

Enhancing Transport Policy Framework to Address Impacts of Pandemics in Southeast Asia: The Case of the Philippines

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Abstract: Many economies, notably in Southeast Asia, were unprepared when COVID-19 pandemic hit them. The subsequent lockdowns resulted to virtually total disruption of the movements of commodities and people, which eventually led to economic slowdown. This paper, based on a separate report prepared by the authors, aimed at formulating a more responsive framework to guide the intermodal transportation systems, focused on supply chain and logistics, to address the impacts of pandemics such as COVID-19, while maintaining an efficient level of service of the transport systems. The paper relied heavily on current activities of the authors in providing technical inputs to government agencies and business organizations on how to address impacts of COVID-19 to transportation systems in the Philippines. The paper argued that improving the transport policy framework can be achieved by incorporating intervening measures on critical infrastructure, disruptive technologies, and resiliency to better mitigate the negative impacts of future pandemics.

Keywords: COVID-19, transport policy, intermodal logistics, critical infrastructure, humanitarian logistics, disruptive technologies

1. INTRODUCTION

As in other countries in Southeast Asia, the Philippines immediately came up with its own measures to contain the spread of the COVID-19 (herein referred to as C-19) pandemic when it hit the country in March 2020. The imposition of enhanced community quarantine (ECQ) on 16 March 2020 in combatting the increasing C-19 cases in the country, notably in the Greater Capital Region (GCR), resulted to strict movement of people and commodities and even suspension of public transport systems. This was further aggravated by respective measures implemented by local government units (LGUs), which also curtailed supply chain and logistics operations traversing their areas. Overall, this negatively affected economic activities in the country. More importantly, it also slowed down the response to last mile operations for humanitarian logistics such as delivery of basic commodities and medical equipment (e.g., personal protective equipment and medicines) during the pandemic period.

As the C-19 crisis continues to date, the brunt to economy is being felt by all stakeholders of society: government, business groups, and consumers. The government has to come up with a collaborative and whole-of-society approach that involves all stakeholders from planning to implementation to avert both the health crisis and economic. The LGUs are in a dilemma too on what to do. The private sector is also urgently seeking means to minimize the C-19 impacts in terms of health and economic costs, especially to their workers. In situation of pandemics and natural disasters (e.g., typhoons, heavy flooding, earthquake), the importance of an intermodal transportation network system in supporting the economy and ensuring humanitarian logistics operations becomes more apparent.

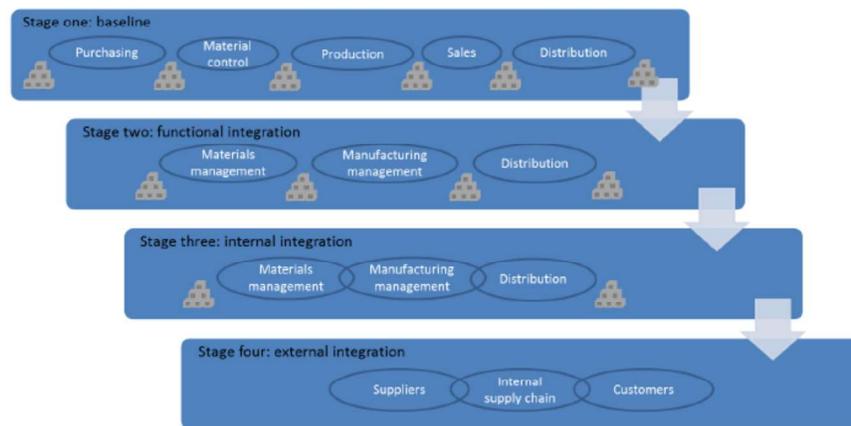
Current practices show that most of the strategies and programs are focused on supply chain for physical distribution during normal conditions and humanitarian logistics in times of natural disasters. Granted in humanitarian logistics literature operations during pandemic situations are mentioned, still not much emphasis was given to transportation approaches during the pandemic situations, which arguably require different requirements. Apart from this, it is also important to look at the supply chain to ensure gradual resumption of a *new normal state of activities, including strategic stockpiling*. Similarly, it is also worth considering how to formulate more responsive strategies that will both lessen the adverse impacts of the pandemics and ensure efficient level of service (LOS) of the intermodal transport systems like in the present case of C-19 crisis.

This paper will attempt to offer suggestions on how to address the impacts of C-19 on the intermodal logistics network system and supply chain in general. This paper is largely based on the study, in which the authors were part of, prepared by University of the Philippines Public Administration Research and Extension Services Foundation, Inc. (UPPAF) Regulatory Reform Support Program for National Development (RESPOND) that investigated how the pandemic impact the supply chain and logistics systems and recommended measures to improve the efficiency of the LOS of the transport systems during the time of pandemic. Furthermore, the paper relied heavily on current activities of the authors in term of providing technical inputs to government agencies and business organizations on how to address impact of COVID-19 to transportation systems in the Philippines. The paper is conceptual in nature and hopes to inspire more technical studies in the future once more data become available and accessible.

2. BRIEF OVERVIEW OF SUPPLY CHAIN SYSTEMS

In the context of transportation and supply chain systems, the main intention is to ensure the smooth and seamless movement of commodities and services from the sources to the end users, regardless if the movement serves economic/business or humanitarian purposes. The main differences between these systems are the end users and whether these systems operate for profit or not. On the other hand, for the humanitarian purposes, there are costs that are not defined, such as the employment of the military in the supply chain operations and the involvement of the government, civil societies and the LGUs. The government's role in this regard is primarily to provide the intermodal logistics network system's facilities, such as the roads, airports, ports, and to ensure fair play in the operation through regulatory and enforcement powers.

According to Applied Humanitarian Logistics Management, under the Certificate in Applied Humanitarian Logistics Management (CAHLM), the evolution of logistics and supply chain management can be traced back to military conflicts when the ability to mobilize personnel and material was critical to the outcome of the war. This then led to its applications to business and up to the 1060s, the center of all activities was in production for supply-driven markets. Eventually up to the 1980s, markets became more demand driven, sales and marketing then considered most important business units. This resulted to growing competition and increasing market requirements. This further led to supply chain and logistics management being recognized as a key competitive advantage for companies.

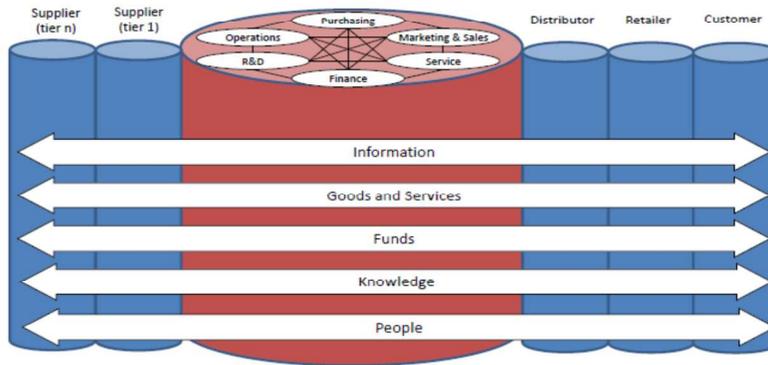


Source: Christopher 2005, as cited in CAHLM, Kuehne Foundation, NUS The Logistics Institute Asia Pacific, SIMM, Humanitarian Logistics-Asia Pacific Training Materials, 2014

Figure 1. Supply Chain Evolution

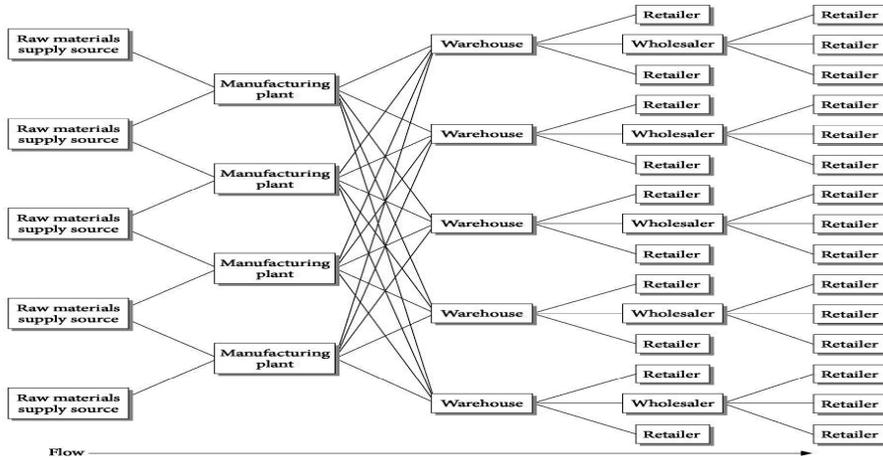
Looking at Figure 1, Supply Chain Management (SCM) is defined as the process that involves the “planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities” (CAHLM 2014). A more important note is that SCM includes coordination and collaboration with channel partners (suppliers, intermediaries, third-party service providers, and customers); and as such SCM combines supply and demand management within and across companies. Given this definition, from commercial point of view, supply chain is shown as in Figure 2 (below) while a typical commercial logistics network is illustrated in Figure 3 (below).

Looking at the commercial definition of logistics and SCM, the challenge is how a balance between the requirements of business and/or economic activities in the context of a natural disaster can be achieved? A number of studies and initiatives was done in this regard where the intention is to minimize the impacts of said disasters, such as typhoon, earthquakes, or climate change-related, to the business activities and ensuring immediate return to economic normalcy. This led to the evolution of humanitarian logistics, wherein the main goal is not to only immediate return to normalcy but also for humanitarian assistance. The humanitarian assistance is manifested through aid ensuring saving lives and alleviating sufferings of a crisis affect population based on the very notion of humanitarian principles of humanity, impartiality and neutrality.



Source: Adopted from Supply Chain Management Institute, as cited in CAHLM, Kuehne Foundation, NUS The Logistics Institute Asia Pacific, SIMM, Humanitarian Logistics-Asia Pacific Training Materials, 2014

Figure 2. Commercial Supply Chain

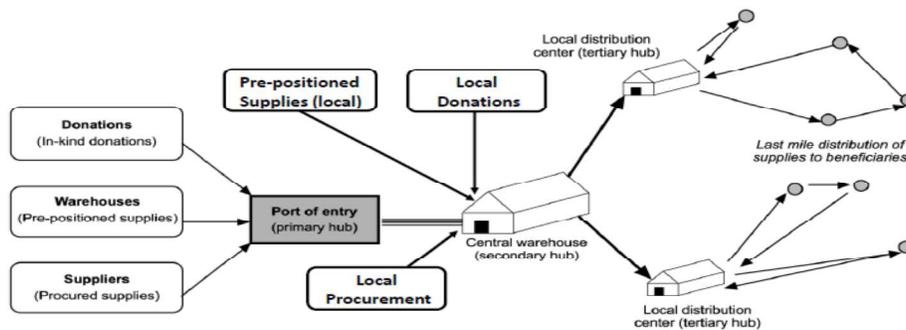


Source: CAHLM, Kuehne Foundation, NUS The Logistics Institute Asia Pacific, SIMM, Humanitarian Logistics-Asia Pacific Training Materials, 2014

Figure 3. A Typical Commercial Logistics Channel

Based on the preceding discussions, humanitarian logistics can be defined as the process of “planning, implementing and controlling the efficient, cost-effective flow and storage of goods and materials, as well as related information, from the point of origin to the point of consumption for the purpose of alleviating sufferings of vulnerable people” (CAHLM 2014). Notably, this definition follows a similar process of commercial logistics and SCM, from range of activities – preparedness, planning, transport, warehousing, tracking and tracing, and customs clearance. The main difference lies on the products being processed, which are humanitarian logistics focused on relief items from point of origin to place of final distribution.

Figure 4 (below) shows the distinct features of a humanitarian supply chain and logistics. It illustrated primary and secondary hubs for goods meant for donations and not for commercial purposes. It also highlighted the importance of last mile distribution of supplies to the beneficiaries.



Source: Modified from the figure in UNDP Disaster Management Training Programme, Logistics Module 1st Ed., as cited in CAHLM, Kuehne Foundation, NUS The Logistics Institute Asia Pacific, SIMM, Humanitarian Logistics-Asia Pacific Training Materials, 2014

Figure 4. Humanitarian Logistics and Supply Chain

At the outset, Figure 4 shows that humanitarian logistics and supply chain is simpler than the commercial one. The complexity, however, lies on the fact that supply and distribution should be during and immediately after a disaster or crisis. This is evident in the last mile operation or distribution. Another factor for consideration in this regard is how to handle debris management, transport of survivors, especially those needing medical assistance, and clearing of cadavers. Debris management handling is also critical for commercial logistics and supply chain to ensure immediate return to business/economic normalcy.

Table 1 (below), on the other hand, highlights the major differences between commercial and humanitarian supply chain systems. The commercial supply chain is a straight forward well-defined network and follows a systematic process from the goal to final distribution of the goods and commodities. In contrast, several uncertainties are embedded in the humanitarian supply chain.

	Humanitarian Logistics (Development Projects & Emergency Response)	Commercial Logistics (Most industries)
Ultimate Goal	<ul style="list-style-type: none"> • Saving lives and alleviate suffering 	<ul style="list-style-type: none"> • Maximizing profit • Optimization of resource utility
Customer	<ul style="list-style-type: none"> • Beneficiary is consuming • Donors are paying 	<ul style="list-style-type: none"> • Consumer is paying
Stakeholder	<ul style="list-style-type: none"> • Multiple stakeholders like donors, Governments etc with different interests 	<ul style="list-style-type: none"> • Typically more homogenous with common goals
Investments/ Capacity Building	<ul style="list-style-type: none"> • Depends on donor support which is hard to get prior to disaster has happened 	<ul style="list-style-type: none"> • Clear investment/innovation strategies
Information systems	<ul style="list-style-type: none"> • Often weak or not adequate • Many different systems in place 	<ul style="list-style-type: none"> • Proper information technology seen as key for success in almost every sector
Environment	<ul style="list-style-type: none"> • Uncertain (political, health, environmental social stability) 	<ul style="list-style-type: none"> • Collaborative and Integrated in most situations for the benefit of economic development
Human Resource Management	<ul style="list-style-type: none"> • Lack of experienced professionals and staff development paths 	<ul style="list-style-type: none"> • Highly experienced professionals

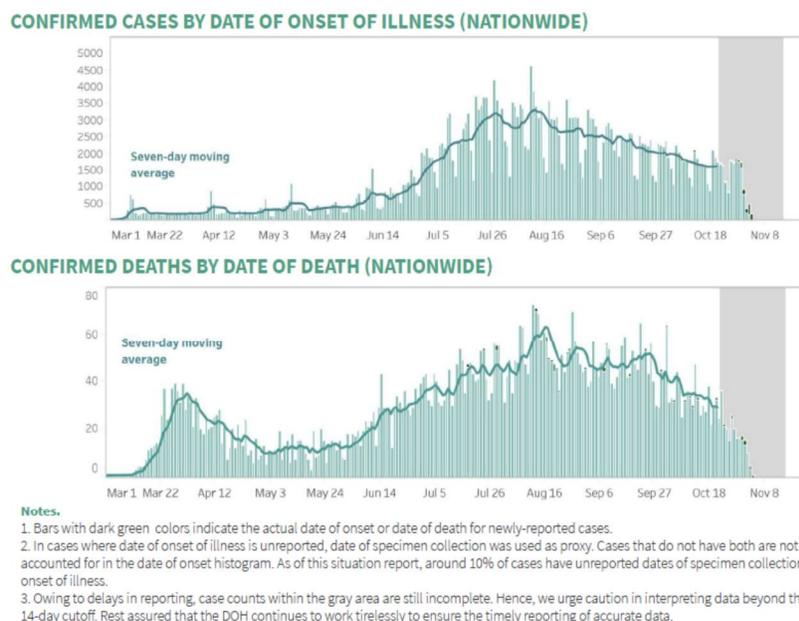
Source: CAHLM, Kuehne Foundation, NUS The Logistics Institute Asia Pacific, SIMM, Humanitarian Logistics-Asia Pacific Training Materials, 2014

Table 1. Commercial Supply Chain Vs. Humanitarian Supply Chain

Given this brief background on the differences between commercial and humanitarian supply chain systems, it is crucial to provide a balance between the two supply chains and how they can complement each other. While this is clear for natural disasters and crises, pandemics may need a deeper approach. Pandemics may require different understanding and approach on how to ensure commercial supply chain and logistics will be normalized (or have some sense of it) and at the same time address humanitarian supply chain during such times. During pandemics, it must be emphasized that efficiency and effectiveness for commercial supply chain will not fully be met. Similarly, humanitarian logistics may require additional concerns given the vulnerability of populations during pandemics.

3. THE COVID-19 SITUATION IN THE PHILIPPINES

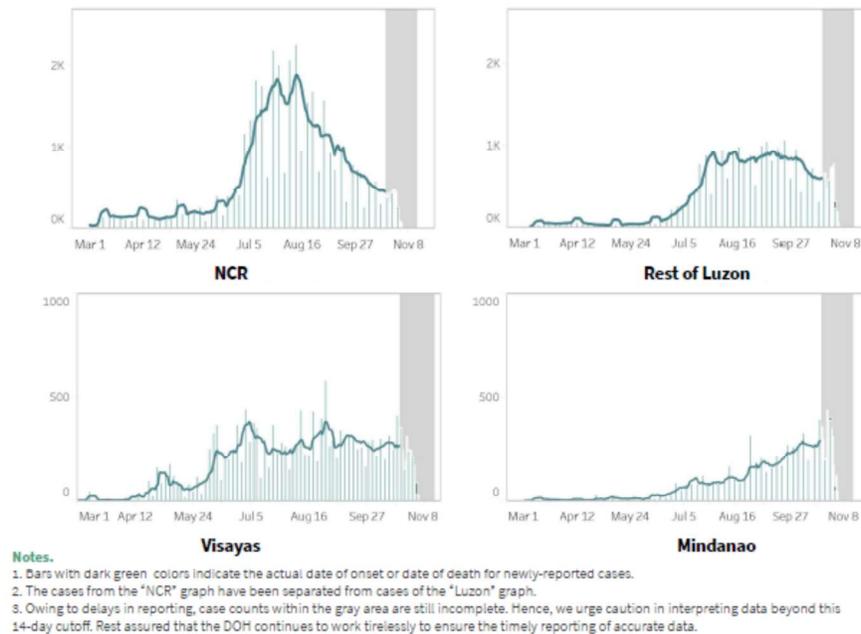
Based on the information posted by Department of Health (DOH) on C-19 Philippine Situationer, the number of active cases recorded as of 06 November 2020 was 32,773, of which 27,199 (83.0%) were showing *mild symptoms* and those in *critical conditions* were 1,454 (4.4%). Looking at these numbers, it can be observed that there is an encouraging sign of flattening the curve or showing a decline in the number of cases. In Figure 5 (below), it can be deduced that the peak of the pandemic was observed on July and August 2020. One possible factor that can be attributed to this was the high number of testing in these months. However, an encouraging note of this observation was that the necessary protocols for addressing the pandemic, including the facilities needed, were put in place accordingly. Similarly, the reporting system of the DOH has since improved and indeed, to some extent, the true picture of the situation can now be observed. Further to this, the various institutions that utilized data from DOH, notably a group in UP Diliman, were able to come up with their sound estimations and were able to provide responsive and plausible recommendations.



Source: DOH COVID-19 Philippine Situationer, 06 November 2020

Figure 5. Confirmed Cases of COVID-19 Cases, including deaths

The DOH C-19 Philippine Situationer further disaggregated its data by region and area, as shown in Figure 6 (below). For illustration purposes, the National Capital Region (NCR), which is the country’s center of economic and political activities, was segregated from Luzon, for comparative purposes. The NCR showed a striking declining number of cases, whereas the rest of Luzon posted no significant change from July to September 2020, but indicated a gradual decreasing trend. Visayas, on the other hand, had shown no major variations and it may indicate no improvements at all. As for Mindanao, at the early months of the pandemic until July 2020, there was no significant increase; unfortunately after July 2020, a sharp increase was observed in this region, which continued up to October 2020.



Source: DOH COVID-19 Philippine Situationer, 06 November 2020

Figure 6. Confirmed COVID-19 Cases, by Major Groups of Island

The observations indicated that stricter protocols and massive information dissemination are needed for Visayas and Mindanao, especially for the latter given the recent uptick on number of C-19 cases. As for NCR and the rest of Luzon, vigilance in maintaining the decline in the trend is needed.

Based on the DOH C-19 Philippine Situationer, the top regions by active cases and top regions by new cases are shown in Tables 2 and 3 (below). It can be surmised from these two tables that regions with highly urbanized areas also showed high number of active cases and even new cases. Furthermore, it can be mentioned that the concentration of industries, including the services sector, are also in these regions, particularly in NCR and its environs. This is important in assessing and understanding how the pandemic affects the supply chain and logistics system. As will be elaborated later, the implications are in the planning and operations of facilities related to supply chain and logistics.

Table 2. Top Regions by Active Cases

NCR	9,744
Region IV-A: CALABARZON	6,208
Region III: Central Luzon	2,925
Region VI: Western Visayas	2,456
Region XI: Davao Region	1,824
CAR	1,554
Region X: Northern Mindanao	1,249
Region VII: Central Visayas	972
Region IX: Zamboanga Peninsula	950
Region XII: SOCCSKSARGEN	906

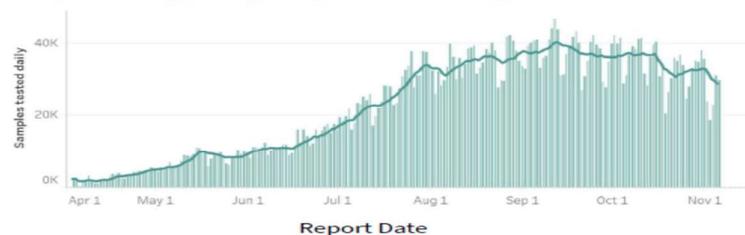
Table 3. Top Regions by New Cases

NCR	573
Region IV-A: CALABARZON	299
Region III: Central Luzon	137
Region XI: Davao Region	136
Region VI: Western Visayas	102
Region VIII: Eastern Visayas	64
Region X: Northern Mindanao	53
Region XII: SOCCSKSARGEN	42
Region IX: Zamboanga Peninsula	35
Region I: Ilocos Region	29

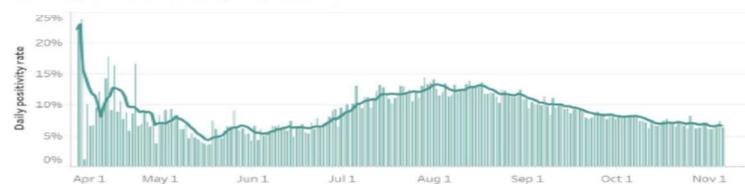
Source: DOH COVID-19 Philippine Situationer, 06 November 2020

Figure 7 (below) indicated that the massive testing, both by government and private sector facilities that presumably began in July 2020, contributed to the increase in the number of cases being reported. Understandably, given this surge, the government, supported by other institutions, was able to expand the required facilities and treatments to mitigate the spread of the pandemic. The protocols were even enhanced and proper planning and actions become more efficient as well. It can be further noted that other countries seemed to have followed what the Philippines have been doing since the start to contain the pandemic and sustain its actions.

Daily Testing Output (Nationwide)



Daily Positivity Rate

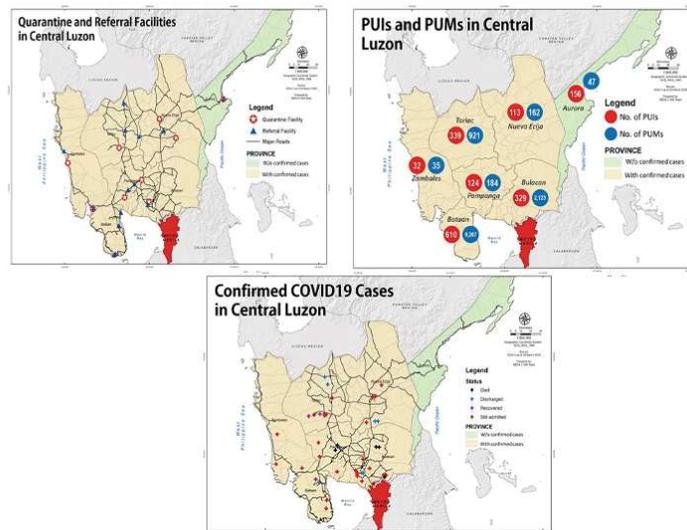


Source: DOH COVID-19 Philippine Situationer, 06 November 2020

Figure 7. COVID-19 Testing Statistics

Figure 8 (below) shows how the supply chain and logistics for both economic activities and humanitarian logistics can be assessed. The proximity of the facilities to the road network and the locations of the C-19 cases may show how to locate the warehouses for both commercial and humanitarian supply chain. The actual routes for Region 3 (Central Luzon) and the desired routes for goods movements during the phases of the community quarantine can be also traced in the same figure. With data on Origin-Destination (O-D), a better picture

of the supply chain and logistics networks and corresponding transport infrastructure such as seaports, airports, national roads, and power and water supply can be further be enhanced.



Source: National Economic and Development Authority Region 3

Figure 8. Location of Facilities and COVID-19 Cases in Central Luzon as of 13 April 2020

Another factor that needs to be considered in the supply chain and logistics sector during the pandemics is Information and Communication Technology (ICT). The advent of disruptive innovations and Intelligent Transport Systems (ITS), concepts such as 3rd Party logistics, 4th Party logistics, and Smart City technologies will play significant roles in the logistics and supply chain for both economic activities and pandemic situations. These technologies will contribute in meeting the requirements for immediate return to normalcy and will also facilitate establishment of pandemic protocols in business transactions and seamless flow of commodities and goods. Current manifestations of use of disruptive technologies in support of supply chain and logistics during the C-19 crisis are online delivery of essential food and medicines, cashless transactions using mobile applications, monitoring of bottlenecks through the use of dashboard (e.g., Supply Chain Analytics Dashboard).

4. ISSUES AND CONCERNS DUE TO IMPACTS OF COVID-19 ON SUPPLY CHAIN AND LOGISTICS

As mentioned above, the C-19 has significantly hampered the supply chain operations of commodities (especially essential food and medicines) and person trips, especially in urban areas. The setting-up of checkpoints and policy restrictions resulted to delays in the delivery of such commodities. Likewise, air, maritime and land traffic were put on hold. Major critical infrastructure namely seaports, airports, and land transport terminals were also closed during the lockdowns. These critical infrastructures are defined as infrastructure systems and facilities that support economic activities through the provision of seamless intermodal logistics network systems and need to be climate change resilient to immediately be functional after any climate change events to ensure sense of normalcy/stability, connectivity,

continued movement of people and goods and provision of basic goods to communities in times of calamities.

The imposition of safety protocols led to the long queues at entry points in major urban areas. Public transport services and operations were put on hold that resulted practically to total shutdown of transport systems. The intention was not being questioned because this was implemented to contain the spread of the C-19. Movements of people were limited to essential travels, and mobility restrictions on the youth and senior citizens were likewise imposed. Though these were justified, however, economic activities were severely affected. A significant number of establishments, from services to commercial and trade, among others, were closed. Bankruptcy fears for many establishments were felt during this time.

During the lockdown, the government, through the LGUs, treated the provision of relief goods like that of natural disasters. Canned goods and rice, among others were distributed. During natural disasters, such as typhoons or earthquakes, distribution of canned goods is understandable since people cannot easily move around. However, it was eventually realized that in pandemics, this may not be appropriate. Hence, the government introduced the provision of monetary aid and allowing basic goods to be sold at neighborhoods. This was eventually found to be a better approach. Through this supply chain and logistics operations gradually resumed. This is worth looking at and see how the supply chain and logistics processes can be further enhanced.

The natural calamities, such as typhoons, that the country experienced, particularly in Luzon, amidst the pandemic showed the need to strengthen humanitarian logistics to address twin concerns at the same time. The government had to respond to the twin impacts of natural calamities and spread of the C-19. This was highly evident in the configuration of the evacuation centers and in last mile response.

Particular to supply chain and physical distribution, another relevant issue is the impact of the pandemic on hubs and warehouses. Safety protocols should be implemented in these hubs and warehouses, not only for the usual safety and cleanliness, but more importantly for containing spread of C-19. Related to this, the location of industries and warehouses, especially in the context of land use and transport interactions, should be also reconsidered.

The imposition of safety protocols to contain the pandemic has significant cost implications for supply chain and physical distribution operations and management, even in commercial establishments and public transport services. There is now a need to incorporate this in the planning of projects and programs. Finally, it is imperative that an overall transport policy framework is able to provide guidance in coming up with more responsive strategies to address the impacts of pandemics, such as the C-19.

5. SUPPLY CHAIN AND LOGISTICS IMPROVEMENTS TO ADDRESS IMPACTS OF COVID-19

5.1 The Proposed Transport Planning Policy Framework

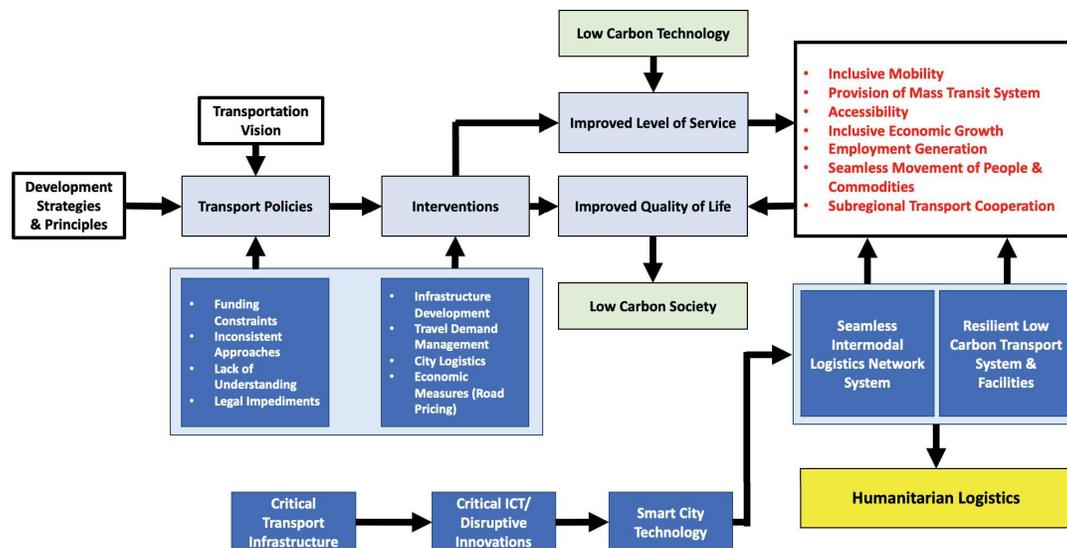
The previous section discussed a number of issues and concerns brought about by the C-19 pandemic, particularly in the daily activities of people, supply chain and intermodal logistics

network systems, and economy as a whole. The issues presented ranges from how the lockdown to contain the spread of C-19 impacted these normal activities to how the measures and initiatives were planned and implemented to minimize the impacts of C-19. Given this note, it is important that the transport policy framework should be reviewed and incorporate more responsive strategies to address the impacts of both the current pandemic and succeeding ones, should there be.

In summary, the following were the main issues and concerns identified by the authors:

- a) Addressing impacts of C-19 on supply chain and logistics operations and management and physical distribution;
- b) Humanitarian concerns such as last mile operations, evacuation centers, protocols;
- c) Distribution of relief goods and evacuation of victims;
- d) Addressing economic analyses of C-19 (viability gap, subsidy, etc.); and
- e) Impacts C-19 on location of industries and land use concerns

These issues are inter-related and addressing them may require multiple approaches. In coming up with the strategies and corresponding transport and logistics initiatives, it is essential that the transport policy framework be examined. Prior to the pandemic, the proposed transport policy framework, based on the revised National Transport Policy Framework (NTPF), was anchored on ensuring that provision of higher levels of the quality of life (QoL) of the people and the preservation and conservation of the environment. Figure 9 (below) illustrates the said transport policy framework. The proposed framework was in consideration of attaining low carbon emission and hence address climate change. Similarly, the proposed framework intends to highlight the need to incorporate humanitarian logistics in improving disaster risk reduction and management (DRRM) to make the infrastructure more resilient. However, resiliency is not enough to meet the transport policy framework objectives. For this purpose, building or strengthening of critical infrastructure such as seaports, airports, and national roads, development is also highly recommended.

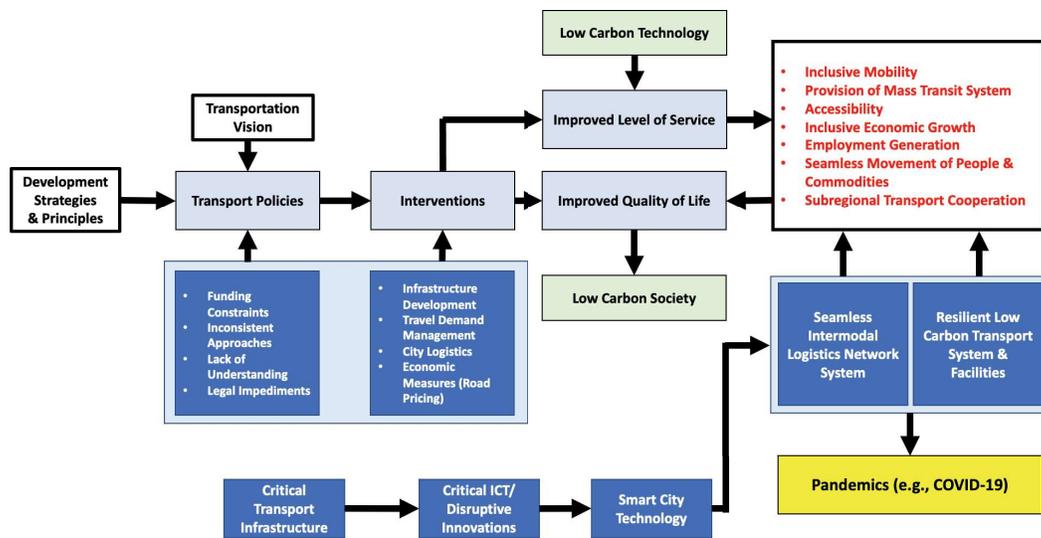


Source: Authors (adopted from various sources)

Figure 9 Proposed Transport Policy Framework

However, with the outbreak of C-19 pandemic globally, economies were caught offhand. As already mentioned elsewhere in this report, the supply chain and intermodal logistics network systems of most countries were not prepared to respond to the pandemic. The pandemic made transport policymakers and planners to rethink and reorient their strategies. As the economies gradually came up with their initiatives to minimize if not address the impacts of the pandemic to their transport systems, new norms are being introduced or re-introduced.

Disruptive innovations, as a result of ICT developments, led to 4th party logistics and ICT applications on business and logistics activities. These innovations can now be considered as vital in coming up with more responsive and advanced approaches in improving the LOS of the intermodal transport systems to meet the requirements of supply chain and intermodal logistics amidst the pandemic and the gradual (and eventual) return to economic normalcy. Hence, there is a need to include in the transport policy framework these disruptive innovations. Among the technologies that were being utilized especially during the pandemic are applications supporting C-19 contract tracing (e.g., StaySafe) and vaccine information management system (VIMS); and mobile applications supporting food deliveries (e.g., Grab, Food Panda), cashless transactions (e.g., PayMaya, GCash), and e-commerce (e.g., Lazada, Shopee).



Source: Authors (adopted from various sources)

Figure 10 Proposed New Transport Policy Framework

Figure 10 (above) highlighted the key elements in enhancing the supply chain and intermodal logistics network systems to meet the requirements for seamless intermodal logistics, resilient low carbon transport systems and facilities, and now humanitarian logistics and addressing pandemics are ICT/disruptive innovations, smart cities, and critical transport infrastructure

These interrelated ingredients are essential in ensuring that the impacts of the pandemic on the economy and in particular on the supply chain and intermodal logistics are minimized or averted. ICT led to the development of disruptive innovations that totally changed the landscape of economic or business activities and significantly improved the LOS of the transportation system and data requirements and managements of the intermodal logistics

network system. The latter are crucial in supply chain and physical distribution. Such concepts as Internet of Things (IoT), ITS, and big data among others led to the introduction of 4th Party Logistics, a key factor for the success of e-commerce, online business transactions and attaining seamless intermodal logistics network systems. The predecessor of these was the 3rd Party Logistics that greatly improved supply chain operations and management, apart from enhancing business and trade transactions and activities.

Prior to the pandemic, the above-mentioned concepts were mostly related to improving the intermodal logistics network systems and in contributing to the reduction of carbon emission and eventually addressing or minimizing impacts of climate change. Similarly, these concepts also hastened the development of smart city technologies that basically combined urban planning, transport planning, and ICT in improving the QoL of urban areas.

It is therefore crucial that a transport policy framework needs to incorporate the above concepts, as shown in Figure 10 (above). As such, the identified issues and concerns on transport will include impacts of pandemic on the transport system. Also, corresponding policies will embrace these strategies in terms of enhancing the supply chain and intermodal logistics network systems such as more efficient processing of permits and documents, especially for essential food and medicines, unhampered movement of goods and services, and continued operations of critical transport infrastructure such as seaports, airports, and roads.

A number of transport studies have been done on strategies that will improve the LOS of the intermodal transport systems:

- a. ITS – combining transport and ICT to reduce the impedance on attaining seamless intermodal logistics network systems;
- b. Smart cities technologies
- c. Land use-transport strategies, such as transit-oriented developments (TOD), introducing mass transit systems, anchored on high occupancy transit systems;
- d. Transport/travel demand management (TDM) – schemes aimed at maximizing the movement of people and commodities through efficient utilization of transport infrastructure facilities and systems, such as city logistics initiatives;
- e. Disruptive innovations applications to transport and logistics operations and managements;
- f. Public transport improvements, through the utilization of combined applications of the above initiatives, such as automated fare collection systems (AFCS), public transport route management, development of smart phone apps for public transport, etc.;
- g. Establishment of logistics hubs linked to strategic transport networks, such as railway systems, maritime, land-based transport and air transport; and
- h. Economic measures to contain movement of vehicles, but not necessarily movements of people and commodities, such as road pricing, parking fees, etc.; and
- i. Development of low carbon transport systems.

Looking at the above developments, it can be surmised that these are plausible initiatives during pandemics and in times of new normal or towards eventual return to economic

normalcy. A combination of the above strategies will contribute to the reduction of contagion and at the same time continue economic activities. Albeit this note, it is therefore essential that the necessary ingredients to ensure that the above developments can be introduced or put in place, as already mentioned elsewhere in this report.

5.2 Menu of Possible Initiatives in Addressing Pandemics

Based on the proposed improved framework, the menu of possible strategies will not only emphasize the importance of enhancing the supply chain and intermodal logistics network systems for seamless flow of people and commodities, reduction of carbon footprints and humanitarian logistics, but also highlight how to contain the impacts of pandemics.

The combinations of ICT, disruptive technologies or innovations and transport measures, both soft and hard, comprise the list of options in incorporating in the more responsive transport strategies in addressing the impacts of the pandemics. Notable of these initiatives are the following:

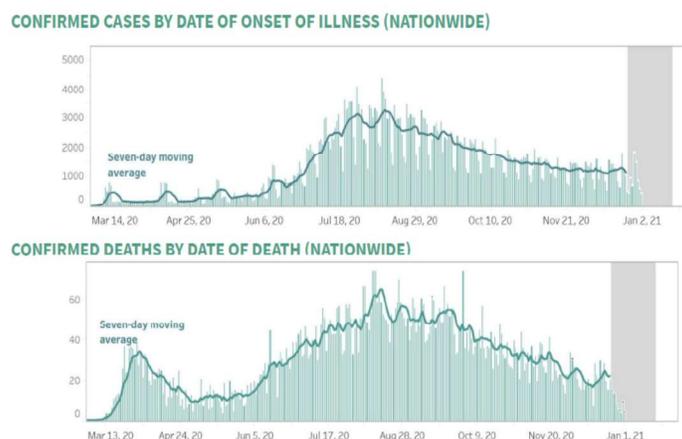
- a) **City logistics measures:** establishment of cooperatives, supply management schemes (aimed at optimizing and limiting interference with other components of mobility, time-window access (to avoid freight transport when the city is mainly used by passengers, to prevent the access in a specific area or in a road during a particular time slice), access regulation of inner areas with the implementation of nearby delivery area (NDA) networks, responsive urban traffic management schemes (e.g.: traffic control systems anchored on ITS, vehicular restraint measures, etc.), rationalization of freight flows by implementing urban consolidation center (UCC) solutions, such as devoting existing places for transshipment from long-distance (mainly heavy goods vehicles) to short-distance (urban, by light goods vehicles) traffic, where consignments can be sorted and bundled, last mile optimization of freight distribution with the maximization of loads and the subsequent minimization of the number of vehicles, delivery area networks (including booking) within limited traffic zone (LTZ), such as reservation of on-street delivery bays only for freight operations, building pick-up/locker points for supporting new incoming ways of purchasing (e-shopping), freight transport management systems for fleet management systems and tracking and tracing systems, reverse logistics in support of smart environment (source: From City Logistics Theories to City Logistics Planning: Towards Sustainable and Liveable Cities, Francesco Russo and Antonio Comi authors, June 2018, <https://www.researchgate.net/publication/326046431>);
- b) **Land use-transport interaction options:** establishment of critical hubs for inter-regional movements of commodities, including warehouses, establishment of efficient logistics centers, incorporating in economic zones logistics hubs that will also handle supplies for pandemics;
- c) **Smart city technologies:** utilization of technologies, such as smart mobility, smart supply, smart economy, smart energy, smart environment, etc.
- d) **Disruptive innovations/technologies:** Artificial Intelligence (AI), IoT, technologies for high-speed travels, robotics, autonomous vehicles, truck platooning, renewable energy, ITS, radio-frequency identification (RFID), etc.

Looking at the above inter-related strategies, it can be observed that most of the efficient and useful initiatives are the soft and infrastructure city logistics measures. Though their objectives are in support seamless and efficient intermodal logistics network systems and ensuring high quality of LOS in urban areas, they are likewise relevant in addressing the pandemics, such as the C-19. They are indeed relevant to enhancing 4th-party logistics (e-commerce, on-line transactions, etc.) and such will not only ensure “normal economic activities, but also minimize the spread of the pandemic. Notable to this is the support to work-from-home (WFH) of persons, either in the private sector or the government. It is already established that these indeed were associated with the reduction of the C-19 cases, as shown in Table 4 and Figure 11 (below).

Top regions by active cases		Top Regions by New Cases	
NCR	7,692	NCR	440
Region IV-A: CALABARZON	4,050	Region IV-A: CALABARZON	299
Region III: Central Luzon	2,448	Region III: Central Luzon	186
Region XI: Davao Region	2,036	Region XI: Davao Region	168
Region VIII: Eastern Visayas	1,405	Region VII: Central Visayas	95
CAR	1,023	Region VI: Cagayan Valley	89
Region X: Northern Mindanao	929	Region VIII: Eastern Visayas	76
Region II: Cagayan Valley	816	CARAGA	76
Region VI: Western Visayas	801	Region I: Ilocos Region	64
Region VII: Central Visayas	798	Region X: Northern Mindanao	61

Source: DOH, Beat COVID-19 Situationer #257.

Table 4 Summary of COVID-19 Cases, by Region, 08 January 2021



Notes.
 1. Bars with dark green colors indicate the actual date of onset or date of death for newly-reported cases.
 2. In cases where date of onset of illness is unreported, date of specimen collection was used as proxy. Cases that do not have both are not accounted for in the date of onset histogram. As of this situation report, around 10% of cases have unreported dates of specimen collection and onset of illness.
 3. Owing to delays in reporting, case counts within the gray area are still incomplete. Hence, we urge caution in interpreting data beyond this 14-day cutoff. Rest assured that the DOH continues to work tirelessly to ensure the timely reporting of accurate data.

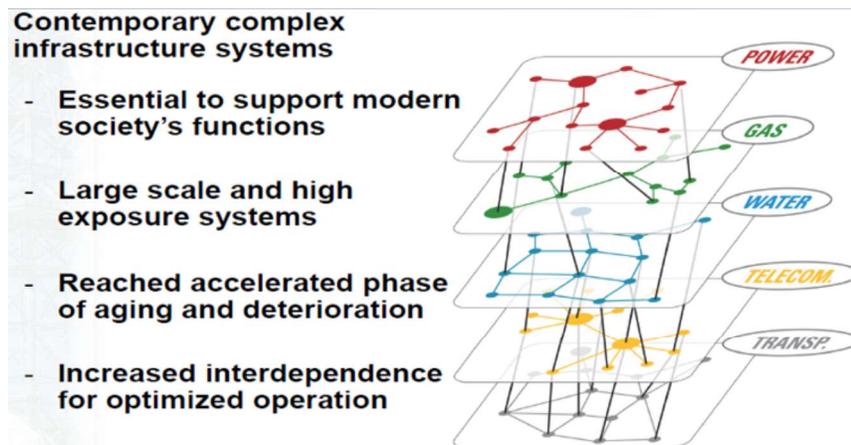
Source: DOH, Beat COVID-19 Situationer #257.

Figure 11 Confirmed COVID-19 Cases, Nationwide, as of 08 January 2021

However, summaries in Table 4 (above) may have not reflected the spike that could be attributed to the holidays. Nonetheless, it was also noted that many people, especially in highly urbanized areas, such as NCR, had restricted their movements during the yuletide holidays. Looking at the overall number of cases, there was a general decline in the number of cases over time since the start of the pandemic in March 2020 up to January 2021. There are now a number of studies being undertaken to relate the applications of ICT in the reduction of the number of cases and also in ensuring the minimal disruption of economic activities.

The city logistics actions are dependent on ICT, transport developments, land use-transport interactions and demand management schemes. Same can be said on the introduction of Smart Cities and enhancing the utilization of disruptive innovations/technologies. These developments need not only the ICT, but also the capacity building support, notably in major urban areas or metropolises. If indeed, the government, with the support of the private sector, is keen in pursuing smart cities technologies and disruptive innovations, then they should now invest on the development of these technologies. Likewise, as already mentioned earlier, critical infrastructure developments, especially in urban areas, economic zones, logistics hubs, etc., are essential and need to be prioritized to meet the requirements of the ICT and Smart Cities developments.

The menu of initiatives summarized are dependent on critical infrastructures. These critical infrastructures are required for efficient humanitarian logistics and last mile operations during and after natural calamities. The discussions on humanitarian logistics were already given in the previous sections. As such, it is indeed important that the present infrastructure facilities in urban areas adhere to the definition of critical infrastructure. It is therefore suggested that critical infrastructure development be given more importance. Figure 12 shows the interdependence of critical infrastructure.

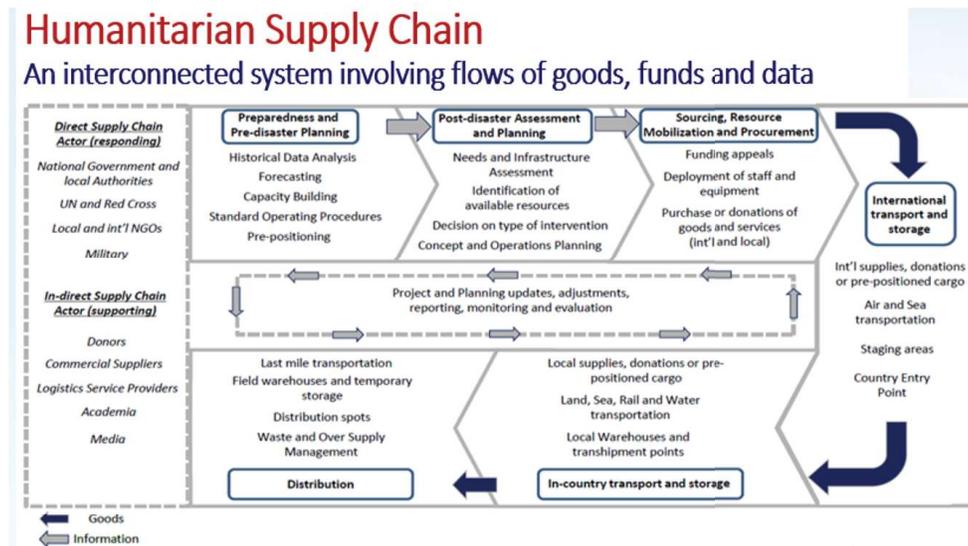


Source: Duenas-Osorio, Understanding Interdependent Infrastructure Systems: Modeling Insights and Practical Challenges, 2021

Figure 12 Inter-dependence of Critical Infrastructure

In the previous sections, it was highlighted that provision of support for C-19, notably in coming up with humanitarian assistance, should be considered in the humanitarian logistics processes. Though the pandemics are included in the humanitarian logistics processes, the current systems are focused on natural calamities and climate change events. The forecasting of relief goods and even the types of provisions are based on natural calamities. Similarly, the

consequent planning for humanitarian logistics has not included pandemics. This should be incorporated in the humanitarian logistics process as illustrated in Figure 13 (below).



Source: Stumpf (2014)

Figure 13 The Humanitarian Logistics Process

At present, the evacuation centers and facilities have not included how to address pandemics. Likewise, it is imperative that the humanitarian logistics planning processes include measures how to contain the pandemics. The same goes for the LGUs, which should include in their planning how to address pandemics. Further to this, in their prediction for required provisions in times of calamities or disasters, they should now consider same for forecasting the requirements for provisions in times of pandemics. Fortunately, the Department of the Interior and Local Government (DILG), through technical assistance from United Nations International Children's Emergency Fund (UNICEF), has a study that will incorporate addressing pandemics in the local planning process.

Thus far, what have been discussed are the initiatives and approaches on how to incorporate addressing impacts of the pandemic on the intermodal logistics and supply chain management and operations. Of equal importance in the discussions is how to consider the economic costs of incorporating measures and initiatives to address pandemics. The economic benefits, which are measured by the economic internal rate of returns (EIRR), need no justifications as these are already given. Albeit this note, what needs to be examined are the associated costs in coming up with the strategies, measures and initiatives. In economic analyses, these are usually considered in the financial internal rate of returns (FIRR). The costs associated with addressing pandemics will definitely decrease the FIRR. For the private sector, such as business and commercial establishments, these are considered in their books and will affect their profits.

Albeit the above, how about in the provision of infrastructure and services for the intermodal logistics and supply chain operations and management? There should be a careful examination of this and ascertain how to reduce the viability gap. The government has

introduced a number of approaches for the public transport systems, most especially public-private partnership (PPP) and user-centered (i.e., serve the commuters and supply chain providers). Perhaps, it is important that in the feasibility studies (FS), costs associated with addressing pandemics should now be incorporated and the economic analyses will provide a better way of understanding the costs implications.

The costs implications also include not only the reduction of production, cargoes and passenger capacities of transport systems (freight and public transport), but also the measures to reduce the infections at workplaces/stations, construction areas, production areas, etc. As such, for example, the costs associated during construction or development should include those costs on how to contain the pandemic. Similarly, during implementation and full development, the same needs to be done. Once the viability gap/s are ascertained then the corresponding subsidies or how to absorb the costs should be proposed. The effects on prices of goods and service, tolls, fares, etc., due to the reduction of capacities of transport systems (and services) need to be addressed too.

In the conduct of FS, there is also a need to revisit the analysis and forecasting of travel demand (either person trips or commodity trips) and consider the significant reduction in travel demand during the C-19 crisis in the subsequent planning. One plausible approach is to come up with two scenarios: a) assuming normal economic situation, and b) impacts of the pandemics. Of course, the assumption of normal economic situation implies that the pandemic will be contained.

Another concern, though not necessarily part of this study but an interesting topic for future research is the logistical requirements for the transport and distribution of C-19 vaccines. This is notably true on the storage facilities needed for the vaccines and how to come up with the most efficient way of transport the vaccines, given that the Philippines is an archipelagic country.

6. RECAPUTILATIONS AND MOVING FORWARD

This paper has provided discussions on how to incorporate in the supply chain and logistics management and operations approaches on addressing the impacts of C-19. As such, by doing so, suggestions on how to come up with a better transport planning framework and process were presented. Foremost, there is a need to incorporate on the transport policy framework how to address pandemics. It should now be of equal footing with addressing climate change and natural disasters. This paper highlighted the key factors for addressing impacts of pandemics are: ICT, disruptive innovations/technologies, smart city technologies, and land use-transport interactions.

From the previous section, it was emphasized that city logistics initiatives are likewise key in addressing pandemics. Apart from improving the efficiency of intermodal logistics network systems, city logistics can be employed to minimize the impacts of any pandemics. The inter-relationships of the above factors will not only improve the intermodal logistics network systems and supply chain operations and management vital for economic growth, business and trade activities, but are also necessary for continued economic activities during pandemics and in containing them. The new normal, as reflected by 4th party logistics, such as e-commerce, are not new but are already in place. It is suggested that further studies be

done towards the direction of establishing smart cities technologies. This will not only enhance supply chain and logistics operations and management, but also in reducing impacts of pandemics and climate change.

In order for the above points to be developed, it is imperative that critical infrastructure developments be emphasized. Critical infrastructure, as already mentioned will ensure the continued provision of the above initiatives. Relatedly, humanitarian logistics need in the Philippines should also consider addressing pandemics.

It is also worth recommending pursuing combinations of initiatives, such as truck platooning (linking of two or more trucks through technology), land use-transport interactions and ITS, in reducing the entry of trucks at urban centers. Truck platooning will not require many drivers. Further, by providing logistics hubs at periphery of urban areas, trucks coming from other areas will unload the cargoes at these hubs and collected by trucks coming from the centers. This way, minimal human contacts can be attained. However, there is a need for further studies for this initiative.

Finally, the study further suggested how to incorporate the economic analyses addressing impacts of pandemics. This will provide insights on how to reduce the viability gaps and likewise, encourage the private sector to be partners of the government in this regard.

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