

COVID-19 Pandemic and Disaster Resilience: Planning Perspective

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Abstract

The focus of urban planning is to place communities in healthy built environments. Providing fresh water, air and sanitation were early concerns however, less tangible but critical concerns are arising with the recent experience of spread of deadly virus diseases. Novel corona virus that hit the world in 2020 is a millstone to almost all the countries keeping activities lockdown. People were socially fragmented, lost access to earnings and basic needs such as food. The growth rates of economies were stuck or alarmingly decreased, followed by the sudden closure of the constructions and productions. This concept paper focus on three specific areas that identified as crucial during the spread of COVID-19. Developing smart networks, analyzing the viability of vertical living and re-building the construction sector were the key areas discussed. The outcomes reveal collection of data at smallest administrative units and combining with digital platforms will facilitate building smart networks. Creating more space at ground level in high rise buildings is a must to facilitate the circulation. Good communications, supportive supply chains and the application of *force majeure* concept are some to speedy recovery in construction field. Policy makers are advised to re-visit the strategies to ensure the uninterrupted networks and re-building the economy.

Key words: Covid-19, Disaster, Resilience, Smart service network, Construction industry

Introduction

The beginning of urban planning, the focus was to improve the quality of life of people in a healthy environment. Ensuring adequate clean air and fresh water, disposing of wastes were some of the earliest concerns. Accordingly, several measures have been introduced to the building and planning guidelines. However, with time passes, several health issues as obesity, heart problems, diabetes and inactive people are apparent in recent decades. Above all, the emergence of the deadly novel corona virus (COVID-19) and the associated respiratory system damages leading to death has brought increased attention and fear to all humans in the world. While many types of precautionary measures have been taken the spread of the virus is faster and there is no proper medicine yet.

The terrible pandemic disease of COVID-19 stuck the world at the beginning of the year 2020 and let the people to be in a lockdown situation. This is a different and most devastated experience to majority of the countries including Sri Lanka. The repercussions of COVID -19 are vital from the point of human being as it leads to psychological stress, mental anxiety and social isolation. In addition, the outbreak-imposed travel bans, stopped gatherings, cancelled all events, void all types of shopping, stopped business and closed offices and vacated schools bringing zero to all investments. The government of Sri Lanka advised the people to stay at home avoiding social gatherings and all types of bans explained above were imposed as precautionary measures. However, with the noticeable impacts on the collapsed networking and associated issues invited the government, the policy makers along with the professionals to search new approaches to re-connect the chains under the health guidance in order to strengthen the day to day life of the people while building the economy of the

country. In this scenario some of the concepts discuss below draws the attentions of decision makers to re-visit, in terms of developing smart networks, analyzing the viability of living in vertical, and re-emergence of the construction sector and adjust the policies accordingly.

Urban resilience and smart service network

It is very much important to identify what kind of relationship can be seen between smart network and urban resilience in the COVID- 19 outbreak. COVID-19 is an unexpected pandemic that directed most of the cities to be locked down, limiting social and service relationships. Being locked in a limited geographical area, people faced difficulties with day to day service networks interrupting and policy makers were keen on urban resilience.

The pandemic brought new experience to many countries including Sri Lanka highlighting the fact that we should improve our ability to resist, absorb and accommodate the effects of a hazard, in a timely and efficient manner. One approach is to develop a SMART service network to minimize the adverse effects of a service disruption as experienced during COVID-19 pandemic. However, with the resource limitations it is needed to develop our capacities and improve our urban service network using the limited resources available in the country. This discussion mainly focuses on ways and means of adopting SMART strategies to service networks thus enabling avoiding disturbances to smooth continuation during future unexpected events.

Urban resilience refers to a city's ability to absorb, adapt, and respond to any changes in urban system. Resilience is an imperative factor because we are facing hastily changing natural and social conditions, which require cities to be more resilient (Traballesi, et al., 2019). Accordingly, The notion of urban resilience can be perceived as a degree to which cities are able to tolerate disruption before re-organizing around a new set of

structures and processes (Alberti, et al., 2003). According to (Meerow, et al., 2016) the term of urban resilience indicates the ability of an urban system-and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales-to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity. The urban resilience concept formulates relatively new question; how a city should develop to successfully cope with external and internal changes (Drobniak, 2012). Resilient City can withstand the impact of shocks, hazards, and pressures through adaptability or transformation to ensure the long-term sustainability, basic functions, characteristics and the structure of a city. According to (Traballesi, et al., 2019) Resilient Cities are those in which their citizens, businesses, and infrastructures have the capacity to withstand, adapt, and recover in a timely manner from any kind of hazards they face, either planned or unplanned.

Globally, the concept of ‘SMART’ relates to the advances in technology. Smart technologies are instrumentals in the development of resilient cities (Traballesi, et al., 2019). The SMART concept in the context of urban resilience, would be associated with advanced technologies. As per (Traballesi, et al., 2019) embracing advanced technologies will enable smart growth strategies which in turn leads to investment attraction and growth in cities. In our context, services can be adapted with technology, but definition of SMART change in an appropriate manner. Accordingly, SMART be defined as using technology that is Specific, Manageable, Accessible, Reliable, and Transformable.

In generally, Smart service network indicate the Smart city concept. Over the past 20 years, “smart-” and “intelligent cities” have risen to prominence as a technological and policy fix for the current (and future) challenges of urban sustainability (Komninos,

2015; Falco, et al., 2018). The concept of Smart is focused on the smartness provided by information technology for managing various city functions and it should be embedded within a broader framework of Resilient Cities (Traballesi, et al., 2019). The SMART city mainly associates with three aspects such as Technology factors, Institutional factors and Human factors.

Smart Cities increasingly incorporate computer-enabled networks, sensors, and software into buildings and infrastructure, where citizens and municipalities can control lighting, heating, and air conditioning. Sensor technologies can gather information in real time to manage traffic flow and energy use, and critical information can be arrayed to do everything from reducing consumption of natural resources to empowering citizens to communicate more readily with first responders and with one another during an emergency. Then, the Smart Cities are powered by networks. Devices, people, businesses, and governments must all be able to connect securely, reliably, and quickly in order to share data to improve how people live, work, and manage their daily activities. Even while adopting the most current state of the art telecommunications and network technologies, a meaningful “Smart Cities” strategy must also pave the way for the integration of the next generation of wireless networks and services. This will have to occur not only in the telecommunications companies themselves but in all participating sectors of the economy (Traballesi, et al., 2019).

There are barriers such as limited resources and limited applications in technological developments to continue the services in an advanced manner like in developed countries in Sri Lanka. Therefore, we need to focus on how to develop our service networks with the above limitations to adapt to a situation like the spread of Corona Virus. Practically, application of SMART concept to all the services using advanced technology is difficult,

but there are ways to streamline our services using simple techniques that would enable flexibility with the changes in the systems.

In the current situation, one of our major problems is, how do we develop an undisturbed network of proper services. One critical example in a lockdown scenario is the uninterrupted delivering of food items to all either rich or poor, or living in urban areas or rural areas in an equal serving manner. With a considerable number of people facing with losing their income with lockdown is another area to be addressed immediately. Hence the government of Sri Lanka introduced distribution of subsidy to those who recognize as loss the income temporary. The above two examples gave experience very much to both distributors and the receivers and shows the interrupting nature and where issues arisen. This is the time to develop a new vision on building a structured, formal service network in the country. COVID 19 has set out a space to use resilience strategies to fill the gaps in our service network.

Building a service network to our country should be specific. What does it mean? It means that we put in a place a specific systematic model, suited for our country, and cannot just replicate a foreign country's model. Our model should be a specific model and it customized for the needs of our country. Hence, 'Manageable' means that all our service networks should be manageable regardless of the different situations the country is facing. On the other hand, 'Accessible' means all the service networks should be accessible to all relevant decision makers to fulfill the requirements of society. Further, 'Reliable' means the service networks developed should be dependable for quality services that will add to the economic development of the country. Finally, 'Transformable' means that the system can transform and adapt to suit the dynamic situations.

Developing a SMART service network, it is necessary to consider on three factors;

1. Development of a SMART public service platform
2. Development of a ‘network economy’ that creates new models for cooperation in production, delivery, and consumption of services
3. Third, identify both opportunities and challenges in integrating with physical products and devices for services, and implement digitized and integrated service systems.

Considering above three aspects we can draw the attention on how we would be able to develop the SMART service network, suitable to Sri Lanka, in a sustainable manner using the strategies of resilience.

The existing administrative structure of Sri Lanka is categorized into mainly three levels such as National Regional and Local (community) levels. National level focus on the whole country while the regional level focus on provinces or at certain circumstances can be defined as a district of a province. Within the provinces and districts, there are Divisional Secretariat Divisions and they can be considered as the local level. The local level has direct connections with community level through Grama Nildadhari (GN) divisions and GNs can be considered as the small community level exist in the spatial entity. As such, the service network coordination platform should start at community level. Development of accurate databases at community level is feasible and easily can be approached. The aggregate of this system automatically, developed local, regional, and national levels.

Commencing the above approach, we have some more questions such as,

1. What is the scale of the area we need to collect data?

2. What type of data do we need to collect?
3. How do we develop simple databases at local level and integrate them with comprehensive databases at national level?
4. How do we gather data into a digital platform and how do we retrieve the data for decision making?
5. How do we collect data and coordinate data collection at local, regional and national levels?

Following sections discuss the appropriate answers.

1. Scale of data collection

Data collection mainly focused on community level and the community level can be considered as Grama Niladhari Divisions. Later, this data can be network with local, regional, and national scales.

2. Type of data

Need to collect all types of data related to different geographic entities. For data collection purpose, first it can be considered all the buildings in the GN division/s to collect socio economic and demographic data of every person. Next, it may be connected to update building layers using Geographic Information System technologies. Here, it is possible to connect with the location and even can develop a mobile app to collect data.

Secondly, it is needed to collect land related data, based on the existing land use pattern of the specific area. Land use maps prepared by the Survey Department can be considered as a base map and google images and field data can be used to update it. Same process can be applied to collect all socio-economic, physical, and environmental data in all GN divisions in the

country. Decision makers are free to decide the type of data that they need for the respective sectors to make sound networks.

3. Development of simple databases at local level and integrate them with comprehensive databases at national level

The collected data at GN level can be integrated to DSDs. A district comprised with several DSDs and at these DSD levels comprehensive databases can be connected to develop district level databases. District level data can then be gathered together to form Regional level databases. Finally, the collection of regional level data can be considered at national level.

4. Uses of digital platform of database for decision making process

Using this comprehensive database, we can develop several networks from community to national level in different stages. Such as service networks like infrastructure, trade, agriculture, health etc. Those networks directly connected with property databases in Sri Lanka.

To understand the benefits of such collection of data we may focus on one example for distributing agricultural products. Generally, Sri Lankan farmers find it difficult to sell their entire yield in every season. This problem has surfaced during the COVID 19 outbreak as well. In addition to the demographic and socio-economic data, it is possible to collect agricultural related data such as, agriculture crop varieties available, their yield, market, best suited transportation mode etc.

Agriculture officials can use this data to get an idea about the nature of crops in different seasons and calculate their expected yield. They can predict whether the output is in excess or inadequate beforehand. Based on this information, at national level the government can decide to develop some food parks for storage

purpose and develop value added industries for excess yield. Decision makers can also look at how to distribute crops within the district in each season without giving any additional financial burden to farmers to sell their crops. Farmers can also be advised on the type of crops to grow based on an analysis on the mix of yield required. In this case digital technologies, we can use for awareness of farmers. Automatically, a network will be developed with a clear administrative structure. Likewise, in every sector we can build databases and develop a comprehensive service network at larger scale.

In concluding this section, it is evident that though with limited resources Sri Lanka also can introduce SMRAT technologies to build networks to ensure uninterrupted distribution systems, facilitating policy decisions vice versa.

Is vertical living a viable option in the current context?

Another important area that emerge as debatable during the pandemic was to what extent is it viable to live in vertical buildings. Probing into the spread of viral disease, does vertical living is threatening or in other hand does it supports the networking as explained in the above section is a question arise.

The ever-growing demand for living space and its limited availability has invigorated the need for vertical housing as a solution. The vertical house itself can help urban development issues physically, while public Spaces itself can help within social problems (Wie & Dewi, 2019).

High-rise and vertical building is supposed to have begun in the ancient civilizations of Egypt and the Americas with the construction of pyramids, temples and community structures. The architectural challenges of building multistory residential buildings continued with the Roman Empire (Gifford, 2017). Large modern

high-rise cities and suburbs began to emerge in the last century, particularly across the United States, India, China, South East Asia and South America to house booming populations and massive urban migration. Recently, due to inner-city land deficiencies and compact city policies to minimize urban sprawl, a secondary high-rise boom is occurring in many developed countries, with a greater focus on more lucrative luxury apartment developments in inner cities and also in the suburbs (Wener & Carmalt, 2016; Nethercote & Horne, 2016). While this might provide cheaper housing, it can also produce adverse living conditions: apartments can be isolated, difficult to access, hard to ventilate, more elevated from the earth (the soil), and more quarantined from a diversity of microbes, plants and animals than traditional housing. This burden of adversity is often greatest in socio-economic disadvantaged communities in high-density areas whose circumstances also restrict access to parks, sporting complexes, gardens or other natural spaces, with consequences for both physical and mental well-being, as well as opportunities to meet and socialize with others (Gifford, 2017; IFLA, 2018).

Covid-19 pandemic bringing new challenges to the entire world gave birth to different approaches for detection, and treatment of patients, but announcing the prevention of the spread of virus mainly depends on isolation and maintaining the social distance. With the observation of the current situation, the rapid spread of the disease can be seen in many cities such as Wuhan in China, New York in USA, Madrid in Spain, Milan in Italy, and London in UK where development density is comparatively high (over 5000/square kilometer), obviously constrained by the inability to maintain the social distances. All these urban centers are with very high population density. Colombo the capital city of Sri Lanka also detected high number of infections is reasonably congested and is currently promoting the vertical living. Therefore, there should be some reasons while vertical living is a necessity that cannot be

avoided. Hence, it is necessary to revisit the viability of vertical living whether there could be any improvement and use some adaptations, to meet the situation like this.

High-density means many people or dwellings per space/time measure (Akristiniy & Boriskina, 2018). Higher densities in urban settlements are created by horizontal and vertical developments. A horizontal spread is basically in informal sector settlements. In recent times, all over the world, rehabilitation of informal sector housing is adopting high-rise option, mainly because of land scarcity and high land values in urban locations. Therefore, urban living is now largely moving towards vertical options whether it is informal sector rehabilitation, middle-class housing or upper-class housing. The need to re-examine the vertical option is therefore timely to identify and address current issues and to re-direct on new developments to avoid the present problems found, in future developments.

Basically, vertical developments are driven by the land market, ex: when land prices go up, people try to build more at a small area. This is the basic concept of urbanization and argumentation of achieving economy of scale by providing infrastructure to a small area. Therefore, it is not possible to opt-out of this vertical development option, because this land constraints continue to exist as population increases.

Although vertical development is an economical option, it is an expensive option due to many reasons such as speculative land price, requires reliable engineering solutions, architecture of high-rise buildings require conscious planning and design, providing services and infrastructure to a high rise is much more complex and costly. Therefore, every decision in vertical development is cost-driven. This is where value comes into the equation. The craze to build higher and higher in urban areas is mainly influenced by the high land prices and the intent to build more to derive a better

yield on investment. In real estate terms, this is called the highest and best use. This is true for public housing as well as private housing since funding is based on feasibility studies undertaken.

In this quest to achieve economic feasibility many things are compromised in high-rise apartments. The first compromise comes in the form of unit size. Next, circulation and common areas get squeezed. In addition, services are also under stress with cost-effectiveness take precedence over efficiency in the system. At the end it come up with the correct economic price, lots of things have been compromised and the said aspects affect the quality of the development. This is where main attention should be given to what compromise, we can accept, whether it should be completely driven by economic considerations or are there any other way of looking at this. This doesn't advocate high-rise living is not acceptable, but we need to re-visit the concept as a promotional mode to address the scarce resources.

Turning back to scholar views, the feasibility of high-rise apartments should be based on the **highest and best value** and not the highest and best use. If it is value, then it reflects a relationship to living beings into the product and the value may differ from person to person. This will bring back into the equation all the things that were compromised in order to achieve economic feasibility. When determines the highest and best value based on defined attributes within acceptable market principles, the biggest challenge in developing a vertical housing development is to decide for an unknown occupier. At the time of designing, it is unknown who will occupy this building. So, designers work on certain parameters believing that they will suit for the certain niche market. Next, the maintenance of construction efficiency is the second challenge. This requires operational ease and economical structural construction that leads to system approach with typical floors, standard units and repetitive elements.

In a vertical development, there are multiple users with diverse needs, expectations and even different lifestyles. In this scenario, accommodating them in vertical development means a diverse mix and it is difficult to accommodate everybody's requirements. So, the challenge is how to bring this feasibility into the system. That needs higher attention and needs to revisit at vertical living.

The above paragraphs explain the background of why vertical development was promoted. Hence, it is worth to analyses does vertical option creates environmental stress and social incompatibility in a pandemic situation. According to (Business Dictionary, n.d.) environmental stress refers to pressure on the environment caused by human activities. High rises have been accused of causing many unpleasant outcomes (Angrist, 1974; Conway & Adams, 1977).

Naturally, high-rise building creates environmental stress such as high-rise buildings require very high energy use for their functioning, the built mass compared to natural area is comparably high emanating heat and create micro climates that will be uncomfortable to the users at ground level (e.g. heat island effects, wind pockets etc.). Then the growth of modern high-rise buildings significantly affects the existing climatic conditions of the terrain and the environmental balance of the living environment (Giyasov & Giyasova, 2018).

Vertical buildings will also require extensive service networks, more consumption of water and generate more waste creating environmental stress, generate concentrated contribute to air pollution and the construction activity contribute to air pollution at different levels during construction creating a bigger impact. Overall, the high-rise option creates more environmental stress than low rise buildings, although they may be covering a larger

footprint. However, the land values in a potential area for high-rise development will lead to more concentrations and create lesser open areas in overall context. So, naturally, high rise building creates stress on environment which needs to be addressed and lots of mitigatory actions are already being taken. Then, everything goes down to the cost aspect as well.

In post-pandemic situation will cause lots of stress on the cost aspect of construction industry because everybody wants to reduce cost and make it cost effective. This means it will require very innovative kind of interventions in order to customize and value engineering may have to come in big way. Further, we must look at entire city fabric as a whole and try to respond to this situation rather than try to resolve in building by building basis that is not possible. Thus, it is important to have practices and means to respond this situation as rational and committed environment which needs to be seriously thought of. After this COVID 19 pandemic, there will be lot of safeguard standards that require at the site level such as keep social distances and maintain hygienic environment. All these mean additional costs. Top of that this shut down also leads to lot of extension of time and workers may not be able to work at the place that they used to work because of the reduction of the number of workers. Since some sites are very small and it will not be possible to accommodate parallel works. Consequently, there may be lot of stress that has not been imagined or planned before. Thus, this is something that everybody needs to start thinking and while not compromising the environmental concerns, because how environment is responding to this Corona virus is also interesting.

Next, it is very important to seriously think about the disaster resilience and pandemic also challenges us to respond how to manage this kind of situations taking vertical buildings. For example, the evacuation during an emergency is the biggest

challenge in vertical developments. On an average complex with 200 housing units with a population of 800 people will require a land area of approx. 30 perches to stand on, if they come down at the same time. The question is in the context of Sri Lanka, do we have such space in and around the apartments? When it is coming to low income housing, the occupancy ratio is more than four. It is the first-time reality is being thrown at us.

In a pandemic like what is experienced today, providing medical care, maintaining social distance and even feeding the occupants can be a real challenge since we have never experienced such a disaster. Accordingly, disaster resilient in building and specially in high rise building is a must aspect to understand and there are many safeguards to be built in order to achieve disaster resilience such as create more space at ground level in order to respond to this kind of evacuations and creating social spaces so that people could comfortably go around. All these aspects need to be accommodated therefore; disaster resilience is an important aspect that needs to be addressed. As explained social compatibility, economic feasibility and environmental stress, all needs to be balanced in order to achieve sustainability.

Another important question that needs to be answered is that can density be achieved in sustainable manner? Because today's trend is to build high in order to achieve economic feasibility. But, the problem is how high can we go whether it is 50 storied building, or 20 storied building or 10 storied building, this is something that should receive serious attention because from location to location, place to place the requirements and the buildability changes, so sometimes it may not be necessary to have such a big concentration to accommodate people. In our country, last few decades, in-migration to our cities are becoming slower, earlier most people tried to come to Colombo for settling, but that attitude is changing. Therefore, it is necessary to rethink about existing

planning aspects because our planning was designed to bring 9 million people in to the Western Megapolis that is half of the population of this country. So, the question is, do we need to have that kind of demographic changes creating lots of problems in the city areas. Instead, should we regionalized and focus into regional centers and move investments to regions so agricultural hinterlands will have better service and will support to build service networks, supply chain networks, etc. By means of all these, it is possible to support rural economy as well. So, it is vital to seriously look at the options available. Earlier, these areas didn't receive much attention and mainly focused on larger urban conglomerations to do economic activities. So, it is important to rethink about whether that kind of densities are necessary and are there any better typologies that we can adopt to have structures that are not so high and think of densities that can sustain with the kind of economic based in that particular locality. By all these means, it is important to humanize this vertical living by innovations and having various means of creating better social spaces, providing better facilities, etc.

Attitude of the dwellers is one more important aspect that influences sustainable vertical development. Inter dependence, respect for common facilities, and conserving resources is an essential consideration for a viable vertical living culture. There are lot of issues that can be avoided or can be mitigated if everybody cooperates each other because it's a community that came from various places, which is quite a diverting community. In building the community as real community, then bigger effort needs to be made and needs to facilitate kind of integration in spatial terms, such a community to get build-up as real community. So, it is important to think how these demographic situations can be moved, what is the kind of threshold, what is the scale that action should be taken, what is the kind of building typology, and what is the kind of localization. Further, if more space is allocated

to common use and proper utilization of such space subscribed by everyone must be inculcated into practice. Innovation is needed to improve system control for common usage in vertical developments so that service charges may be kept to a minimum. So, it is important that the communities are built and not the housing units that works as a part of a whole.

Re-emergence of the construction industry in Sri Lanka during the post Covid 19

The novel Corona virus made severer impacts to each industry and it is vital to see how it would be in the construction industry in Sri Lanka.

In this pandemic scenario, as per the regulations of the labor department in Sri Lanka, employees from large construction companies are safe from deductions or stopping the salaries, whereas workers from several small and medium enterprises, which are unable to generate income as a result of COVID-19, are more vulnerable to pay full payments and down-sizing. This may result in a significant increase of the unemployment rate. It is noticeable, once control is gained over the pandemic in the island and though life returns to normal, it has been indicated by experts that a portion of Sri Lanka's workforce will continue to receive a lower payment for a significant time.

Considering the contribution by the construction industry to the GDP and employment generation is about 8%. Gross domestic capital formation contribution is about 42%. Next, the construction industry employs over one million people of which a majority are laborer and semi-skilled workers. Mostly, they belong to the lower echelon in society and are the sole wage earners of the family.

In construction industry, impact can be broadly categorized into two stages.

1. Projects in the pipe- line to come - still at the design stage.
2. Projects currently in the mid of construction progress.

Projects in the pipe- line to come - still at the design stage cannot just wait or postponed due to curfew or shutdown, there should be some way to get the construction sector to some level to move forward. Solutions can be to restart the projects, offer some benefits to investors to invest in the industry to uplift the industry and, accelerate the approval process through some mechanism to avoid frustration of the investors as investors will not accept further delays.

Next, important point to consider in this scenario, is to re-orient the projects that are still in the design stage to accommodate our local products/materials as much as possible and lower the dependency on imported materials. So, it is important to re-look at our procurements of foreign products, to help our countries economy to develop by using our own products. Providing more value to these products plus creating employment in these industries will kick start generating money, reduce the costs and assist our economy.

Then, for the projects currently in the construction phase, there are two main parties in building construction or infrastructure construction. One is the employer who would provide the funds to get a project done and the other is the contractor who will construct the building/project.

In a construction contract, there are two important milestones and they are the commencement date of the construction work and the other is the date of completion of the construction work. These two milestones are important because these dates are impacted from this pandemic and shutdown. So, the people who are working in the construction field must immediately draw their attention to areas how they can come out of this without getting penalized.

In any contract, these two dates are fixed and could only be varied based on certain conditions of the contract terms such as variations required by the employer which could affect the time to complete and with additional cost. Today's delay to complete most of these current projects is due to the lock down currently in force. The current situation of this covid-19 pandemic falls generally in forms of contract under the conditions of contract Force Majeure Clause. Force majeure refers to a clause that is included in contracts to remove liability for natural and unavoidable catastrophes. Force majeure clauses are contractual clauses which alter parties' obligations and/or liabilities under a contract when an extraordinary event or circumstance beyond their control prevents one or all of them from fulfilling those obligations (Pinsent Masons, 2020). Definition of 'force majeure' in the form of contract is FIDIC 1999 Red Book is; "force majeure" means an exceptional event or circumstance:

- (a) Which is beyond a party's control,
- (b) Which such party could not reasonably have provided against before entering into the contract,
- (c) Which, having arisen, such party could not reasonably have avoided or overcome, and
- (d) Which is not substantially attributable to the other party.

There may be various claims put forwarded by either the employer or the contractor by pondering on various other clauses in the contract terms to make a claim against the other. But this should not be the approach. The approach should be amicable and through discussion an agreement should be reached by both parties in order to re start the work without penalizing the other.

Notice of force majeure

If a party is or will be prevented from performing any of its obligations under the contract by force majeure, then it shall give notice to the other party of the event or circumstances constituting the force majeure and shall specify the obligations, the performance of which is or will be prevented. The notice shall be given within 14 days after the party became aware, or should have become aware, of the relevant event or circumstance constituting force majeure.

So, in this situation the contractors must immediately give a notice to the employers saying that there is a force majeure issue and they reserve their rights for extension of time for the completion of work. If they don't do that they are in a quite big problem.

Strategies to Overcome

Having considered the implications of COVID-19 it is important to discuss what solutions may apply for speedy recovery of the above repercussions. In this situation, it is not possible to give 100% solutions. However, the industry could reemerge at least by 50% or 60%. There may be solutions where it can assist the industry to recommence but may not be at the same rate as previous. When discussing solutions, some countries have already tried to find solutions and those can be taken as benchmarks for our progress.

As per (Saludin & Hassan, 2012) modern technology has provided working from home (WFH) possible for many workers. The development of information and communication technology has led directly to a growing importance of WFH as a new form of flexible working for many organizations. The individual, organization and societal benefits are known to be obtained if WFH is implemented. Information technology, financing, service, technology and advertising are some of the industries that adopt

WFH for their employees (Lal & Dwivedi, 2009; Kowalski & Swanson, 2005; Peters, et al., 2010)

The construction industry has a culture of long hours and weekend works. Hence, construction employees struggle to achieve a balance between their work and personal lives (Lingard & Francis, 2005). According to (Pocock, et al., 2007) the industry as a high-risk industry for work stress. Some of the stress faced by the professionals in construction is stress associated with external demands such as deadlines, time constraints and workload in construction estimators.

Then (Saludin & Hassan, 2012) stated that WFH is an alternative for construction employees to ensure that they can reduce their stress and achieve their work-life balance.

In this context, Royal Institution of Chartered Surveyors (RICS, UK) has done some analysis globally, and they have come up with some revelations about how some other countries have used methodologies in this lockdown situation. One method they recommend is to obtain expertise in managing complex building programs to prepare to be 'first out the traps' after the lockdown and keep projects moving. This approach can be used to minimize delays and restart projects immediately after the restrictions are lifted. China has used the methodology with 80-90% of staff being brought back on construction sites for projects. So, Sri Lanka could introduce innovative ways of working to achieve this, such as splitting the teams into those that could manage during the shutdown and those that prepare to get projects moving right after the recovery. For example, within the period of 'down time', risk reviews, testing of supply chains and assessing inventories and availability of labor and materials can be carried out.

In this regard, if we can take some strategies adopted by China how they managed the pandemic and how they are back on track

so soon is a good benchmark for us to ponder and implement with some adjustments to suit Sri Lankan culture working norms. Turner & Townsend one of the leading Property Developers Globally have done an analysis on China's bounce back of the real estate industry after they controlled the COVID 19 to comfortable levels. Although it seems like an age since China diagnosed its first COVID-19 cases, the pace of change since governments first acted has been rapid, requiring quick decision-making for those managing projects and programmes across real estate, infrastructure and natural resources in China.

As this global pandemic moves across the rest of the world, we can see parts of China are starting to come back following periods of shutdown. Governments in the West are – rightly – looking at the approaches taken by Asia to protect their citizens. Good Example is Sri Lankan Government's quick action and measures taken to protect the people. The construction sector must follow that advice – responding quickly to restrictions, but also focusing on how projects can get back out of the blocks when the situation improves. So, to do this, we need to have swift reactions, good communications, acting collaboratively in the interests of the whole supply chain and rapid response.

In China in particular, the speed and totality with which the authorities put the country into lockdown, did not allow time to prepare. What it did, however, was forced teams to react collaboratively to limit the fallout. The results have been largely a success: for most live projects in the construction phase of China, they are looking at a six to eight-week delay, broadly reflecting the length of the country's shutdown. This has been achieved by using the shutdown period wisely. With sites shut overnight in many cases, teams quickly divided resource into: those managing that process and those focused on the bounce back. Next, through swift risk reviews and supply chain stability testing, China have been

able to use the time productively – assessing inventories, logistics, shipping and financial stability of essential labor and material providers, so that orders and programs are ready to go when they get the green light. Clients have responded well to this advice and will now benefit from being first out of the traps as sites reopen. In China, we are now seeing 80-90 per cent of labor back on sites for some projects and this is improving each day.

Good communication is another significant point. A collaborative attitude and team management skills will be essential throughout the pandemic. This will assist each party to work on a much more confident platform and get the projects back on track by minimizing on the impact of extended completion periods and also analyzing the cost impact and how it can be mitigated. It's important to be flexible, recognizing different client preferences in how to communicate, and arranging regular calls and check-ins where decisions can be made.

Supporting the supply chain can be regarded as another significant aspect. Singapore's Building & Construction Authority issued advice since the very early stages of the crisis, to shore-up public sector contractors and make clear that financial penalties around cost or schedule overruns wouldn't automatically be enforced. Other governments and clients globally are now taking that lead, allowing much easier conversations to take place about how to get projects back on track. In Hong Kong, this has been matched by early commitments to supporting supply chains as they get back on their feet – including speeding up planning applications and approvals, and even forward funding up to ten per cent of overall contract values on some state-funded projects, in order to re-capitalize the sector. So the message to both public and private clients is that if you are in a position to support your supply chains at this time, you should do so. Accordingly, these norms can be used by other countries to reemerge the industry.

Further, in this scenario, it is important to establish (and sustain) new ways of working remotely –collaborating better across teams, using digital, social media and communication platforms to drive projects forward. In this respect,

1. Have to learn and use technology to our best advantage.

For example: Re-align our offices by allowing the staff to work from home by using online technology. This will reduce the time wasted by the employee on travelling time and also can save the cost of travelling. However, this will not be 100% results oriented at the start but will eventually get into the cycle. Further, the employees could work from their own home comfortably which also enhance more family time. This will boost up the productivity.

2. The Staff attendance to office can be made in shifts so that less office space will be required and also moving forward the social distancing too can be maintained. This will assist to reduce the overheads on the Employers. For example, as a Quantity Surveyor, in order to Value the Construction Work, there need not have many people going to the site. The progress can be evaluated by certified construction drawings of the Consultants or by photographs or even by drones. We need to drop the old methodologies and come to terms with smart technology. Of course, there will be

issues, but we need to find solutions looking at the big picture.

On new ways of working:

1. The laws need to become more flexible to permit staggered / flexi working hours, shorter day weeks and flexible work arrangements that suit employers and employees; and improve productivity across the state and private sector.
3. Getting continuity plans in place – able to adapt rapidly to changes in people, delivery plans and market shifts.
4. Re-shaping Employer’s portfolios and capital investment – whether increasing or shrinking, rapidly assessing scenarios, impacts, risks and opportunities.
5. Keeping construction going – while considering the safety and welfare of those involved, keeping the build going is key to progress. Where projects do have to stop for a period, supporting them to manage and assess the impacts of demobilization and planning/managing the re-start.
6. Navigating the risks – challenges with materials, labor, supply chain and logistics are all areas that require close scrutiny, management and resilience to deal rapidly with change.
7. Using this window to ‘get fitter’ – many clients want to catch up on those things they should have done, invest in

research and development (R&D) and gain competitive advantage.

Next, with respect to post COVID- 19 and as soon as the restrictions are lifted by the Government, a very important aspect that construction industry needs to ensure is Health & Safety at the Construction sites. As per the current regulations put forward by the Government regarding Health & Safety, it will be useful to implement. Finally, this pandemic has provided the whole world an eye opener and has also provided us with a learning curve how to better prepare ourselves in the future in multiple disciplines. As Real Estate Professionals, we are now much more educated and experienced in our approach to all Real Estate & Construction Work, than the Pre COVID- 19 Virus. Disruption could be seen as an opportunity to re-think, revert or even pivot to help you understand your exposure to COVID-19, and more importantly, position your business to be resilient in the face of this and the next global threat.

Another important point is that all professional institutes in Sri Lanka need to come together and use their expertise to help the government to recover the country's economy. The current scenario is a very good opportunity to all professionals to make a task force of professionals and provide solutions that will be beneficial to all areas of the real estate and construction industry. It can be a professional think tank. So, the contribution of valuable ideas can be proposed to the government to be implemented. This is something that needs serious consideration.

COVID-19 is finite; it will pass; things will start to return to normal. We call it the "New Normal" and will help clients plan and get ready.

Conclusion

According to the above-detailed discussion, it is evident the importance of the three sectors in a lockdown situation. The explanation justifies that even with limited resources, Sri Lanka also can implement SMART technologies. Introducing SMART techniques will ensure the smooth functioning of delivering all necessary serviced to communities. It is also understood that we cannot totally reject the vertical living concept. However, the attitude of the dwellers is one more important aspect that influences sustainable vertical development. Interdependence, respect for common facilities, and conserving resources is an essential consideration for viable vertical living culture. Further, if more space is allocated to common use and proper utilization of such space subscribed by everyone must be inculcated into practice. Innovation is needed to improve system control for common usage in vertical developments so that service charges may be kept to a minimum. So, it is important that the communities are built and not the housing units that work as a part of a whole. In an unavoidable situation such as a lockdown situation, the continuation of construction is highly important especially to safeguard the small-scale contractors. Therefore, in this scenario, it is vital to establish new ways of working remotely, collaborating all teams. Using digital and social media and communication platforms will be very useful tools in implementing meaningful ways to drive projects forward.

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