Sectoral impact assessment framework for governments

A multivariate, sector-agnostic approach to recovery and building resilience

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01 Introduction

1.1 Background

Back in 1918, the spread of the Spanish flu forced the United States to implement social distancing to contain the virus leading to a slowdown in the economy. At this time, the entire global economy has, however, never experienced a downtime of this magnitude before. The shutdown has started a chain reaction through restrictions in movement of people and goods, leading to manufacturers reducing supply and cutting down on costs by initiating layoffs. Rising unemployment has left individuals with reduced purchasing power leading to plummeting demand for goods and services. This is likely to push the supply-demand equilibrium into a downward spiral resulting in economic recession. Implementing measures to stimulate economic recovery has become a Herculean task for governments.

In its recent World Economic Outlook report, the IMF projected that the global economy would contract by 3 per cent in 2020[1]. It is certain that the scale of the coronavirus impact could be much larger and reverse a decade's worth of benefits of globalisation.

The world is going through disruption in almost all spheres of modern life. The pandemic and eventual lockdown has impacted businesses, disrupted functioning of societies, cultures, ecosystems and environments. The onus now lies on central and state governments to leverage fiscal and monetary policies to revive supply and demand factors. To do so, it is important that governments make an impact assessment of industrial output, employment, essential supplies etc. on economically weaker sections of society, regions and the entire country to take informed decisions.

Impact assessment should play a key role in designing the relief measures by governments. A quantitative impact assessment goes a long way in providing the numerical sense to decision makers in ensuring that relief measures are commensurate with the severity of the impact. If the impact analysis does not account for the actuals, the relief measures or the allotted budget may be inadequate or altogether redundant.

This paper introduces you to an impact-assessment framework suitable to situations of a partial or complete economic shutdown.

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1. Chapter 1, World Economic Outlook, April 2020, I.M.F. Accessed on 29th June 2020

1.2 Need for a framework

The impact of an unprecedented global pandemic will expectedly be multilayered and without a well-defined framework, it is difficult to make a thorough assessment of areas, regions and factors that need correction. Infusing liquidity and relief measures are short-term solutions. Governments ought to focus on the more complex task of planning for contingencies and preparing a medium-to long-term roadmap to revive the overall economy.

The framework discussed in this paper is intended to help governments in taking a systematic approach to deconstruct any sector, study the problem, identify interdependence between components and finally reconstruct it back with an objective to make it more resilient than ever before. The framework helps governments identify, quantify and justify the strategy to overcome catastrophes that result from an economic lockdown and similar events.

1.3 Differentiated solution

The framework stands out because it incorporates:

a. Deep dive into sectoral sub-components and their characteristics

b. Sectoral Macroeconomic data analysis from authoritative sources

c. Calibration of impact projection through appropriate indices for both supply and demand.

These indices have been prepared considering the nature of the COVID-19 situation and should be applicable for similar lockdowns causing economic damages in the future.

02 About the framework

The framework uses the triangulation technique for assessment of impact due to economic standstill in any sector. The technique is used to validate the findings obtained from one approach with the other equivalent approach.

Integrate

De-construct

Define

In this framework, the following are triangulated.

a. Consensus on insights from sectoral SMEs to identify impact characteristics

b. Refine the insights with sectoral cause-effect relationship analysis

c. Macro-economic valuations.

While (a) and (b) utilise qualitative analysis techniques, (c) provides and follows a quantitative assessment methodology.

2.1 Basic building blocks of the framework

The building blocks are the foundational principles on which the impact-assessment framework rests. The three building blocks are (1) define (2) deconstruct (3) integrate.

A. Define sectoral characteristics
Questions such as which sector needs assessment, the scope of study, stakeholder grouping, etc. may help nail down the problem statement.

B. De-construct the sector into sub-components
Once the sector is identified with its boundaries defined, it needs to be de-constructed. An understanding of the interplay of the sub-components, such as value-chain actors, various departments, material and capital-flow cycles would help drill it down

C. Integrate the insights from sub-components
The event that led to economic standstill will disrupt the overall sector but it is important to see if there are patterns in the way sub-components are affected. This pattern will help in grouping the sub-components under one bucket. The components in one bucket will face similar problems and, hence, it becomes easier to analyse.

2.2 Applicability of the framework

The framework has been designed with a specific context, which is to enable governments to estimate losses at a sectoral level when the economy is at a standstill. The target audience for this framework could include high-level committees, statutory committees and any government body/agency entrusted with the task of preparing impact study or revival strategy reports.

This simple yet powerful tool is effective in achieving the following objectives.

| 01 Reduce subjectivity and bring objectivity | 02 Achieve enhanced utilisation of time and resources | 03 Shift to systems thinking. |

The framework helps in gaining insights about the situation both quantitatively and qualitatively and though it does not directly suggest a strategy or action plan to rectify the damage, it could be surely well utilised to formulate one.

2.3 Basic assumptions

The framework has been designed with the following assumptions.

i.   Access to institutional/sectoral information will be available despite time and mobility constraints

ii. Inter or intra department/sector collaborative data is identifiable

iii. Exact degree of impact is not necessary, an estimate close to reality is good enough.

2.4 Key outcomes from the framework

With the help of this framework, government agencies may obtain the sectoral economic impact with the following three key outcomes:

1. Sectoral/sub-sectoral order of impact to identify the degree of risk. This will help governments to identify the most critical parameters that need to be resolved on priority to mitigate the impact

2. Quick macro-economic loss estimates with quantification of impact. E.g., in terms of GDP. This will enable governments to make an economic assessment of the macroeconomic net loss in value derived from the State Gross Domestic Product (SGDP) or National Gross Domestic Product (NGDP)

3. Panel consensus from leading subject-matter experts on major challenges. This will generate insights into the problem areas and their possible solution.

These outcomes are expected help in formulating effective strategies and action plans to mitigate the problems caused due to economic shutdown.

03 Drivers of the framework

3.1 Elements of the framework

The objective of the framework is to enable committees/working groups of governments to effectively estimate and arrest the losses in a sector through quick action when COVID-19 lockdown like situations arise.

Two important concepts that drive this framework are systems thinking and the triangulation technique. Systems thinking takes a holistic approach to analysing the impact of any system's constituent parts, how they might interrelate, work overtime and within the context of larger ecosystems. The triangulation technique helps in drawing boundaries and checking for consistency of findings by using different data-collection methods, both qualitatively and quantitatively.

The principal drivers of the sectoral impact-assessment framework for governments are three-fold.

1. **Representative panel consensus of sectoral SMEs**
2. **Cause-effect relationship analysis**
3. **Macro-economic time series valuation of sectoral impact.**

01

Qualitative panel consensus of sectoral SMEs: this part analysis the opinions and voices of luminaries and subject-matter experts from leading universities, government departments, private firms, etc. about the overall scenario of the impact of any lockdown causing economic havoc on a sector through consultations for their respective assessment and remedial measures. The output from this analysis will be insights gained from the knowledge of SMEs.

02

Cause-effect relationship analysis: it helps governments identify the stressed and affected underlying factors responsible for the partial paralysis or total collapse of any sector on the brink of such a catastrophic event. This analysis can predict the degree of relative stress in each sub-sector. Various visualisation techniques can be used to represent a heat map comprising multiple codes showing the degree of impact deduced in order to identify the worst hit sub-sector so as to enable prioritising the delivery of relief measures. The output from this analysis is to ordinally rank causal factors.

03

Once the degree of relative stress or impact is understood from the cause-effect relationship analysis, governments can utilise the next driver of the framework i.e. **macro-economic time series valuation**. This makes an economic assessment of the macro-economic net loss in value derived from the State Gross Domestic Product (SGDP) or National Gross Domestic Product (NGDP). In this technique, the annual contribution of various sub-sectors to the SGDP (or NGDP) are discounted and factored in by the **appropriate indices** to estimate losses. The output from this analysis will be a qualitative measure of the economic impact.

Table 1: Sectoral impact assessment for governments

Cause-effect relationship analysis	Macro-economic time series valuation	Qualitative panel consensus of sectoral SMEs.
• Identify the causal factors • Estimate criticality of sub-sectors • Identify the relative ranking of the degree of impact on sub-sectors.	• Analyse historical data • Discount factors developed in the supply side and demand side to be adjusted as per the scenario and sector • Deploy appropriate indices to discount the estimated losses.	• Consultation with subject-matter experts (SMEs) for assessing practitioners' view on socio-economic impact on respective sub-sector of study.

04 The framework in use

4.1 Cause-effect relationship and interplay of sector sub-components

Like the sub-components of a machine, every sector consists of intrinsic characteristics, referred to here as major causal factors, that are vital to the smooth operation of the sector, e.g., dependence on supply chain. To factor in the impact of repercussions brought about by an event of this nature, governments would need to look at the scenario through the lens of a cause-effect relationship. It would enable them to clearly breakdown the impact into identifiable and measurable major causal factors that can be prioritised to deploy strategies for relief.
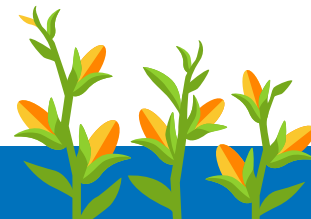
Exhibit 1: Cause-effect analysis of agriculture sector

For example, the agriculture and allied sector is composed mainly of sub-sectors such as crops (rice and pulses), horticulture produce (fruits and vegetables), dairy produce (milk and milk products), animal husbandry produce (meat and eggs) and fishery produce (fish and fish seeds). The major causal factors of this sector are perishability and dependence on a supply chain.

Let us take one of the major variables i.e. dependence on supply chain and see how it can be broken down for deeper and meaningful analysis.

"Since the market chain or system refers to specific operations, handling, transportation and trade practices, there is a close correlation between the type and magnitude of loss incurred by a specific product and the chain or system wherein it moves." - Food and Agriculture Organization of the United Nations (FAO)[1]

As per a study on integrated Agri-supply chain management by the National Institute of Agricultural Extension Management, an organisation of the Ministry of Agriculture, Government of India[2], in a typical supply chain of horticulture products, the dependence on supply chains is on all the three degrees of transport viz. primary, secondary and tertiary transport. As it can be seen from Exhibit 2 that showcases a typical price build up for 1 kilogram of banana in India, the usage of primary transport is during harvesting from farms, secondary transport for value addition or by wholesalers. Tertiary transport is used when the retailers collect their inventory from the wholesalers. On the above basis, the degree of dependence of agriculture and the allied sub-sectors on the supply chain can be calculated and augmented in the framework with the necessary calibration and discounting factors of supply and demand side to arrive at one of the many major variables for assessing the degree of stress in the sector at hand.

1. Food loss prevention in perishable crops, Chapter 2.3 Marketing and distribution, FAO 1981. Accessed 29th June 2020.
2. Training programme on Supply Chain Management in Agriculture, NIAEM, Accessed on 29th June 2020.

Exhibit 2: Degree of dependency in supply chain of agriculture sector

Sr. No.	Agriculture and allied sectors' product sub-sectors	Factors for dependence on supply chain
1.	Crops (Rice and Pulses)	What is the efficacy of Public Distribution System assistance? What is the degree of government and private sector intervention?
2.	Fishery (Fish and fish products)	Nature and frequency of rural markets daily/ weekly? What is the degree of government and private sector intervention?
3.	Horticulture (Fruits and vegetables)	Nature and frequency of rural markets daily/ weekly? What is the degree of government and private sector intervention?
4.	Dairy (cattle milk and buffalo milk)	What is the share of the unorganized market? What is the degree of government and private sector intervention?
5.	Animal husbandry (Meat and eggs)	What is the degree of government and private sector intervention?

In cause-effect relationship analysis, the cumulative impact assessment on the chosen sector is calculated considering appropriate ordinal scales. In some cases, a five-point equidistant Likert scale like M1 and M2 below can be taken and for others an unbalanced Likert scale like M3 could be adopted as events like COVID-19 have no 'safe' or 'no-impact' zone.

Exhibit 3 shows the ranks of the sub-sectors based on points of impact arrived by considering M1, M2 and M3.

Exhibit 3: Cumulative Impact Assessment of sub-sectors based on highest impact

Sub-sectors	M1	M2	M3	Cumulative Score of Impact	Rank based on ordinal scores of impact
Agriculture	2	2	2	6	4
Fishery	1.2	1.2	1	3.4	5
Horticulture	1.8	1.8	4	7.6	1
Animal Husbandry	1.6	1.6	4	7.2	2
Dairy	1.4	1.4	4	6.8	3

Subsequently, in **cause-effect relationship analysis** of the framework, **multiaxial impact maps**[3] comprising the major variables may be developed to plot the degree of impact of the lockdown causing catastrophe for any sector. This technique will enable governments to have a holistic view of the sector with a top-down approach and effectively prioritise the delivery of relief measures by touch basing, sometimes relatively more, in the areas of high impact within sub-sectors.

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3. (Wilkinson, Leland; Friendly, Michael (May 2009). "The History of the Cluster Heat Map". The American Statistician. 63 (2): 179- 184. CiteSeerX 10.1.1.165.7924. doi:10.1198/tas.2009.0033.)

4.2 Macro-economic analysis of sector

In the previous section, it was shown how governments can arrive at the ordinal score of impact in case of a lockdown causing a catastrophe in a sector. The result of which was an estimation of the order of impact as could be seen from the example where horticulture was the most hit followed by animal husbandry.

In this section of the framework, the estimated loss to any sector during the affected period of such lockdown causing catastrophe in terms of SGDP or NGDP,

whichever best suits the need, is projected. This pillar of the framework requires a study of the macro-economy of a sector and its component sub-sectors.

The assessment of impact types and the application of the appropriate indices can be used to discount the statistical result for a more realistic output of the impact analysis.

Exhibit 5 shows such an example of sectoral macro-economic analysis of the COVID-19 lockdown impact for the first 40 days on loss in horticulture in Assam.

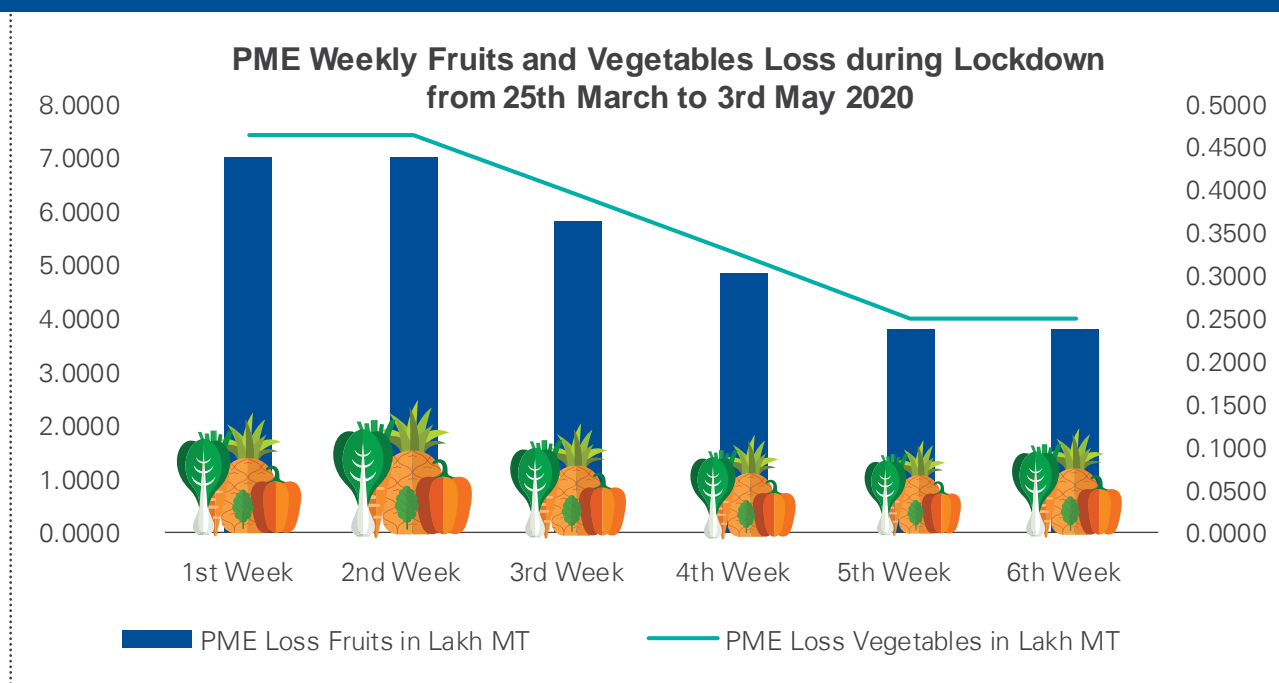## Exhibit 4: Impact Heat Map

Table 3 Heat Map Impact Model

5	Moderate	Major	Critical	Critical	Critical
4	Moderate	Major	Major	Critical	Critical
3	Moderate	Moderate	Major	Major	Critical
2	Minor	Moderate	Moderate	Major	Critical
1	Minor	Minor	Moderate	Moderate	Major

Major Variable 1 (y-axis). Major Variable 2 (x-axis: 1, 2, 3, 4, 5).

The above table represents a heat map for identification of the worst hit sub-sector within the any Sector. It contains the degree (labeled from 1 to 5) of Major Variable 2 on x-axis with increasing order towards the right and the degree of Major Variable 1 (labeled from 1 to 5) on y-axis with

increasing order upwards. Thus, one can plot the degree of impact of the lockdown causing event based on the 2 most important variables that are responsible for the growth and sustainability of the sector and arrive at a relative degree of impact within the sub-components of the sector.

Exhibit 5: Time series analysis of quarterly loss on horticulture in Assam[4]

Horticulture sub-sector cumulative impact heat rank	1
Total projected quarterly loss in **Horticulture** sub-sector	159.71 Lakh MT
Heat map impact	Critical i.e. minimum 75 per cent impact
PME quarterly loss in horticulture	119.79 lakh MT

PME Weekly Fruits and Vegetables Loss during Lockdown from 25th March to 3rd May 2020

Legend: PME Loss Fruits in Lakh MT / PME Loss Vegetables in Lakh MT

Lockdown Period	PME Loss Fruits in lakh MT	PME Loss Vegetables in lakh MT
1st Week	0.44	7.39
2nd Week	0.44	7.39
3rd Week	0.37	6.25
4th Week	0.30	5.12
5th Week	0.24	3.98
6th Week	0.24	3.98
First 40 days Total Loss	**2.01**	**34.14**

4. Yearly Production Figures of Horticulture from Economic Survey 2017-18 of Assam, Directorate of Economics and Statistics, Assam Transformation and Development Department. Accessed 29th June 2020.
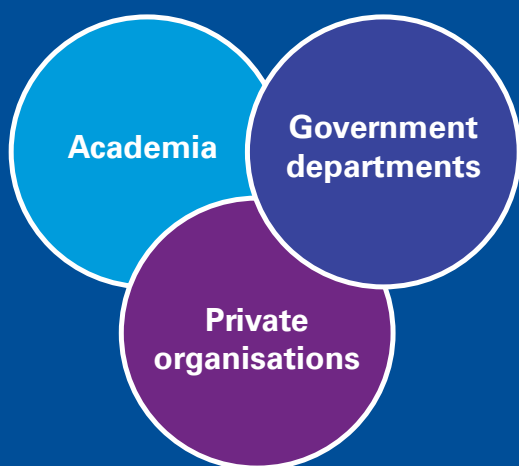
4.3 Qualitative analysis through panel discussion with SMEs of sector

In this section, the panel consensus method is used for qualitative analysis of the impact of events like pandemics on the various sub-components of a sector. In this final step, governments can consult SMEs and other eminent figures of the sector for their opinions and suggestions to arrive at the overall macro-economic impact of any lockdown causing catastrophe.

By implementing short-term relief measures for the critically hit areas, governments can plan for contingencies and devise a roadmap for medium- and long-term strategy to revive the economy especially through setting up of committees and leveraging the knowledge of experts. A well-defined framework for impact assessment for such unprecedented situations cannot be complete without rounds of consultation of top academicians from various government departments and leading universities in the field, including key persons from the private sector and state public-sector enterprises.

Exhibit 6: Verticals for qualitative panel consensus of sectoral SMEs

Academia

Government departments

Private organisations

The inputs from the consultations form the outcome of the **panel consensus** method.

This framework can prove to be very useful for governments when performing impact analysis of situations characterised by such economic standstill as it is generally difficult to obtain ground-level data points in a short span of time.

05 Conclusion

Early adoption and immediate application of the sectoral impact assessment framework for governments that has been put forward in this paper is an economic imperative in the light of the recent fiscal stimulus packages announced by governments world over to tide over the COVID-19 pandemic. The fiscal and monetary measures are to be applied in optimal prioritisation and the right direction keeping in mind the local conditions of the economy being assessed.

Today, when economic sectors have grown considerably big and are vital to growth of countries and states, they are interlinked as well as dependent on several sub-components that make them increasingly vulnerable to a range of risks, with more potential points of rupture and less margin of error for absorbing disruptions of the scale and magnitude witnessed recently.

Though the details of how to create a sectoral impact assessment Framework will vary from industry sector to sector and even from one state to another, the drivers of this framework will continue to be relevant. The framework, when it is devised, will not only be aligned with the 'As- Is' characteristics and functions of sectoral components but also be integral to building a 'To- Be' resilient version of the sector in the future.

Whether it's a black swan type event like COVID-19, an emergency, an act of war or terrorism, regulatory change, labor dispute, or any such lockdown causing catastrophe, the framework strives to empower governments with a ready reckoner containing a valid set of drivers for a reliable and effective methodology to gauge the impact quantitatively and qualitatively of such outlier events on the various sectors of an economy.

KPMG in India Contacts:

Elias George
Partner and National Head
Infrastructure, Government and
Healthcare (IGH)
T: +91 124 336 9001
E: eliasgeorge@kpmg.com

Brijendra Kumar
Partner
Government Advisory Infrastructure,
Government and Healthcare (IGH)
T: +91 95 600 75 707
E: brijendrakumar@kpmg.com

Nilachal Mishra
Partner and Head
Government Advisory Infrastructure,
Government and Healthcare (IGH)
T: +91 120 386 8000
E: nilachalmishra@kpmg.com

Aknowledgements:

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