for an effective use of the data and the monitoring, how to carry out a big data population epidemiology/mobility assessment and the privacy protection of the data.

Moreover, the paper covers the “health QR code” which are based on real data reported online by individuals. Individual report and after the comparison and verification of the background data, a QR code is generated. The colour of the health QR code represents the individual's health status, and the health QR code is also the electronic certificate of the individual's health status during the pandemic prevention which in turn is a very useful way to control and monitor the spread of the disease. The paper covers how to build and use a QR code system and how to protect privacy.

Moreover, the paper brings a spatial perspective on how to prevent and control COVID-19 using “prevention pandemic maps” explains the propose and benefits and suggest how to build and make use of the maps. The paper is limited to Chinese context and in particular Wuhan experiences as is base in the knowledge of Wuhan University to set up the recommendations and in turn the recommendations might need to be contextualized to a specific context.

The value lessons learnt from Wuhan University not only set up the base for this paper but for future work to be develop under this umbrella. UN-Habitat in its last publication on urban health “integrating health in urban and territorial planning” defines spatial epidemiology as the study of spatial variation in disease risk or incidence. Risk patterns in health and health inequalities tend to have both a temporal and a spatial component. The methods presented in this paper are a form of epidemiology, statistics and geographic information science.

UN-Habitat is committed to ensure planners are well equipped for working toward healthier environments. The technology used to trace the epidemic is an activity that engage both planers and the public health professionals to better analyse the data. This paper sets the stage for both sectors to continually join forces for longer engagements.

### 3.2 Applicable Chinese Institutional Framework

The National Health Commission of the P.R. China actively plays the role of China's disease prevention and control information system, collects and publishes pandemic data in a timely manner, strongly supports the governments' precise decision-making, fully guarantees the people's right to know, and strengthens information linkage with the Ministry of Industry and Information Technology, Ministry of Public Security, Ministry of Transportation and other ministries. The National Health Commission established a multi-source data monitoring, exchange, aggregation, and feedback mechanism for roads, railways, civil aviation, communications, medical and other relevant parties of the pandemic, and use big data technology to track the development of the pandemic in real time, conduct mass screening of high-risk populations, and make the valid prediction so as to provide the data support for scientific prevention and precise policies implementation. The

Ministry of Industry and Information Technology of the P.R. China uses big data to support the study and judgment of the pandemic situation and the deployment of pandemic prevention and control, and makes personnel tracking, material deployment, resumption services, and government affairs decisions.

### 3.3 Population Mobility Monitoring Based on Big Data

#### 3.3.1 The Purpose and Significance of Big Data Population Mobility Monitoring

COVID-19 has a strong human to human transmission ability, and the epidemiological characteristics have yet to be fully defined. In the absence of vaccines and specific medicine, the most effective way to prevent the disease is to quarantine the source of the infection and induct non-medical interventions such as reduce population mobility and encourage social distancing. If the spatial and temporal characteristics of population mobility can be accurately grasped in addition to conducting the real-time monitoring, we can formulate scientific prevention, control measures and response strategies to achieve accurate response to this pandemic and active intervention to minimize the spread of disease.

The following are the three main purposes on the population mobility monitoring based on big data:

- Tracing the path of disease transmission : Personal track information obtained based on big data can be used to trace the infection path of cases and determine the possible disease transmission caused by its activity routine and ultimately to provide a basis for epidemiological investigation and screening of high-risk groups;
- Judging the development trend of the pandemic situation: combining the information of the spatial and temporal distribution of cases and the pandemic model, it can assist in judging the overall trend of the current pandemic situation, and provide a decision basis for the implementation of hierarchical classification and control of regional risk assessment and population mobility restrictions;
- Assisting in pandemic prevention and control: releasing the regional risk rating and case number distribution to the public in combination with geographic location information, and at the same time, publishing relevant information on restrictive measures to high-risk groups.

#### 3.3.2 What basic data is needed for big data population mobility monitoring

Since the level of regional information infrastructure and data usage policies are not unified, the choice of basic data can be based on their regional own needs.

Table 1. Sources and Overview of Basic data

Data Sources	Main forms and contents	Purpose	Remarks
Department of Public Health and Disease Control	Epidemiological survey data of cases	Tracing the historical trajectory, research and judgment on the development situation	Extraction of spatital-temporal information, and privacy information protection
Mobile operators	Mobile phone signaling data, geographic spatial distribution of base stations	Analysis and tracking of population spatial-temporal trajectory	There are historical time limits and privacy restrictions



APP of Mobile Phone	Time geotagging, disease feature information	Case trajectory tracking and high-risk population screening	Require users to actively install and provide information
social media	Geotagging, help information, etc.	Pandemic data collection and public sentiment monitoring	Rely on users to actively provide information
Related government departments	Traffic passenger flow data, vehicle management information data, and community investigation data	Case transmission risk screening, travel restriction screening	Multi-end data fusion needs to be coordinated by relevant functional departments

### 3.3.3 How to carry out big data population mobility monitoring

The epidemiological survey data of the confirmed cases is the basis for carrying out the monitoring of the big data population mobility monitoring.

- In the path of disease transmission, the patients' ID information, address, social relationship network, recent activity trajectory, etc. can be obtained based on the routine epidemiological investigation of cases. Therefore, multi-source data fusion conducted based on the people's identification information to obtain detailed spatiotemporal trajectories of cases, and then to determine the possible close contacts compared with the trajectory of others;
- For the high-risk groups who have been diagnosed or suspected or in close contact, travel restrictions will be taken according to different anti-pandemic measures, and activity monitoring and risk warning can be carried out based on mobile phone APPs;
- Aggregating and visualizing the spatial-temporal data of cases. According to the spatial aggregation and time series characteristics of cases, the spatial-temporal relocations of the pandemic can be found, the spatial transmission path and the intensity of infection among the population can be judged, and then the pandemic risk in different regions can be assessed, and follow-up measures can be formulated in stages.

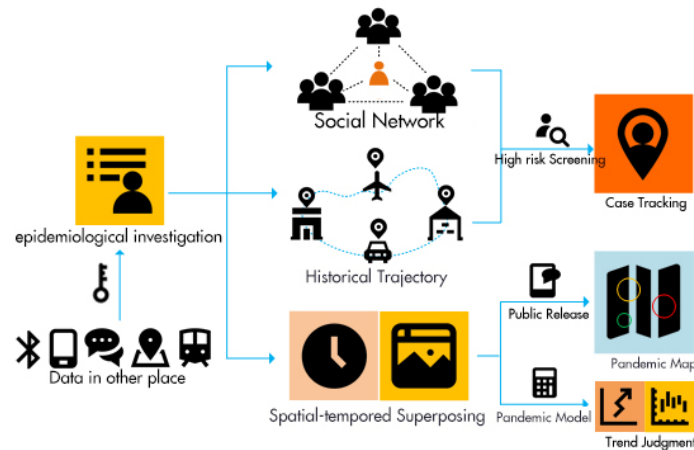


Figure 13. Flow chart of big data population mobility monitoring

### **3.3.4 Privacy Protection of Big Data Population Mobility Monitoring**

There is private information included in the aggregated data, such as ID number, mobile phone number, social media account, detailed home address, etc. Therefore, while ensuring the transparency of public's right to know about the pandemic, the information can be released to the public after desensitized.

- Whether through the pandemic map or the information pushed to the public, the privacy information needs to be desensitized, and the data related to detailed geotagging needs to be used after a certain degree of regional aggregation to ensure that the published information does not contain personal privacy information;
- The directional push can be used for the actively querying of trajectory information by the individuals who are considering their personal security, or for releasing of restricted information for the specific groups of people ;
- During the pandemic, the data collection and storage department strictly enforced the information confidentiality regulations, and authorized the data provided externally or data application interfaces accordingly. The data used under temporarily authorization must be deleted within the prescribed timelimit;
- The scientific research data for assisting government decision-making can be used after government authorization, signing a confidentiality agreement and passing the scientific ethics review. And the data provided must be desensitized.

## **3.4 Health QR Code**

### **3.4.1 The Purpose and Meaning of the Health QR code**

The health QR code is based on real data, which is reported online by individuals. After the comparison and verification of the background data, a QR code is generated. The colour of the health QR code represents the individual's health status, and the health QR code is also the electronic certificate of the individual's health status during the pandemic prevention. In the prevention and control of pandemic and resumption of work and production, the utilization of health QR codes can achieve efficient management of the population mobility. The application scenarios of health QR code cover community management, business resumption, transportation, school opening, drug purchase registration, shopping in upper markets and malls, etc., and the health QR code application can assist communities, enterprises, schools, etc. to do pandemic management, prevention and control. At the same time, it can also be used in crowded places such as office buildings, shopping malls, subways, railway stations, etc. to improve the efficiency of inspection and avoid excessive personal contact and gathering.

### **3.4.2 How to Build a Health QR Code System**

The framework of health QR code system can be divided into two parts, a personal client (user end) running on mobile devices such as mobile phones, and a server running on a multi-source big database.

- In the user end, it can be realized through a dedicated mobile phone APP or a mini app interface of commonly used social media software. Its main functions include personal information reporting and return with the requested health QR code;
- The server end operated and managed by the full-time departments mainly implement main functions of

information collection and storage, user health risk assessment and user health status classification based on multi-source big data fusion;

- As for the abnormality of the health QR code caused by the error information, the full-time customer service department provides the services of verification, answering and revision.

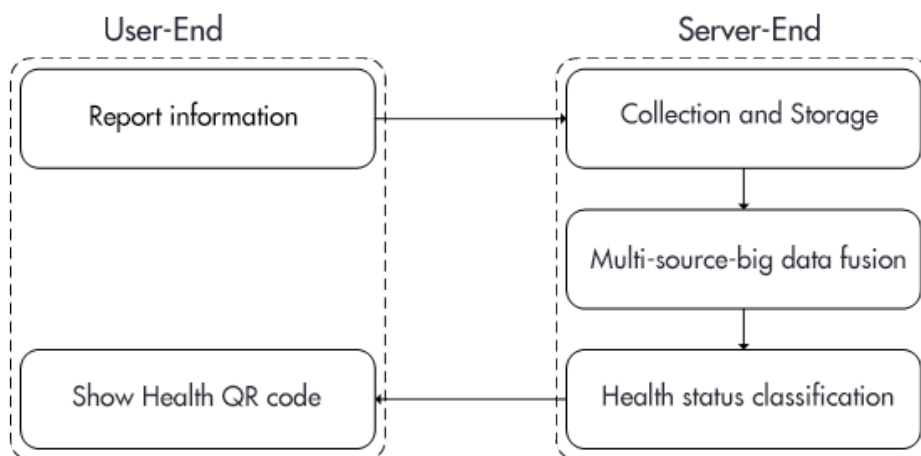


Figure 14. Basic Framework of the Health QR code System

When deploying the health QR code system, data integration problems that may be caused by different administrative regions and different service providers should be considered. Unified management and utilization of database can be achieved as much as possible, and various user access channels can obtain a consistent and valid personal status Identification code.

#### *Basic Data Collection*

Case types: diagnosed, dead, cured, asymptomatic infected, suspected, and close contacts;

The geospatial attributes of the case: the diagnosed person's place of residence, work place, activity trajectory during the incubation period and other spatial information.

#### *Development Technology and Functions*

- Front-end system

The front-end system exists in the form of mobile APP, which is the most simple and convenient. From the functional module, the health QR code APP is divided into the following two parts.

UI design: user landing page, health QR code display page in different colours, registration page for travel checkpoints.

Front-end and back-end data interaction: The health QR code APP reports data to the health QR code background and requests the user's latest health QR code status.

- Back-end system

In principle, the back-end uses different channels of data aggregation and big data processing to realize the logical judgment of the user's health QR code classification, and responds to the request from the health QR code front-end APP in real time, returning the latest health QR code status of the corresponding user, so as to provide a reliable reference for user travel and management decisions.

The basic logic of health QR code determination:

The initial user application defaults to colourless: grey

Determined to be healthy after data comparison: green

Determined to be confirmed case after data comparison: red

Determined to be suspected case after data comparison: yellow

Determined to be close contacts after data comparison: yellow

#### *Health QR code transcoding rules*

The conversion of health QR codes can be carried out through data comparison in accordance with regional prevention and control regulations.

- Regulations for red code converting to green code

Those with red code can be converted into those with green code after treatment, meeting the relevant regulations of centralized quarantine for medical observation, and testing to meet local prevention and control requirements.

- Regulations for yellow code converting to green code

Those with yellow code can be observed for 14 days through centralized quarantine or self-quarantine at home, and continue to check in health continuously. After verification and in accordance with local prevention and control requirements, they can be converted to those with green code.

- Regulations of error code correction

Those who obtained a wrong code due to personal mis-filling of information, etc., can submit an application, and the health QR code can be corrected after the prevention and control department checked it progressively and verifies it.

### **3.4.3 How to use the health QR code system**

#### *Apply for a health QR code*

Open the health QR code application through the mobile phone APP (Alipay, WeChat, etc.), complete the account login, information filling, real-name authentication, etc. according to the prompt of the user interface, and then the health declaration can be made. Note: The filled information must be true and accurate, so as not to affect the distribution of health QR code.

#### *Using the Health QR code*

In communities, enterprises, schools, office buildings, shopping malls, subways, airports, railway stations and other places, the code scanning for the entry and exit can be carried out based on actual needs. The health QR code displayed in green is the basic conditions of passage, and the time of entry and exit should also be recorded.

### **3.4.4 How to Protect Privacy**

#### *Database System Security*

The health QR code system will integrate the individual's identity ID, residential address, mobile phone number, social media account, and the spatial and temporal information of access to the community or public facilities. This part of data is private data, so the health QR code system must first guarantee the high degree of security of the database.

#### *Security Application for Health QR code Terminal*

The health QR code is the unique ID of the individual's identity and health status. Only the health status or action track of the individual is displayed in the application terminal, and other private information are not displayed, which can protect the individual's privacy information from being disclosed.

## **3.5 Pandemic Prevention Map**

### **3.5.1 The Purpose and Significance of the Pandemic Prevention Map**

The pandemic prevention map is a combination of pandemic situation data and a map to display the distribution and changes of the pandemic situation in a visual way. The pandemic prevention map can provide pandemic situation information to the public and organizations in a graphical way, which helps to enhance personal awareness of prevention and control, and assist organizations at all levels to formulate prevention and control strategies. Its main purpose is:

- Providing residents with information on the spatial spread of pandemic: residents can quickly understand the pandemic risk and development situation in the communities, workplaces and life circles they live in through intuitively and comprehensively visualized pandemic spatial and temporal information, so that the

- residents can respond more effectively.
- Providing the resources of the pandemic treatment resources to residents: Release the spatial location and medical resource supply information of the hospital or temporary hospital for COVID-19 special treatment through the map to ensure that the infected people get the most recent, reasonable and effective treatment.
  - Assisting the government in formulating pandemic prevention and control measures: detecting the potential risks in the resumption of work and production areas, formulating and evaluating the public health policies of COVID-19 in different regions through the overall development situation of the pandemic map and spatial risk rating.

### **3.5.2 How to Build the Pandemic Prevention Map**

The Pandemic prevention map is mainly based on COVID-19 related data, using the methodology of mathematical statistical analysis, displaying the spatial distribution of the pandemic situation through geographic visualization, and providing the functions of data query.

#### *Basic Data Collection*

- The types of cases: diagnosed, dead, cured, asymptomatic infected;
- The geospatial attributes of cases: the living place, working place of the diagnosed, the activity trajectory during the incubation period and other spatial information;
- The geospatial attributes of medical institutions: In order to avoid potential cross-infection and ensure the timely treatment of other diseases, the public sectors should provide the geographical location of all medical institutions such as hospitals, temporary hospitals and sheltered hospitals participating in COVID-19 treatment;
- Treatment ability of medical institutions: providing the total number of beds and the current number of remaining beds in the current medical institutions.

#### *Development Technology and Functions*

- Development Technology

It should integrate multi-channel disease information database and urban spatial database through geographic information system (GIS) and web (Web) technologies. Under the Internet platform, the functions of input, modification, retrieving, graphic output, editing and other functions of pandemic spatial data can be realized to form map-based information query platform for the pandemic.

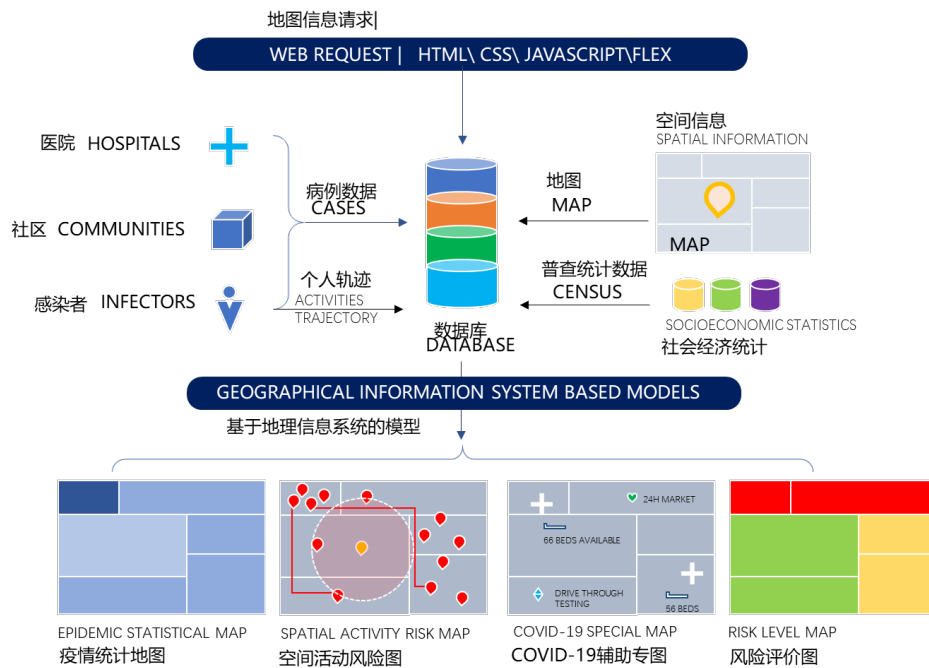


Figure 15. Framework of Development Technology of Pandemic Prevention Map

- Graphic Visualization Function

- Case summary statistics chart: daily case summary at different geo-spatial units (province, city, district, county and block), the main indicators include cumulative number of infected, cumulative number of cured, cumulative number of deaths, number of new infected, number of new cured, number of infected in real time, number of asymptomatic infected;
- Epidemiological index map: combining with the total area, and total population of the spatial unit for further index calculations, providing geospatial pandemics, which mainly including infection rate, mortality rate and population density of infection;
- Space activity risk map: superimposing the spatial trajectory of the infected person's residential address, work address and incubation period on the map, and users can query the activity risk map around the individual's space through the web page or APP;
- Special maps for medical resources: superimposing the locations of medical institutions, temporary testing institutions, and related life support facilities participating in COVID-19 treatment on the map;
- Pandemic risk grade map: According to the actual situation and development trend of the current pandemic situation, comprehensively considering the factors of new and cumulative confirmed cases, etc.. Taking the administrative area as a unit, they are divided into low-risk areas, medium-risk areas and high-risk areas. Improving the accuracy and effectiveness of pandemic prevention and control through zoning and classification, and minimize the impact of the pandemic on economic and social development and residents' living.

### **3.6 How to Use the Pandemic Prevention Map**

The utilization of the pandemic prevention map mainly includes two levels: personal application scenarios and government decision support scenarios.

Individual application scenarios: Individuals can directly query the case summary index and pandemic index through the mobile phone APP to determine the pandemic transmission risk of the geospatial unit in which they live, or directly query the risk of daily life-related places through the spatial activity risk map.

Government utilization scenarios: Government agencies formulate different risk management and control measures for different risk maps, and it can also conduct local space risk detection in areas where work and production are resumed.



## 4. Approaches to resume work and community life

### 4.1 Introduction

The following paper is based in the experiences of going back to work and school during the post COVID-19. The use of specific techniques and approaches to provide a safe work environment reducing exposure to risk and promoting health.

The paper covers the standard for resumption work production and school activities, the paper includes guidelines on the minimal required measurements inside the work environment for example training the employees and build capacity and understanding on how does it transmit and how to mitigate risk, also provide guidance on daily sanitizing routines and the necessity of making available quarantine facilities and provisional/temporary health centers for the monitoring and scanning of staff with symptoms.

Moreover, the paper brings a territorial perspective on how to prevent and control COVID-19 and a long-term approach for overall improving the work environment and in turn improving workers health and wellbeing. The paper is limited to Chinese context and in particular Wuhan experiences as is base in the knowledge of Institute of Public & Environmental Affairs to set up the recommendations, the recommendations might need to be contextualized to a specific context.

The value lessons learnt from Institute of Public & Environmental Affairs not only set up the base for this paper but for future work to be develop under this umbrella. UN-Habitat in its last publication on urban health “integrating health in urban and territorial planning” categorize descent work for health equity as one of the key 12 elements urban planning can do to improve health and wellbeing. This paper and the initiatives taken in here set up the base for a longer term reformation of our work environment for health promotion, reduction of health risk and health equity.

### 4.2 Applicable Chinese Institutional Framework

The Ministry of Industry and Information Technology of the P.R. China has strengthened financial and financial and innovation support for small and medium-sized enterprises, as well as strengthened public services for small and medium-sized enterprises, and promoted the resumption of work and production of private enterprises and small and medium-sized enterprises. The Ministry of Finance of the P.R. China and the State Taxation Administration of the P. R. China exempted taxpayers from value-added tax on income derived from the provision of public transportation and living services. The Ministry of Education of P.R. China, in conjunction with relevant departments, has actively expanded employment channels from five aspects, including expanding national strategies-oriented recruitment, expanding recruitment in key areas, and guiding grassroots employment, etc. The Ministry of Transport provides precise and orderly restoration of transportation services, which strongly supports the resumption of work and production, economic and social development, and the restoration of production and living order.

### 4.3 Standards for Resumption of Work and Production

During the peak of the epidemic outbreak, to contain the spread of the COVID-19 pandemic, China issued a notice to postpone the resumption of work, requesting that all enterprises need to postpone the resumption of work “except those enterprises involving the work and production indispensable for securing urban and rural operations, prevention and control the epidemic, the life of people, and other relating to important national

economy and livelihood, and those in special circumstances that are urgently need to resume work”.

At present, the pandemic in China is generally under control. In accordance with national requirements, all provinces and cities conduct risk classification and classified prevention, control according to the local situation on COVID-19. Carry out dynamic analysis, study and judgment, and adjust risk levels timely. The risk classification is based on the level of county, city and district. An area with no confirmed cases or no new confirmed cases for 14 consecutive days is identified as a low-risk area; an area with new confirmed cases within 14 days and the cumulative number of confirmed cases does not exceed 50, or the cumulative number of confirmed cases exceeds 50 but no cluster epidemic occurrence within 14 days, is identified as medium-risk; an area with more than 50 cumulative confirmed cases, and cluster epidemic occurrence within 14 days, is identified as high-risk. This is the risk level criteria in China. Each country should formulate risk level criteria suitable for the country's local epidemic according to the actual situation, in order to coordinate, guide and arrange the resumption of work and production in overall.

“Enterprises involving the work and production indispensable for securing urban and rural operations, prevention and control the epidemic, the life of people, and other relating to important national economy and livelihood, and those in special circumstances that are urgently need to resume work” are not limited by the risk level criteria to meet the needs of operation security. These industries can resume work only when they meet the following requirements for epidemic prevention and control, and ensure that the prevention and control efforts of resumption of work and production in the enterprises are in place:

- Establish and improve prevention and control mechanisms. Enterprises should formulate thorough measures and emergency plans for epidemic prevention and control, and establish an epidemic prevention and control management system. The person in charge of the enterprise is the chief person responsible for epidemic prevention control, and it is necessary to clarify the responsibilities of responsible person at all levels and the internal responsibility mechanisms for epidemic prevention and control.
- Comprehensively check-up on returning employees. Carry out a comprehensive investigation and check of hidden risks factors, as well as organizing the employees to register the results by category, and grasp the health status of each returning employee and their travel history in the past 14 days. Persons with a history of staying in key epidemic areas within the past 14 days must undergo medical quarantine observation for no less than 14 days, and are eligible to go back to work only when they stay asymptomatic after 14 days of quarantine; take measures avoiding the peak to return to work, and persons not in key positions are encouraged to postpone returning to work.
- Provide and secure protection goods and materials against the pandemic. Enterprises should prepare the necessary materials for epidemic prevention and control (protective items such as masks, gloves, thermometers, etc., and disinfection and sterilization supplies such as hand sanitizer, disinfection water, alcohol, etc.), and ensure sites for quarantine. For enterprises that do not have the conditions to set quarantine sites by themselves, each district shall arrange specific quarantine observation sites.
- Strengthen internal management. Enterprises should well arrange the ventilation, disinfection and sanitation management of the sites, and implement closed-off management. Irrelevant personnel are strictly forbidden to enter production sites and offices in the unit, and all entered personnel should be given temperature tests every day. Enterprises with conditions should implement a flexible work schedule.
- Strengthen publicity, education and guidance. Enterprises should strengthen the publicity and training of epidemic prevention and control, and effectively enhance the enterprise employees' awareness of self-protection.

According to the requirements of epidemic risk level, enterprises and institutions in low-risk areas across the country can fully resume work and production, and resume normal production and living order as soon as possible; high-risk and medium-risk areas need to continue coordinating and implementing the epidemic prevention and control and the resumption of work and production in public institutions and enterprises in accordance with relevant requirements on scientific prevention and control, precise policy implementation, and regional classification, so as to restore the order of production and life in an orderly manner. The state requires

all local governments to dynamically adjust the list of low-risk, medium-risk, and high-risk counties (cities, districts, and banners) within their jurisdictions and disclose to the public in a timely manner, and strengthen the overall coordination and guidance for the epidemic prevention and control and the resumption of work and production in enterprises and institutions.

#### **4.3.1 Resumption management requirements in low-risk areas**

Enterprises and institutions in low-risk areas should implement the strategy of preventing external importation, keep abreast of employee turnover, and conduct health management of personnel from high-risk and medium-risk areas and overseas; individuals from low-risk area can go to work if the body temperature is tested to be normal, and no barriers should be set up and no quarantine should be requested before resumption. It is required to timely understand the physical condition of employees. Once a suspected or confirmed case is found, it is necessary to immediately initiate the response plan for properly treatment. It is necessary to keep good ventilation in workplace; pay attention to the cleaning and disinfection in work and living places; minimize the gathering of personnel and collective activities; strengthen the management of employees' dining activities and peak-shifting meals; clean and disinfect the tableware in the cafeteria. Under the premise of taking effective measures to ensure the ventilation, cleaning and disinfection of the employees' dormitory, each unit have the independence to decide the number of personnel to be arranged in each dormitory. Popularizing knowledge on epidemic prevention and control should be well conducted, employees should be guided and urged to raise protection awareness, and personal protection requirements should be implemented. Employees engaged in hazard-related operations such as exposure to dust and chemical poisons should wear masks in accordance with occupational health regulations and other relevant requirements. Other employees can wear masks in accordance with the "Guidelines on Scientific Mask Wearing for the Public," depending on the specific circumstances in enterprises and institutions. The emergency response capacity should be secured, to achieve early detection, early report, early quarantine and early treatment of asymptomatic infected person, suspected cases and confirmed cases, and to prevent clustered epidemics.

### 4.3.2 Management requirements for resumption of work in high-risk and medium-risk areas

On the basis of implementing prevention and control measures for enterprises and institutions in low-risk areas, enterprises and institutions in high-risk and medium-risk areas should strengthen health monitoring and entry and exit registration management of all employees; and conduct temperature tests for employees and external personnel before they enter the offices or sites, and allow their entrance only when the test shows normal; implement prevention and control measures in workplace, reduce the number of meetings held, shorten the time and control the scale for meetings that need to be held indeed, promote video or telephone conferences, adopt new work hours avoiding peak hours, flexible work schedule or home office according to the actual situation; guide employees to do take good personal protection and minimize going out, especially avoid assembly occupancies or sites with poor ventilation, and; clarify emergency measures and disposal procedures for epidemic prevention and control, delegate prevention and control responsibilities to specific departments and individuals, and properly handle abnormal situations. High-risk areas should suspend group and gathering activities, suspend the opening of various indoor entertainment, cultural and recreation sites, and all catering units shall suspend dine-in services. Except for the farmers' markets, supermarkets, and convenience stores that are necessary for life, other public activity sites shall be closed depending on the epidemic situation.



Figure 16. National Pandemic Prevention Map in China

## 4.4 Measures for Resumption of Work and Production

### 4.4.1 Health Examination for Resumption

In order to ensure the safety of epidemic prevention and control after resumption of work and production, personnel in key industries such as teaching faculty, medical personnel, staff working in public place and public transportation, etc., shall all be done the nucleic acid testing thoroughly if they are required or willing to be tested.

### 4.4.2 Transportation

Under the premise of effective prevention and control, urban and rural roads and public transportation services can be gradually be restored in all regions. Reasonably arrange public transportation routines and shifts, fully restore the normal operation of taxis (including cruise cars and online car-hailing), and ensure the normal operation of the shuttle lines of railway stations, airports, highway passenger stations, waterway passenger stations and other transportation hubs.

#### **4.4.3 Economic and Financial Policy Stimulus**

In order to assist enterprises and institutions to resume work and production, local authorities have introduced policies to reduce the labour costs of enterprises, such as reducing the cost of social insurance, implementing unemployment insurance stabilization rebates, and issuing subsidies for stabilizing enterprises and jobs; some cities reduce the operation burden of enterprises through reducing taxes, tariffs and rental fees, etc.; while some cities provide financial support, such as encouraging banking sector and financial institutions to provide support on postponed loan repayment, extension of loan renewal, interest rate reduction and interest reduction to enterprises that are greatly affected by the epidemic; funding support are provided for enterprises who expand mask machines, protective clothing labelling machines, negative pressure ambulances and other urgently needed key equipment, as well as the production of key and urgently-needed components, and; reduction of loan interest rates for enterprises and individuals affected by the epidemic is encouraged. Meanwhile, in order to support the resumption of work and production in business and trade, culture, sports, and tourism industries, some local governments have provided consumer coupons of up to tens of millions of USD to activate the consumer market.

#### **4.4.4 Technology Innovation Support**

Electronic health codes have been developed in various cities, and employees are classified and managed according to the status of the electronic health codes, and employees holding green health codes are organized to return to work in an orderly manner. Persons with red or yellow health codes are temporarily suspended for work resumption. If an individual with red code, yellow code or no code is found, he or she should be reported to the community health service center in the jurisdiction area for nucleic acid test, and stay at home or centralized quarantine sites for 14 days' medical observation. Individuals with green code can return to work if body temperature test shows normal. Institutions are encouraged to strengthen health management for employees and provide nucleic acid testing for employees when necessary.

In order to make it more intuitive for the public to understand the epidemic situation around themselves and their relatives and friends, and to take more targeted protective measures, the Chinese public welfare organization Institute of Public & Environmental Affairs launched a pandemic map. The pandemic map collects the latest information on the pandemic situation in each place. From global - provincial - municipal - district level - county level to community level, each level has a dedicated layer for display, and is visually presented to facilitate public understanding. A high degree of refinement and visualization will help governments at all levels to make scientific decisions and coordinate the response to the pandemic. As the pandemic is basically controlled domestically, enterprises and institutions across the country implement strategies of preventing overseas importation, keep abreast of employee turnover, and conduct health management of personnel from high-risk and medium-risk areas and overseas; personnel from low-risk area can go to work if the body temperature is tested to be normal, and no barriers should be set up and no quarantine should be requested before resumption. The risk index integrating the district / county-level pandemic map has become a basis for some regions, such as Hebei Province, to decide whether visitors need to be quarantined.

Relying on internet platforms, governments at all levels continuously optimize government services during the epidemic. Some places make full use of big data to strengthen the survey and monitoring of migrating employment, and provide more precise and in-place services for migrant workers. Depending on the "Yue Shang Tong" (Guangdong Business Integration) platform, Guangdong Province timely released policies and measures for benefiting enterprises during the epidemic prevention and control period, established a response platform for enterprise appeal, and promoted the establishment of appeal response mechanisms in various places to promptly solve the outstanding problems faced by enterprises in production and operation.

#### **4.4.5 Staggered back to School**

Affected by the pandemic, the online education method has become the best way to respond to "non-stop learning with stopped classes". Education institutions such as schools use online platforms such as Dingding Online and Tencent Meeting to continue teaching activities.

When the pandemic situations are basically within control, schools start to reopen as planned. In addition to conducting nucleic acids and serum antibodies tests for staff and students, schools also implement staggered opening, arriving and flexible departure, separated classes, staggered dining, and establish the mechanism of home-school joint prevention and teaching-medical joint action.

#### **4.4.6 Regional Joint Prevention and Control**

In the coordination stage for the resumption of work and production, in some region, for example, the Yangtze River Delta, three provinces and one city have established five mechanisms for the resumption of work and production to promote mutual recognition, mutual assistance, coordination and cooperation in the Yangtze River Delta region: mutual recognition and access of health codes; cooperation and mutual assistance in resumption of work and production for industrial chains; coordination and cooperation for employment in enterprises during resumption of work and production; coordination and consultation to accelerate the implementation of cross-regional transportation and other infrastructures, and; coordination and notification of regional economic policies during special periods of epidemic prevention and control. The group also appointed specific personnel in charge of coordination, tracking, supervision and implementation, to ensure the smooth operation of various mechanisms, give full play to the advantages of integration, and support the resumption of work and production in many fields.

#### **4.5 Establish a Normalized Prevention and Control Mechanism for the Pandemic**

To adapt to the requirements for normalized prevention and control of COVID-19 pandemic, all local authorities carry out the resumption of work and production in accordance with the general requirements for preventing importation externally and preventing rebound internally. Normalized epidemic prevention and control should be established, such as keeping the mask on, detecting fever continuously, disinfecting and ventilating continuously, remaining the fixed quarantine sites, etc., and as to ensure the security, service, inspection, and accountability. Different control modes for different areas:

- Assembly occupancies, such as high-speed railways, subways, airports, docks, stations, supermarkets, markets, farmers' markets, should not relax but strengthen epidemic prevention and control management, continue to strictly implement control measures, such as body temperature detection, mask wearing, cleaning and disinfection, ventilation, public hygiene and public order maintenance, etc.
- Open parks and scenic spots should strictly control the flow of tourists, implement interval entering for visitors, conduct prevention and control measures such as body temperature detection at entrance and requesting tourists to wearing masks; and regularly carry out cleaning and disinfection to maintain environmental hygiene.
- Closed-off entertainment and leisure sites remain closed tentatively.
- Dining venues shall set reasonable distances between dining facilities and tables, strictly control clustered table meals, and avoid gathering queues.
- Hotels should continue to strictly implement the health information registration system for check-in personnel, strengthen communication and connection with their communities (villages), and report and handle any abnormalities in a timely manner.
- Medical institutions should further improve the management of outpatient and emergency pre-examination

and triage, standardize the setting and management of fever clinic, make staggered schedule appointments and online consultations, strengthen the prevention and control of infection within the hospital, and improve the laboratory testing capabilities of medical institutions.

#### **4.6 Preparations for Pandemic Prevention and Control before Resumption of Work and Production for Enterprises and Institutions**

##### **4.6.1 Advance Survey and Analysis, and Classified Management for Employees**

Classify and manage employees according to the status of electronic health codes, and organize employees with green health codes to return to work in an orderly manner. Persons with red or yellow health codes are temporarily suspended for work resumption. If an individual with red code, yellow code or no code is found, he or she should be reported to the community health service center in the jurisdiction area for nucleic acid test, and stay at home or centralized quarantine sites for 14 days' medical observation. Individuals with green code can return to work if body temperature test shows normal. Institutions are encouraged to strengthen health management for employees and provide nucleic acid testing for employees when necessary. Meanwhile, enterprises and institutions are required to implement the strategies of prevent external importation, keep abreast of employee turnover, and conduct health management of personnel from high-risk and medium-risk areas and overseas; individuals from low-risk area can go to work if the body temperature is tested to be normal, and no barriers should be set up and no quarantine should be requested before resumption.

##### **4.6.2 Temporary Medical Observation Point and Separate Quarantine Observation room**

Based on the actual situation, such as the number of employees and sites, a certain number of temporary medical observation points and separate quarantine observation rooms can be set up. Temporary medical observation points are used for re-testing the body temperature of employees whose initial temperature is equivalent to or higher than 37.3 ° C and staying of employees waiting to be sent away. Separate quarantine observation rooms are used for isolated observation of persons with fever and other symptoms but not necessary to be quarantined in the hospital.

##### **4.6.3 Strict Health Monitoring and Registration for Employees**

Each returning employee is required to truthfully register personal information such as recent personal travel history, contact history, physical health, etc., through the online reporting platform. Employers should carry out daily health monitoring and registration of all employees; designate a dedicated person to summarize the health status of employees every day, such as fever, dry cough, fatigue, and other symptoms suspected as COVID-19; report to the local disease control institution, and; guide suspected patients to local fever outpatient departments or designated hospital as required for further examination or other corresponding measures. All units should set up specific telephone numbers for suspicious symptom reporting, and employees should report to the unit in time when they have fever or respiratory symptoms.

#### **4.6.4 Staff Training**

Enterprises and institutions should clarify the responsibilities of epidemic prevention and control, and carry out knowledge training for personnel responsible for body temperature detection, preparation of disinfectant, and prevention and control knowledge publicity and education.

#### **4.6.5 Workplace Epidemic Prevention, Control and Management**

##### *Entrance and Exit Registration and Management in Factories*

Conduct temperature tests on employees entering and exiting the factory area, and transfer persons with abnormal body temperature immediately to the temporary quarantine area, and take corresponding measures according to relevant regulations. Strengthen the registration and management of external visitors, and minimize unnecessary entry of external visitors; if it is indeed necessary to enter the factory area, personal information such as institution, health status and contact history with persons from the epidemic area should be checked, and entrance is allowed only after the temperature test meets the requirements.

##### *Cleaning and Disinfection in Workplace*

Keep the working environment clean and hygienic, and disinfect regularly. Cleaning and disinfection for the surface of objects in the workplace shall be well carried out, and the surface of objects or components with high contact frequency such as operation buttons and handles should be disinfected regularly. For operation positions that gloves are allowed, employees should wear gloves as much as possible for operation.

##### *Ventilation in Workplace*

Ventilation in the workplace should be strengthened and indoor air circulation should be maintained. Natural ventilation is preferred when allowed, and mechanical ventilation is supplemented when natural ventilation cannot meet the requirements. For a factory workshop with mechanical ventilation, sufficient fresh air input should be ensured, and the amount of fresh air per capita should be over 30m<sup>3</sup> / h. If air conditioning is used, the air supply should be safe and sufficient, and all exhaust air should be discharged directly to the outdoor; the return air channel should be closed when air conditioning is not used. Air-conditioning system should be regularly cleaned and return air inlet filter should be disinfected.

#### **4.6.6 Prevention and Control of Epidemic in Public Areas**

##### *Gathering Activity Management*

In principle, the frequency and scale of meetings shall be controlled, meeting time shortened as much as possible. For meetings that must be convened in gathering, participants need to protect themselves. Promote the use of remote meeting such as video meeting, conference calls and other forms of online meetings.



### *Dining Requirements*

Enterprises and institutions with cafeterias must comply with the relevant national hygiene standards, provide hand-washing facilities and sterilize supplies for dining staff to wash their hands and disinfect, and disinfect cookware and tableware. For those do not have the conditions for disinfection, disposable tableware or personal tableware shall be prepared and used. Implement staggered and scattered dining, avoid sitting face-to-face and avoid talking with others. For counties (cities, districts) in high-risk for epidemic prevention and control, the dining hall for gathered dining shall be suspended.

### *Dormitory Management*

The number of occupants in staff dormitory should be strictly controlled, openable windows shall be set up, and regular ventilation provided. For dormitories with poor ventilation, mechanical ventilation equipment such as exhaust fans should be installed. The washroom should be equipped with a hand basin and disinfection supplies, and cleaned regularly.

## **4.6.7 Hygienic Requirements in Public Places**

### *Waste Collection and Processing*

Collect by category and clear in time. General waste should be put into black plastic bags, and masks and other protective equipment should be classified according to domestic waste sorting principles. Garbage cans and garbage collection points shall be well managed with no scattered waste around; all kinds of garbage in the garbage storage points shall be cleared and transported in time, and; the waste shall not be excessively piled up over time. Cleaning and Disinfection Garbage transfer trucks and garbage cans should be kept clean, and can be regularly disinfected by spraying or wiping with chlorine-containing disinfectant of 500mg / L effective chlorine; the walls and grounds of garbage sites should be kept clean and regularly sprayed with chlorine-containing disinfectant of 500mg / L.

### *Escalator and Elevator*

It is recommended to avoid taking an elevator as much as possible, and wear a mask when riding. The ground and side walls of the elevator should be kept clean and disinfected twice a day. Elevator buttons, escalator handrails and other frequently contacted parts should be disinfected at least 3 times a day.

### *Underground Parking*

The ground of the underground parking garage should be kept clean. Frequently contacted parts such as the parking card pick-up button should be disinfected at least 3 times a day.

### *Meeting Room, Office, and Multi-function Hall*

Office area shall be kept clean. It is recommended to ventilate 3 times a day for 20 to 30 minutes each time, and keep warm during ventilation.

### *Toilet*

Ventilation should be strengthened. The effect of water seal isolation devices such as wash basins and floor drains should be ensured. Sanitary cleaning shall be performed daily at any time, to keep the ground and walls clean, and no dirt on the sink, and no faecal dirt accumulation on the toilet. The surface of the object shall be disinfected using chlorine-containing disinfectant with 500 mg / L of effective chlorine to wipe the surface of objects, such as public countertops, hand washing sinks, door handles and sanitary wares, and wiped with clean water after 30 minutes.

#### **4.6.8 Instructions on Personal Protection for Employees**

Staff in offices, enterprises, institutions and factories and mining sites should prepare disposable masks with them. Masks can be taken off at home or outdoors, or places without people gathering and in a well-ventilated environment. Masks should be worn when in close contact with others, go to crowded places or have respiratory symptoms such as fever or cough. Before wearing the mask, keep hand hygiene, distinguish the front and back side of the mask, and cover the whole mouth and nose when wearing, and the press the metal strip on both sides of the nose with both hands to make the mask fit the face closely.

Strengthen hand hygiene, wash hands in time, especially after wearing and removing masks or changing filter cotton. When there are no hand-washing facilities available on site, no-wash disinfectants can be used for disinfection. Sneezing or coughing should be covered with paper towels, handkerchiefs, sleeves, etc.. It is promoted to have healthy lifestyles such as reasonable diet, moderate exercise, and regular timetable.

#### **4.7 Prevention and Control Measures for an Outbreak**

In case of infection during resumption of work and production, relevant treatment measures shall be carried out in a timely and effective manner in accordance with the requirements of the government authorities, with reference to the appendix Emergency Plan.

### *Sporadic Cases*

Once sporadic cases occur, the employer enters the special protection stage, and should enhance the monitoring and prevention efforts, cooperate with the disease control institution on search and management of close contacts, carry out terminal disinfection, and implement various prevention and control measures under the guidance of local health department. Based on the severity of the epidemic, temporarily close the workplace.

### *Two or more Clustered Cases within Two Weeks*

Corresponding control measures should be taken after the evaluation by epidemic prevention and control experts.

## Annex

### Case 1: Prevention of COVID-19 Pandemic in Sitai Community, Wuhan

#### *Brief Introduction of Sitai Community*

Sitai Community is located in the northwest of Hanyang District. It is south to the Hancui Highway, and north to Hanjiang River. It covers an area of 2.74 square kilometers, including four villages (Linjiatai, Shangzhaojiatai, Xiazhaojiatai, Tianjiatai) and an industrial park (Sitai Industrial Park). Its permanent population reaches 7,996 with 2,359 permanent residents (906 households) and 5,637 migrant workers.

#### *Specific Prevention Measures in Sitai Community*

- Establishing and Improving the Community-based Mechanism for Prevention and Control of the COVID-19 Pandemic
  - The local members of CPC, community officials, community enterprises and resident volunteers were jointly organized as a team to prevent and fight against the COVID-19 Pandemic, with a total of 97 people.
  - Given the layout of the community clusters and the population distribution, the community was divided into several parts based on the community grid to ensure that each part was well taken charge by one team member.
- Implementation of Prevention and Control by Refined Classification
  - Strengthening the management and control of community entrances and exits, and implementing 24-hour closed-off management. Residents were consciously isolated at home and were strictly prohibited from going out except for medical treatment. Outsiders are not allowed to enter the community without special reasons.
  - Preventing residents from gathering and cross-infection. It was not allowed to visit relatives and friends or gathering within the community; strictly control the stores inner the community, control the population flow within the store, and prevent crowd gathering.
  - Strictly preventing and controlling fever, confirmed patients, suspected patients, and close contacts of the "four categories of people". Once they were found, they were sent to hospitals and centralized isolation centers as soon as possible.
  - Protecting the vulnerable people in the community, organizing special personnel to procure and distribute materials for vulnerable groups such as the elderly, the disabled, one-to-one insurance, and providing 24-hour telephone or online consulting services to help them purchase their daily needs Materials and medicines; providing necessary home medical services for the elderly living alone or those with limited mobility.
- Ensuring Material Reserves of the Community
  - As for medical material reserves, the designated person took the responsibility for unified management and allocation the materials.
  - As for living material reserves, the community agency for Pandemic prevention and control actively contacted the merchants for supply. After the residents made the online order, the merchants would

- deliver the goods to the community, and the designated person from the above agency will deliver the goods to the residents. Meanwhile, daily material transaction in open squares were encouraged.
- As for prevention material reserves, the packages were distributed adequately to the community designated personnel, which includes surgical masks, protective suits, goggles, disinfectants, disinfection tools and other materials.
- Utilizing New Technologies for Releasing Pandemic Information
    - The Pandemic information was released timely, comprehensively and transparently. With the Internet, big data and other information technologies, the health QR code reporting of all residents in the community was well finished. The community conducted the resident information survey to collect names, addresses, lived units, and telephone numbers. Based on the dynamic data of the Pandemic, a special-temporal map of the community Pandemic prevention was established, which displayed the spatial distribution of the community Pandemic in real time and reminded the residents to avoid high-risk areas.
    - To provide life service information by means of informatization technologies, certain mobile phone apps have been specially developed for the community residents staying at home during the Pandemic. With the phone, people can know about the distribution and operation situations of the life service facilities nearby. And the information like medical treatment, transportation, resumption of labor, etc. was promptly released to establish a good communication channel.
    - Through various means such as visiting, notices, broadcasting, and WeChat publicity, knowledge promotion of the COVID-19 was carried out. The community actively promoted hygiene, persuaded the residents to eliminate bad habits, including littering and spitting.

### *Achievements*

By May 11, there has been no new COVID-19 cases in the Sitai Community for up to 90 days. There has been a total of 7 diagnosed people, 4 suspected and 1 with common fever. All of them have recovered after treatment. Basic life protection and personal Pandemic prevention for the vulnerable groups like the elderly, people living alone, people with chronic illnesses, and the disabled. The physical and psychological support and care were also effectively provided by the community staff. All vulnerable groups in the community have passed the high-risk period of the Pandemic safe and sound and gradually returned to their normal life. After lifting its lockdown and resuming working and production in Wuhan, the Sitai Community has kept performing well in normal prevention and control, strictly implementing the control of people returning from other cities in China and ensuring that the community people who have resumed working and production go in or out in an orderly manner. And there has been no rebound of the Pandemic so far.

## Case 2: Wuhan Living Room-Makeshift (Fangcang) Care Center

At the beginning of 2020, the COVID-19 Pandemic broke out in Wuhan, China. Due to the rapid spread of the virus, there had been a time when the hospital beds were inadequate for such a large number of patients. In order to solve the problem that "one bed was hard to find", the Wuhan Municipal Government decided to transform the Wuhan Living Room—Chinese Culture Expo Center into the first three Makeshift (Fangcang) Care Centers to treat the patients with mild symptoms.



Figure17. Exterior View of Wuhan Living Room

The building was originally an exhibition center of four halls A, B, C, and D. The three halls A, B, and C were converted into Makeshift (Fangcang) Care Centers. There are two squares on the north and south sides of the building. And the exhibition hall is divided into front part and back part. The layout design was based on the principle of "three areas and two channels" that the hospital for infectious disease requested. Based on the current situation, the south square was set as the clean area for the medical rescue team and the passage for the medical staff; the front exhibition hall was transformed into a semi-polluted area and a buffer zone to enter into the center; the back exhibition hall was set as the contaminated area of beds with its exit connected to the north square. The people and cars for patients coming and out, as well as patients transformation were through the back exhibition hall, so as to separate the cleaning area and pollution area.

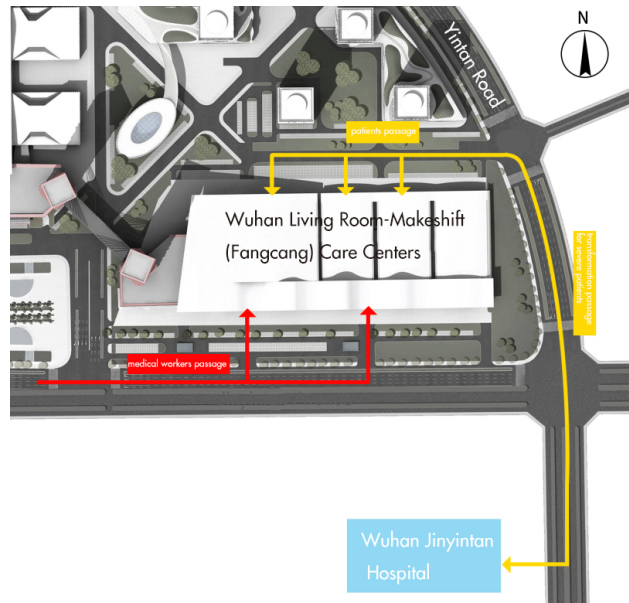


Figure 18. The General Layout of Wuhan Living Room

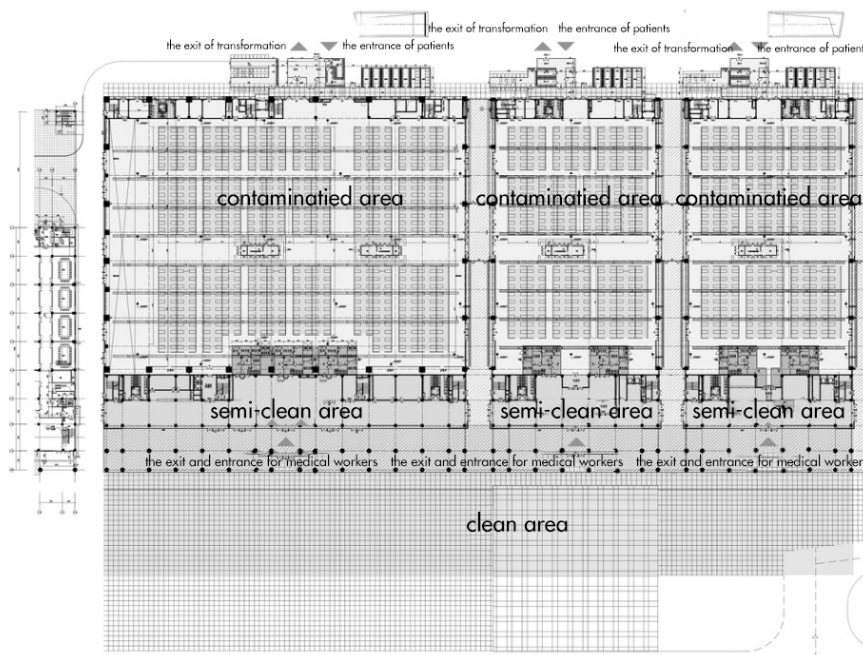


Figure 19. The Layout of Wuhan Living Room

In order to finalize the normal-emergency reconstruction quickly and efficiently, containers with the modular of 3mx6mx2.9m were used to form buffers zones, patient entrances, rest rooms and other rooms. And the bed area was separated by finished flame-retardant panels. The center was equipped with TVs, reading corners, etc. And a 10-meter-wide main passage was reserved as sports area for the patients and medical staff. A total of 1,461 beds were set up in the center, which once served 1,430 patients during the peak periods. After the center opened, the Wuhan Living Room has become a benchmark among all the makeshift care center for its

professional and human-centered design.



Figure 20. Panoramic View of the Bed Area



Figure 21. Medical Staff Working Area



Figure 22. Sports Area



Figure 23. Reading Corner

## Case 3 : Solution for Sewage Treatment of COVID-19 Care Center

### Xylem Flygt TOP Integrated Pumping Station

In the late January, 2020, when the COVID-19 spread in China, there's increasingly urgent need to establish the emergency treatment model of "Xiaotangshan Hospital" in various provinces and cities in China.

#### *Brief Introduction of the Hospital*

On January 26, the Health Bureau of Fuqing City, Fujian Province proposed to expand the new infectious disease areas in Fuqing City Hospital. As an emergency medical treatment area in Fuqing, the new hospital covers an area of 9,200 square meters with around 200 beds in plan. After completion, it would be used as a centralized treatment center for the COVID-19 patients in Fuqing City.

#### *Prevention Measures in the Hospital*

Novel coronavirus may be alive in the stools of a confirmed COVID-19 patient with the risk of fecal transmission. To respond to infectious diseases, especially those with the risk of fecal transmission, it must be pay attention to the sewage collection, treatment and discharge in hospital. Drainage systems of large general hospitals usually discharge sewage and wastewater into the sewage treatment stations, and into the municipal pipe network after reaching the standard. Based on the water pollutant discharge standards for medical institutions, the standard for sewage treatment from infectious disease medical institutions is much higher than from that required by the general medical institutions. Therefore, when responding to the emergencies such as the novel coronavirus, hospitals that treat patients as temporary centers need to temporarily adjust their sewage treatment facilities.

#### *The Urgent Need for an Integrated Pumping Station*

The expansion project of the Fuqing City Hospital should be completed in a very short time (1-2 weeks). Within three days, Xylem quickly worked out a mature solution—Flygt TOPGATETM integrated pumping station.

The medical sewage (waste) water in the new infectious disease area in the Fuqing City Hospital contained a lot of debris and particles. Therefore, not only should the pump have no blockage, but also keep 7×24 hours' full-speed operation. Flygt TOPGATETM integrated pumping station is equipped with automatic control and central control systems with the pre-alarm function, which can help prevent accidents. At the same time, the Flygt TOPGATETM N pump uses AdaptiveN® technology, which can prevent blocking and achieve sustainable low energy consumption. It has been proved that after the pump station was put into operation in the new infectious disease area of the Fuqing Hospital, it has been operating automatically, efficiently and safely with excellent anti-blocking performances. It has also enabled the centralized collection of the medical sewage (waste) water in the infectious disease area, and safely discharged it to the sewage treatment station to avoid secondary pollution of the surroundings of the hospital.



## Case 4: Population Mobility Monitoring Based on Big Data

Population Mobility Monitoring Based on Big Data is mainly used to detect the spatial trajectory of those infected people in the initial or final stage of the Pandemic, following up the potential close contact people to avoid further spread of the Pandemic. Tianjin COVID-19 Map System provides comprehensive information such as Pandemic maps (Pandemic situations in each district, patient trajectories, fever clinics, communities which has Pandemic and Pandemic situation nearby), Pandemic trends, infection relations, and population migration dynamics.

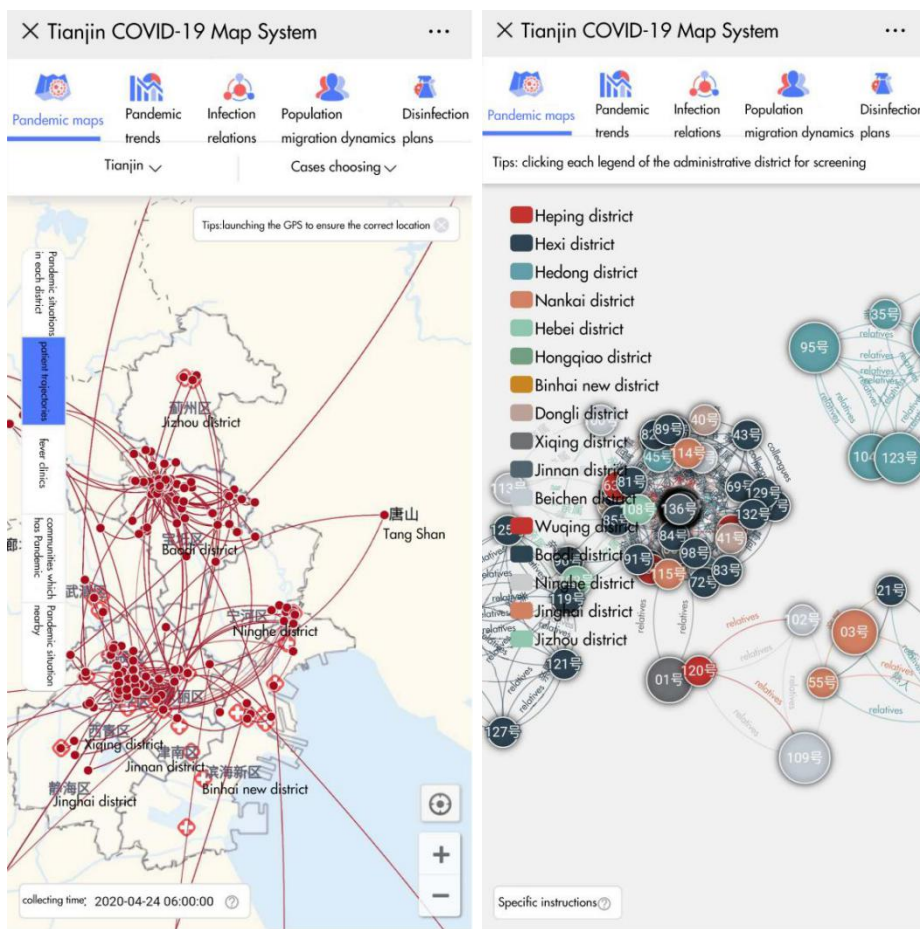


Figure 24. Population Mobility Monitoring in Tianjing, China

## Case 5: The Health QR Code

The health QR code is an important proof for going out for outdoor activities, taking public transportations, and entering into public service facilities and workplaces.

Despite the fact that Wuhan has lifted its lockdown, all the communities in Wuhan still implemented closed-off management. People must scan the Community Health QR code through the mobile APP (WeChat or Alipay), log in to the health QR code system, and present their own green Health QR Code. They have to mark their status of entering or going out of the community on the APP, and then get measured of their body temperature by the community management staff at the entrance of the community. Only when their body temperature is normal, can they go out of or enter the community.

Before entering the public places like shopping malls and railway stations, people also need to link their own green Health QR Code with their status of entering or going out in the same scanning way.



Figure 25. Application Scenario of the Health QR Code in Wuhan Railway Station

The Health QR Code is also an important proof for personnel management in the companies which have resumed working and production. For example, Wuhan University has developed a Health QR Code mini online APP named “Wuhan University Daily Safety” (referred to as “Wuda Health QR code”), which allows all the faculty and students (including the retired employees and hired staff) to complete personal health information reporting quickly. The "Wuda Health QR Code" has achieved the school's unified identity real-name authentication, and linked with the mini APP "Wuhan Zhanyi" and "Wuhan Health QR Code". In Wuhan University, teachers, students and other relevant people are required to perform daily health check-in. At the entrance of the campus, anyone has to scan the QR code, present the individual Health QR Code based on “Wuda Health QR Code”, and then pass the temperature measurement to enter the campus.



Figure 26. Wuhan University Health QR Code Mini APP

## Case 6: Pandemic Map

The Pandemic Map is mainly divided into Case Distribution Map, Map of Pandemic Management and Control Levels, and Medical Resource Distribution Map. Medical Resource Distribution Map can be generated through the mobile APP by directly loading medical resource information.

The World Health Organization collaborated with global scientific research institutions, governments and NGOs to provide Pandemic maps for the global residents and local residents by means of data visualization. For example, Johns Hopkins University has provided a global COVID-19 cases distribution map and data interface, which can help the residents to know about the global COVID-19 Pandemic developing trend effectively. Blue APP in China has provided the spatial distribution pattern of China's COVID-19 Pandemic at smaller scale. These Pandemic distribution maps can help local residents to make basic judgments on the development of the Pandemic.

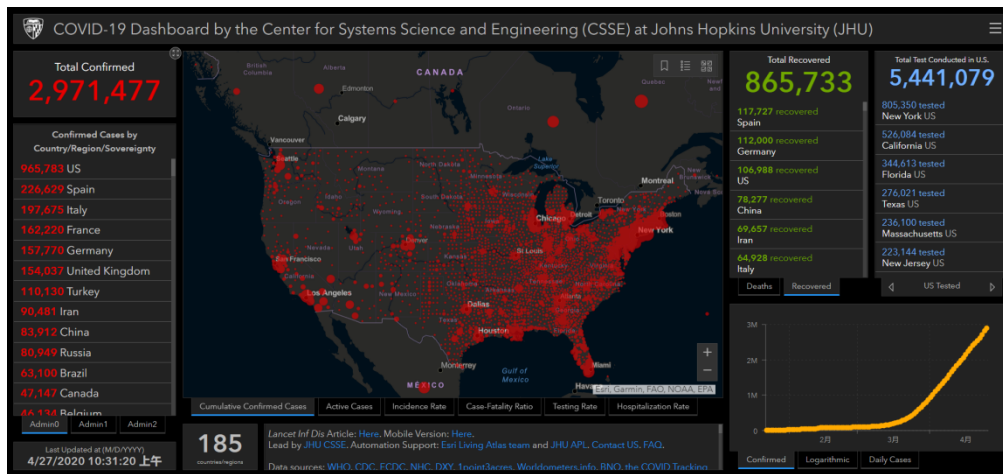


Figure 27. The Global COVID-19 Case Distribution Map by Johns Hopkins University

As for Pandemic risk control, China has divided all the cities and towns into three risk levels. In high-risk and medium-risk areas, population mobility control measures must be implemented strictly, while in low-risk areas, relatively limit population mobility is allowed. For example, according to the risk rating map of cities and towns in Hubei Province on March 3, in the high-risk areas and medium-risk areas dominated by Wuhan “1+8 metropolitan areas”, strict regional closure measures will continue to be implemented, and residents may get certain restrictions when going out. While other low-risk areas in green can lift their lockdowns. Residents can go out when necessary protection and prevention measures are taken. But in public places, population flow still needs to be limited.

Wuhan conducts level control on the activities of community residents according to the distribution map of neighborhoods without Pandemics. Residents of those neighborhoods can move freely within the neighborhoods, but residents of other neighborhoods are still asked to conduct indoor activities only. The government has provided a cash reward of 100 thousand yuan to the neighborhoods without Pandemics, encouraging them to conduct self-organized risk management and control more effectively.

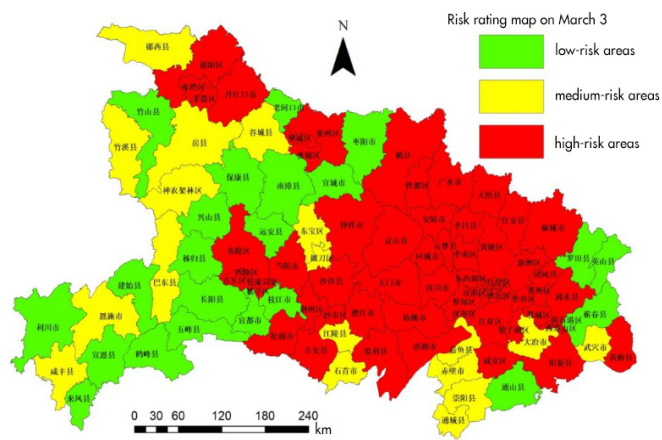
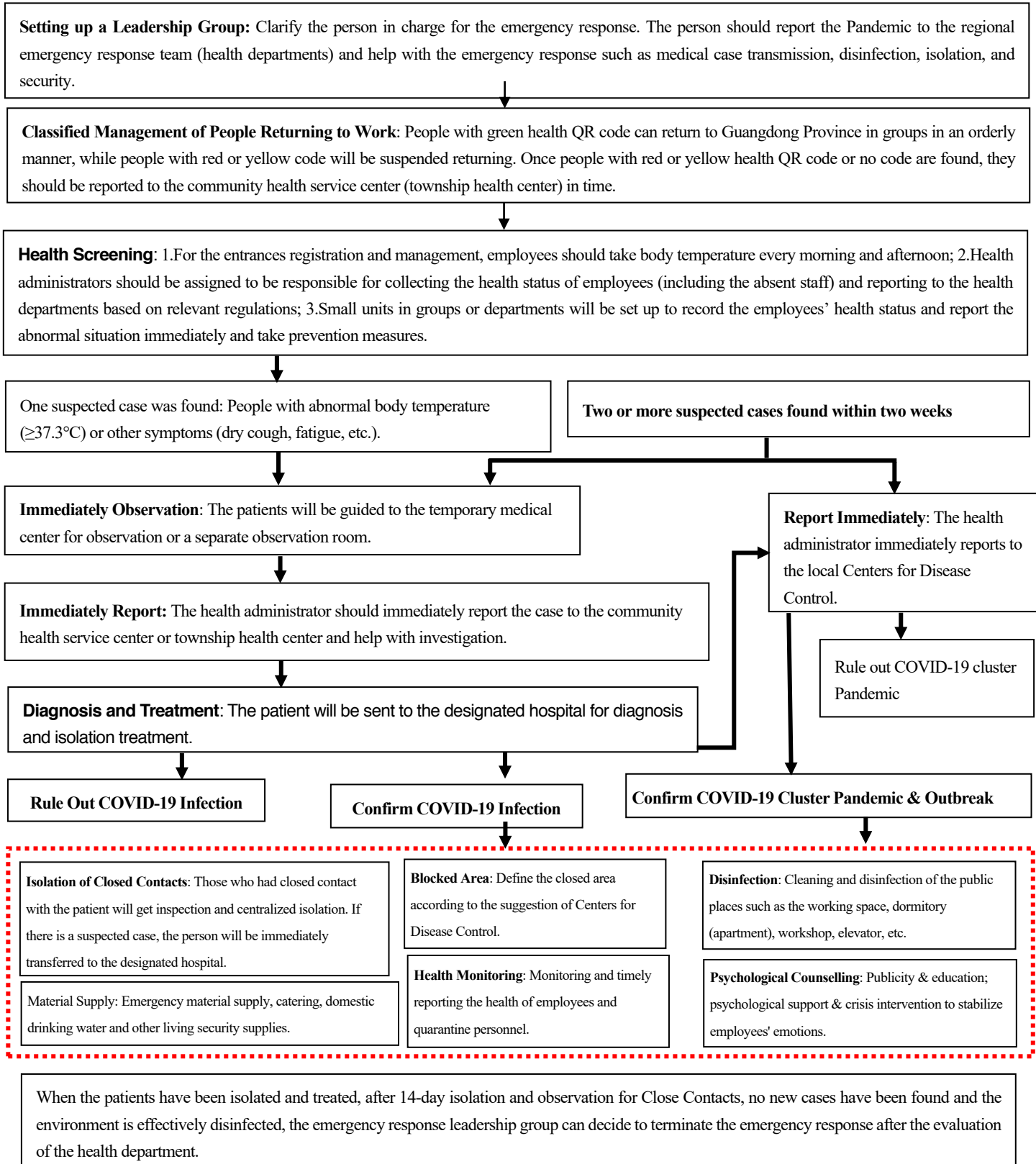


Figure 28. Maps of Pandemic Risk Control of Hubei Province and Wuhan

# Case 7 : Flow Chart of Emergency Response to COVID-19

## Flow Chart of Emergency Response to COVID-19 in Factories, Government Departments, Enterprises and Public Institutions in Guangdong Province



## Case 8 : Consumption Coupons

During the Pandemic, many countries have adopted the policy of directly distributing cashes to ease economic pressure. For example, the United States has launched an emergency rescue plan due to the Pandemic, who distributing \$1,200 per person to low-income and middle-income residents. Canada has announced a rescue plan of 107 billion Canadian dollars, distributing 2,000 Canadian dollars a month to each unemployed person. The UK has directly subsidized 80% of their wages to the people who cannot work because of the Pandemic. In China, based on the national conditions and the storage habits of the public, since the outbreak of the Pandemic, 28 provinces and over 170 cities and prefectures have coordinated the local governmental and social funds and have cumulatively issued consumption coupons to the public which value are more than 2.71 billion US Dollars.

Consumption coupons are one of the tools to economic stimulus policies. When the economic downturn leads to a sharp decline in the public consumption capacity, the governments or enterprises issue consumption coupons to the people as payment vouchers for future consumption. It's expected to revitalize consuming activities by increasing people's purchasing power and consumption desire, and even further driving the activities like production and investment to accelerate the economic recovery. During the special periods such as the financial crisis, consumption coupons have gradually become one of the important means to promote sales and ensure economic growth. Although the consumption coupons are aimed at promoting the consumption, it can also be used as the social relief tool.

The consumption coupons have significant effects in stimulating consumption and boosting the economy. From May 1st to May 3rd, the consumption coupon issuing area of Guangdong Province drove a total of 72 million US dollars in consumption, and driving consumption up to 11 times. In Bao'an District, Futian District, Guangming District, Longgang District, Longhua District, Luohu District, Nanshan District and Pingshan District in Shenzhen, consumption coupons have driven a local consumption of 37 million US Dollars. And in Wuhan, consumption coupons have driven 8.28 million UN dollars in three days, driving consumption by more than 12 times.

In some areas, consumption coupons have been issued to the families in need and the low-income groups to guarantee their daily lives. In addition, the issuance of consumption coupons has helped the industries which have been severely affected by the Pandemic, such as the catering and retail businesses. It has significantly led to more customers and practical incomes for those enterprises, and has played an important role in stabilizing the development of the enterprises and industries.



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