CONSULTATION PAPER ON CITY GDP MEASUREMENT FRAMEWORK

Smart City
MISSION TRANSFORM-NATION

Ministry of Housing and Urban Affairs
Government of India

150 YEARS OF CELEBRATING THE MAHATMA

Foreword

"Dull, inert cities, it is true, do contain the seeds of their own destruction and little else. But lively, diverse, intense cities contain the seeds of their own regeneration, with energy enough to carry over for problems and needs outside themselves." – Jane Jacobs

By most accounts, Indian cities exemplify Jacobs's description of 'lively', 'diverse', and 'intense'. There is a greater socio-cultural diversities in our cities with strong forces of assimilation and integration. Collectively, people in Indian cities contribute a far higher share in the country's GDP than what their share in the national population. More than one study has confirmed the existence of 'agglomeration economies'. This means that firms and people show higher productivity in cities. By 2050, India is likely to add 416 million population to the world's urban population vis-à-vis 255 million for China. India's rural population is likely to come down by a few million during the same period. All of these underline the status of Indian cities as the true 'engine of growth'. Yet, Indian cities miss one thing that most other engines have – 'a check engine light'.

In other words, there are very few tractable indicators of the economic activity in a city. The Central Statistics Office (CSO) releases all India GDP data disaggregated by rural and urban areas for selected years. There are a few other estimates available from private agencies and researchers but these are again either aggregate urban estimates, or one-off exercises. The lack of this critical data point has led the Ministry of Housing and Urban Affairs (MoHUA) to appoint a team under Technical Assistance for Smart Cities (TASC) to conduct the following activities:

- Explore the availability of suitable data at the national, state and city level which can be used to estimate city level GDP;
- Develop a framework to estimate city level GDP based on available data sets; and
- Estimate city GDP and adjust it suitably to reflect spatial productivity differences.

Several stakeholders are expected to benefit from these estimates including policymakers and planners, private sector and citizens and researchers. Policymakers will be able to use this data to plan for future infrastructure investments and raise finances for the same. The private sector will be able to use this data to complement public investment, strategize business decisions. They will also be empowered to identify 'emerging city economies' – i.e. future investment destinations, beyond the usual metropolitan suspects. Citizens may use this data to make migration decisions, and academicians and researchers will be able to exploit the data to undertake critical research in urban economics and planning. It would also foster a spirit of competition amongst the cities. Our cities are on a path of prosperity except that the economic progress remains unmeasured. We have made a benign attempt to generate annual city GDP statistics with the release of this framework document while recognizing the fact that it may be challenging.

This consultation paper presents the draft framework developed by the TASC, for city GDP estimation. We would like to invite your feedback/ suggestions/ recommendations on the proposed framework, using the feedback link provided on http://smartnet.niua.org/city-gdp and https://www.mygov.in/group-issue/discussion-consultation-paper-city-gdp-measurement-framework/ by 31st March, 2019. We look forward to your participation in this journey.

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New Delhi

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Government of India

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List of abbreviations

Abbreviation	Full-form
AEV	Aggregate Efficiency Value
ALP	Apparent Labour Productivity
ASI	Annual Survey of Industries
BEA	Bureau of Economic Analysis
CEI	Coincident Economic Indicators
CEP	Centre for Economic Performance
CES	Consumer Expenditure Survey
CIBC	Canadian Imperial Bank of Commerce
CPI	City Prosperity Index
CSO	Central Statistics Office
DDP	District Domestic Product
DES	Directorate of Economics and Statistics
DISE	District Information System for Education
DMSP	Defense Meteorological Satellite Program
EIU	Economist Intelligence Unit
EUS	Employment Unemployment Survey
GDP	Gross Domestic Product
GIS	Geographic Informational System
GSDP	Gross State Domestic Product
GST	Goods and Service Tax
GSTN	Goods and Services Tax Network
GVA	Gross Value Added
HPEC	High Powered Expert Committee
IERMB	Institut d'Estudis Regionals i Metropolitans de Barcelona
ILO	International Labour Organization
IMF	International Monetary Fund
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
LAPI	Local Area Personal Income
LSU	Louisiana State University
MGI	McKinsey Global Institute
MHRD	Ministry of Human Resource Development
MPCE	Monthly Per Capita Consumption Expenditure
MUEPA	Ministry of Urban Employment and Poverty Alleviation
NAS	National Accounts Statistics
NCEUS	National Commission for Enterprises in the Unorganised Sector
NDP	Net Domestic Product
NIC	National Industrial Classification
NSC	National Statistics Commission
NSSO	National Sample Survey Office
NVA	Net Value Added
OECD	Organisation for Economic Cooperation and Development
OLS	Operational Linescan System
PDI	Productivity Differential Index
PPP	Purchasing Power Parity
RBI	Reserve Bank of India
SNA	System of National Accounts
TAC	Technical Advisory Committee
TST	Technical Support Team
USA	United States of America
WPR	Worker Participation Rate

1. Introduction

1.1. Background

The relative affluence and standard of living of people in different cities are often measured in terms of per-capita income. However, there is no standardised methodology for estimating city level GDP; similar to the international guidelines on measuring national GDP [SNA, 2008]. In India, while there are multiple estimates of urban GDP available; yet none of these are estimated and published annually.

Globally, there is a recognition of the importance of evidence-based decision making. Data brings evidence. Estimation of city GDP is an attempt to make available data at the city level. Measuring city GDP will enable cities to do better socio-economic and infrastructural planning. It will help in attracting private investment as well as encourage the spirit of competitiveness amongst cities. All these makes it essential to have an estimate of city GDP. It is thus being considered to develop a framework to estimate city level GDP for Indian cities.[1] This consultation paper presents a draft framework for city GDP estimation and has been prepared with an objective to invite feedback/ suggestions/ recommendations on the proposed framework.

A Technical Study Team (TST) under the Smart Cities Mission has studied the different global approaches for the same and reviewed the available datasets in India that could be used for the city GDP estimation. The draft methodology based on this exercise is presented here. Section 1.2 describes the available estimates of urban GDP in India and notes that there are no estimates available at regular intervals. Section 1.3 discusses the power of cities as engine of growth. Section 2 enumerates different stakeholders who stand to gain from the city GDP estimation exercise. Section 3 discusses the global approaches to estimate sub-national and city GDP while Section 4 discusses the methodology followed in India for sub-national GDP estimation. We find from both these sections that the top-down approach to estimate city GDP, using the labour-input method is the most appropriate. Section 5 presents the TST's proposed approach and methodology in some detail. Section 6 proposes the way forward.

1.2. City GDP estimates in India – one indicator, many numbers

It is noted that Central Statistics Office (CSO) estimates rural-urban GDP for base years of National Accounts Statistics (NAS). The latest available rural-urban break up of Net Value Added (NVA) is for the year 2011-12 (National Account Statistics, 2016). It is available at the aggregate country level, by economic activity. The procedure adopted for compiling these estimates is the allocation method in which the activity wise net value added (NVA) is allocated between rural and urban areas.

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[1] It is to be noted that this estimation of city GDP is an analytical exercise to have a reasonable estimate, which can aid in planning and policy making while also providing a comparable benchmark constructed uniformly for all the cities. It should not be construed as a National Income Accounting exercise which CSO and respective DES offices undertake for country or state level. For a thorough review of methodology and the challenges involved in estimating city level GDP in India, please refer to the study: Calculating city level GDP in India: An assessment of methodologies and an evaluation of feasibility (The Economist Intelligence Unit, July, 2018).

Besides CSO, many private agencies and researchers have also estimated urban GDP. Estimates at city level GDP are fewer. Table 1 provides some estimate of Urban/City GDP.

Table 1: Share of Urban Sector in National Economic Activity, Estimates and Sources

	Measure of urban economic activity	Share of urban income in national income	Source
1970-71	Share of Net Domestic Product (NDP)	37.6%	Central Statistics Office (CSO, 2007, 2012, 2016; Chand et al, 2017)
1980-81		41.1%	
1993-94		45.7%	
1999-00		51.7%	
2004-05		51.9%	
2011-12	Share of Net Value Added (NVA)	52.6%	
2009-10	Urban share of GDP	62-63%	Mid-term appraisal to 11th Five Year Plan (Planning Commission, 2013; 2011)
2008	-	Mumbai (USD 209 billion), Delhi (USD 167 billion) Kolkata (USD 104 billion), Bangalore (USD 69 billion), Chennai (USD 66 billion) [All PPP dollars]	PwC (2009)
2008	Share of GDP	58%	McKinsey Global Institute (2010)
2011	Share of GDP (projected)	65%	Overview Document to Jawaharlal Nehru National Urban Rural Renewal Mission (JNNURM) (MUEPA & MoUD, 2005)
2000-01	Method 1: Share of GDP (estimated using urban employment share and average urban wage relative to average all-areas wage)	70%	Mitra and Mehta (2011)
	Method 2: Share of GDP (estimated using urban employment share and average urban Monthly Per Capita Expenditure (MPCE) relative to all-areas MPCE)	59% (Average of method 1 and 2 is 64.89%)	

Note: This table is not exhaustive. There are other studies with urban/city GDP estimates. However, none of the studies provide such estimates on an annual basis.

As noted in Table 1, the CSO releases data for disaggregated rural-urban GDP for selected years between 1970-71 and 2011-12. Typically, it coincides with the year when CSO undertakes the base change exercise of GDP. The latest estimate is more than a half-a-decade old, and not available at city level. Given such paucity of data, non-availability of these estimates at the city level and the important role of cities in economic growth, there are compelling reasons for estimating city GDP and refining it over a period.

1.3. Cities as engine of growth

> *The city is not only the place where growth occurs . . ., but also is the engine of growth itself (Duranton, 2000, pp. 291–292).*

The idea of cities as modern growth centers draws its early inspiration from the work of Jane Jacobs (1969,1984) and has gained momentum with the spread of economics of geography (which propagated agglomeration economies) and new growth theory (which highlighted scale economies). While agglomeration economies traditionally refers to the gain in productivity due to physical proximity or clustering of firms and people, one can extend it by saying - it is also a place of agglomeration of ideas, information, and network. Athens and Sparta are two good examples of city states which influenced world history by their contrasting ideas in Greece beginning with 750 B.C.E. While geography played a critical role in the development of Greek Polis, we now have enough reason to believe that development of city ought to be a part of modern statecraft.

Agglomeration economies operate through scale economies (more people, more choices, more demand and the spiral goes on); lower infrastructure cost per capita, less information asymmetry (physical proximity of people, firm and modern civic centers to exchange ideas); hub of producers, suppliers, artisans (everyone has enough to contribute, collaborate and grow) and ease of networking. One would notice better schools, colleges, universities and training facilities in the city as agglomeration economies push for innovation and help in knowledge spillovers which sets in dynamic efficiency effect. Cities are no longer the hub of only production and exchange activities, they are also the place of germination of ideas on governance and policy making.

A quick review of literature suggests a well-established link between the level of urbanisation and economic growth (Bloom, Canning and Funk, 2008; Fay and Opal, 1999; Jones and Kone, 1996, Duranton, 2009; Overman and Venables, 2005; Rosenthal and Strange, 2004).)[2].

This is true for India as well where lower-income states are less urbanised[3] though the direction of causality needs to be explored. While urban areas contributed between 52.6% and 64.89% of national output in 2011-12 (estimates from different sources) in India, its official share of population (be it state or census definition) is lower than that of rural areas lending support to the argument of agglomeration economies. There are studies which have confirmed the existence of agglomeration

[2] High correlation between economic growth and urbanisation does not necessarily indicate causation. That is, studies have been unable to confirm if urbanisation leads to economic growth or vice-versa.

[3] States with low per capita incomes also have smaller shares of urban population. For example, Bihar, Uttar Pradesh, Madhya Pradesh recorded the lowest per capita Gross State Domestic Product (GSDP) in 2011 and rank 27th ,23rd and 15th in terms of urban share of population (Census, 2011) amongst the 28 states.

economies in India, though there is scope to undertake further research (Lall et al, 2003; Mitra, 2000; Quigley, 2009).

There are several criticism to the view that urban areas are the real catalyst of growth. Notwithstanding the criticism, cities remain as aspirational places evidenced by movement of people from rural to urban areas. Whether people need to move to cities or cities should move closer to the people (urban facilities in rural areas) is a different discussion beyond the scope of this document. Eventually, places would get converted to cities if more people start inhabiting these places with all modern facilities.

2. Why is measuring city GDP important?

Three sets of stakeholders are likely to be benefitted from the estimation of city level GDP – policymakers and city planners, corporate sector and entrepreneurs, and citizens and researchers.

As income and economic opportunities in cities grow, so will inward migration. By 2050, more than half of India's population is likely to be urban (United Nations, 2018). Accommodating this large number of people implies massive investment requirment with long gestation periods. This would be necessary to ensure that issues of over-crowding do not outweigh agglomeration economies. By one estimate, the period between 2012 and 2031 would require an investment of Rs.39.2 lakh crores (at 2009-10 prices) in eight sectors to serve the basic needs of the urban population (MoUD HPEC, 2011)[4]. Better planning is possible if policymakers can have an estimate of the economic size and relative needs of cities. Similarly, cities can benchmark their own earnings and investment requirement against their peers once they understand their cities' size and economic structure. City GDP is a critical data point in this exercise, and is part of the Ministry of Housing Urban Affairs (MoHUA)'s ongoing push to accelerate evidence-based decision-making.

Another Use-case for estimating city GDP is for attracting higher private investment. Investment primarily flows on the basis of expected return; so city GDP is a key ingredient for private sector decision making. If potential investors could gauge the nature and momentum of economic activity in cities, it would help them make targeted investments. While the economic potential of the larger metropolitan areas are known, the city GDP measurement exercise could unearth a number of other cities, whose potential as investment destinations are hitherto unknown. Some could be early investors, i.e., those who reap the benefit of being early movers and others could follow up as the city progresses.

Finally, city level GDP data could be of use to citizens in their decision-making. For instance, city GDP could be one of the data points that individuals consider (apart from the availability of social and urban infrastructure that is captured through other indices – MoHUA's Ease of Living Index, for instance) when making decisions to move to cities. The release of city level GDP data could also open avenues of research in urban economics and planning that is currently limited due to lack of city-level datasets.

[4] The eight sectors are water supply, sewerage, solid waste management, storm water drains, urban roads, transport, traffic support infrastructure and street lighting. This does not cover any social infrastructure such as primary healthcare or education.

3. How city GDP is measured: a panoramic view

Globally, national statistical agencies, supra-national organisations, researchers and academicians have attempted to measure sub-regional or City GDP

Table 2 provides a summary of the approaches. It draws from the documents of various statistical agencies, research papers and the study conducted by EIU (2018).

As is evident from Table 2, there are broadly three approaches (besides eclectic approaches that have surfaced with the advent of data science and technology) to measure city GDP. These could be listed as **a.** Top down approach; **b.** Bottom up approach; c. Proxy measures. These are discussed in the following points:

Top-down approach: In the top-down approach, city level GDP is calculated as a proportion of the national or sub-national GDP. The decision on the *proportion* to be used for this *apportioning* is the differentiating factor between methodologies. For instance, the OECD uses the city's share in sub-regional ('T3' in OECD terminology) population to calculate metropolitan GDP. In contrast, the US Bureau of Economic Analysis (BEA) uses the city's share of state-level incomes (wages and salaries of employees and proprietors' incomes) to apportion state GDP to metropolitan cities. Academics may use a combination of the two approaches. For example, Aguilera et al (2018) estimated a relationship between labour productivity (i.e., Gross Value Added (GVA) to Employment) and average wage at the regional level in Spain. The authors then use this relationship and city level data available for employment and wages to arrive at city level GVA. A third way to apportion national or sub-national GDP is to use the city's share of household expenditure in total household expenditure.

Bottom-up approach: The bottom-up approach requires adding up income, expenditure or output of each economic agent (such as households, firms, government and non-profit sectors) to arrive at the aggregate GDP measure. In essence different branches/units of economic activity needs to be separately and uniquely measured and added up to arrive at the macro figure. It implies use of primary or survey data as well as household or establishment census data to arrive at various sectoral estimates. For example, New Zealand adopts a 'blended' GDP estimation for regional GDP estimation using enterprise surveys. For sectors not covered by the enterprise surveys, top-down apportioning is done based on indicators of the region's performance for those sectors.

Innovative methods using proxies of economic activity: Night luminosity captured by satellites are often used to gauge the economic activity in the city. The methodology involves first estimating a relationship between the measure of nightlights and GDP for administrative units for which GDP data is available. The GDP estimated by this regression equation is then apportioned among its constituent sub-regions (for which GDP data is not directly available) based on the sub-region's share in the region's nightlights (Bundervoet et al, 2013; Ghosh et al, 2010). However, these methods have challenges for estimating city level GDP (Bhandari and Roychowdhury, 2011)

Table 2: Broad approaches of measuring city GDP

Broad approach	Use by agencies	Use in academic or research studies	Learnings for this study
Top down approach using population/ employment data (overall or by sector): apportions the state/ provincial GDP to cities based on the cities' share in population or total workforce in the state.	**UNHABITAT:** As part of its framework to calculate a 'City Prosperity Index', the organisation recommends the computation of a 'City Product per Capita'. This requires a ratio of city employment in a sector to national employment to be calculated. This ratio is multiplied with the national GDP of that sector. This is repeated for each sector, and the resultant numbers summed up to arrive at the figure for 'City Product'. This is then divided by the city's population to arrive at per capita figures. **OECD:** Socio-economic data is available for OECD countries at TL2 (large-regions) and TL3 (smaller area) levels. The organisation defines an urban area as a densely inhabited 'core' and a 'commuting zone' whose labour market is highly integrated with the core. This may include more than one municipality. GIS techniques are used to map municipalities to sub-national regions (T3) of which they are a part and for which GDP data is available. This T3 level GDP is apportioned to the municipality based on its share of T3 level population. Thus apportioned GDPs of the	**Mitra and Mehta (2011)**: Use the UNHABITAT framework for calculating urban areas GDP, with one adjustment. To the sector-wise urban GDP derived using the UNHABITAT method, they multiply the ratio of urban wage to all- areas wage. This adjusts for the productivity differential in urban areas. Given that at the city level, wage data is not available, adjustment is done using the city Work Participation Rate (WPR). **Aguilera et al (2018)**: Estimate the Gross Value Added for Spanish cities by using data on employment and wages. They estimate two ratios at the regional level. One, is 'Apparent Labour Productivity' (ALP) which is the ratio of the GVA to employment. The second is the Average Wage which is the ratio of remuneration to the number of salaried employees. They then regress the ALP on the Average Wage to estimate the relationship between the ratios at the regional level. Using	We propose to use a variant of this method for this study whereby the labour input is taken as a key parameter.

Broad approach	Use by agencies	Use in academic or research studies	Learnings for this study
	different municipalities are summed together to achieve the GDP of the corresponding urban area.	this relationship, and city level data on Average Wage, they find the corresponding city level ALP, and thus the GVA.	
Top down approach using sectoral income data: apportions the state GDP to cities based on the cities' share in sector wise incomes (i.e., wages and salaries, operating profits, rents and interest)	**US Bureau of Economic Analysis (BEA)**: uses earning statistics, obtained through its Local Area Personal Income (LAPI) dataset, to allocate GDP to metropolitan areas. Earnings consist of wage and salary disbursements, supplements to wages and salaries, and proprietors' income. Representing over 60 percent of GDP by industry, earnings are considered to be reasonable indicators of relative levels of economic activity for most industries across geographic areas.	**Barreca et al (2012)**: estimate parish level (a small administrative district) GDP for Louisiana state of USA, using the BEA method where they find the ratio of parish earnings to state earnings and multiply with the state GDP to arrive at the parish level GDP. This is done separately for each industry. If parish level data on earnings is not available for a sector the share of parish employment in state employment is used to apportion state GDP. **Kosareva and Polidi (2017):** Use employee compensation in the city to calculate its GDP in Russia. They assume that the ratio of compensation of employees to GDP in a city equals the average of the corresponding ratios for the country and Moscow. The absolute level of city-wise compensation of employees is available, so they scale that up proportionately to arrive at city GDP.	In India, as documented in EIU (2018), income data is not adequately available to adopt this approach. Annual Survey of Industries (ASI) covers registered factories, i.e., those employing 10 or more workers and using power, as well as those employing 20 or more persons but not using power. There are survey and census sectors within ASI. It covers only manufacturing (focusing on factories) and does not cover services (except for repair services and utilities) or agriculture (primary sector). Also, it is not possible to identify cities from ASI data.

Broad approach	Use by agencies	Use in academic or research studies	Learnings for this study
		Brown and Rispoli (2014): Canada has firm level data on compensation of employees and operating surplus. The authors allocate this to a given city depending on the location of the firm. If the firm has a single location, then all of the compensation of employees and operating surplus is allocated to that city. If the firm has offices in multiple locations, the total compensation and surplus is allocated based on share of firm's total employment in that location. For non-business sector, labour income earned by government and non-profit sector contained in censuses are used. The industry wise incomes so derived are then compared to provincial income to GDP ratio, and the city GDP arrived at, accordingly.	Unincorporated Enterprise Survey conducted by NSSO covers unorganized sector, although this excludes the construction sector, agricultural sector, and mining. It has most of the income variables. Economic census (1998, 2005, and 2013), that covers all establishments (except agriculture, public administration, defence and compulsory social security) does not provide data on wages and emoluments, operating surplus, rent etc.
Top-down approach using expenditure data	While estimating GDP for certain sub-sectors, CSO as well as DES at the state level use the expenditure method for estimation of GVA. For example, while calculating the state level GVA for firewood sub-sector (under the 'Forestry and Logging' sector), total value of firewood is estimated by multiplying per capita firewood consumed	**Mitra and Mehta (2011):** The authors use the UNHABITAT framework for calculating urban areas' GDP (i.e. multiply the GSDP with the ratio of urban areas' workforce to total workforce), with some adjustment for the productivity differential between urban and rural areas. One way in	This approach assumes that household expenditure forms a majority of the expenditure at the city level. It also does not provide any information

Broad approach	Use by agencies	Use in academic or research studies	Learnings for this study
	with population and price of the reference year. Bottom up approach is followed at the state level. Similarly, in calculating district level firewood sub-sector GVA, the DES apportions state level GVA based on the district-wise consumption rates, available in the NSS Consumption Expenditure Survey (CES) as a top down approach.	which they do this adjustment is by multiplying the ratio mentioned above with the share of average monthly consumption expenditure of urban areas in that of all areas.	on the economic structure of the city.
Bottom up approach: building up of consistent regional accounts at the city level	**Statistics New Zealand:** uses a 'blended approach' to measure metropolitan GDP so that economic activity is allocated to regions by directly measuring the activity of local units (through enterprise surveys) and building up regional accounts. The methodology is consistent with national estimates such that sum of GDP of regions equals national-level GDP. For regions/ industries not sampled as part of the enterprise survey, top down approach is used. GDP is allocated to regions by using an 'appropriate regional indicator' to derive regional ratios which are then applied to national industry GDP.		This would be a highly data intensive exercise. India's household and enterprise survey data needs to capture all the elements that are required to estimate the city GDP.

4. Learnings from India's journey of GDP measurement

4.1. Measuring GDP at national and sub-national level

Central Statistics Office (CSO) produces the GDP estimate for the country at quarterly and annual intervals. It periodically updates the base year (latest being 2011-12), increases the coverage of goods and services, incorporates latest survey and census information, improves the estimation procedure as well as adapts to the revised guidelines of Systems of National Accounts. CSO also provides guidance to the State Statistical Agencies on Gross State Domestic Product (GSDP) and District Domestic Product (DDP) estimation. States compile estimates of GSDP on an annual basis by aggregating the contribution of different industry groups. For this purpose, individual economic activities are grouped into a number of compilation categories (See, Annex 2) based on the nature of economic activity and data availability. Both the Central Statistics Office (CSO) at all India level and the Directorates of Economics & Statistics (DES) at the state level use the same compilation categories for estimation to ensure consistency and comparability.

While GDP can be measured in terms of income, expenditure or production approach, a combination of approaches is typically adopted by practitioners given data challenges and suitability of measures in a particular context. Broadly in India, GDP for most of the commodity producing sectors is estimated using production approach while for services it is predominantly income approach. Expenditure approach is used sparsely.

4.2. Practical estimation of national and sub-national GDP

GDP across various levels of economic units are estimated either by the method of allocation ('top down' approach) or direct estimation ('bottom-up' approach) based on the availability of data. While the exact methodology and data sources may differ from state to state, we summarize the broad approach followed by various state government as well as at the national level. Since it is a broad summary, the fine details may not be covered here for each of the sector.

Manufacturing: Measurement of manufacturing GDP differs by the nature of ownership of entities engaged in manufacturing activities like public corporations, private corporations and households or unincorporated enterprises. CSO calculates the public corporations' GVA and allocates to the states based on their sanctioned strength of employees or location of enterprise. It compiles Private corporate GVA using MCA21 database and allocates to states based on state-wise value added in manufacturing as per the last available ASI.

For unincorporated enterprises, there is no such comprehensive database for estimating Gross Value Added despite its economic importance in the country. In 2012, a committee was set up to study the major data gaps relating to unorganised enterprises and unorganised workers and to suggest ways and means for developing a statistical database on the unorganised sector (National Statistical Commission, 2012). So far the study which is often quoted is the NCEUS, 2008 study on unorganised sector.

National Commission for Enterprises in the Unorganised Sector (NCEUS, 2008) defined unorganised sector as consisting of all unincorporated private enterprises owned by individuals or households engaged in sale and production of goods and services operated on a proprietary or partnership basis and with less than 10 workers. Using this definition, the ratio of unorganised sector workers to total workers was 86% in 2004-05. The share of unorganised sector worker in manufacturing and construction sector was estimated as 71.2% and 75.6% respectively. The unorganised sector contributed 49.9% of GDP in 2004-05. In the manufacturing sector, the contribution of unorganized sector to the GDP was 26.8%. In the wholesale and retail trade, and construction sector, the informal sector contribution to GDP was 75.1% and 46.3% respectively. In nutshell, this shows the importance of unorganized sector in Indian economy even though over the years there might be a moderation in unorganized sector share.

Given the data challenges, the estimation of GDP for the unorganised sector (informal, unregistered and unorganised are interchangeably used though each has a specific connotation) is done through the **'labour input'** method. This involves multiplying the value added per worker with the number of workers for benchmark estimates and extrapolating these benchmark estimates with suitable indicators for the annual estimates. The benchmark estimate of 'GVA per worker' is calculated from the NSS Survey of Non-Agricultural Unincorporated Enterprises 2010-11 (henceforth, NSS ES 2010-11). The benchmark estimates of the number of workers comes from the NSS Employment Unemployment Survey 2011-12 (henceforth NSS EUS 2011-12).

District GDP for manufacturing sector is typically calculated by apportioning the state level GDP to the districts on the basis of their share of industrial workers or share in value of industrial output.

Electricity, Gas and Water Supply: The CSO estimates GVA for Public and Private corporate sector uses production approach and allocates to states. GVA for private unincorporated sector is estimated for a base year as wage per day multiplied with the number of working days and allocated to the states based on state-wise annual wages in the activity. For the subsequent years, the growth rate of GVA at current prices of Private Corporate Sector at the national level in this category is used and allocated according to base year proportions.

Service sector (Trade; Hotels & Restaurants; Transport other than Railways; Storage; Communication & Services Related to Broadcasting; Real estate and other services): Like manufacturing sector, measurement of GDP differs by the nature of ownership of entities, namely, public corporations, private corporations and households or unincorporated enterprises. Hence, data on GVA generated by Public Corporations and Private Corporations (excluding quasi-corporations) is taken from Annual Reports of Public Sector Enterprises, budget documents of Departmental Enterprises, ASI and MCA21.

For the **private unincorporated sector** (i.e., households and quasi-corporations), the national GDP and GSDP are estimated through the use of the labour input method using the data from the unincorporated enterprise survey. For district level service sector GDP, a few states have apportioned the state GDP to the districts on the basis of workforce in the district in the sector. Several states have used the 'labour input' method by which they have multiplied the GVA per worker (state estimates) with district labour force in the sector.

Construction: Construction sector is divided into three compilation categories (a) Public sector (b) Household sector (c) Residual sector. The estimates under this sector are compiled using the commodity flow approach. The estimates of GVA for public and private corporations are prepared separately and the households' estimates are taken as residual.

Supra regional sector: Certain activities have no physical state boundaries. The income generated from these economic activities are not restricted to one state. These type of economic activities like railway, communication, finance and central government administration are called supra regional sector. CSO estimates the GDP generated from these sectors and apportions to states based on relevant indicators (e.g. share of the state in vehicle kilometres/ net tonne kilometre per route per day). Certain activities like defense, para military, border security force, high seas drilling etc. are kept outside the purview of the state income estimation.

Agriculture and allied activities: The estimates for these commodity producing sectors are prepared using the bottom-up production approach i.e. measuring the value of output and deducting the cost of input used in the process of production. Value of output is calculated by multiplying current year production volume and price. In the estimation of district GDP if data on production is not available, then state GVA is allocated to the district based on its share of the state's cultivated area. If price of a certain crop at district level is not available, state average price or price available in the neighboring district is taken to calculate value of output.

Mining & Quarrying: This sector is divided into major minerals and minor minerals. In case of major minerals (coal, crude petroleum, natural gas, etc.), CSO estimates the GVA using the production approach and allocates this value amongst states based on the number of employees in each state as a proportion of total employment in that sector. State DES calculate the GVA of minor minerals using the value of output data provided by State Geological Departments. At the district level, either it is apportioned by the state on the basis of district share in major and minor minerals or workers. Wherever production and prices data are available, it is used to arrive at the district level estimates.

4.3. Key takeaways

There are some distinct learnings from the experience of national and sub-national measurement of GDP. First, as we move from the national to sub-national, data availability at a granular level becomes a challenge. Second, wherever data for the bottom up approach is not available, GDP is being estimated either through 'labour input' method or being allocated by the state to the districts on the basis of certain proportions (like employment share). Third, due to the paucity of data, surveys that were conducted several years ago are still being used with certain adjustments.

In Table 3, we have presented the sectors with a mapping of state and district GDP showcasing the usage of labour input method or apportioning of GDP to a smaller geographical unit. It is evident that except the commodity producing sectors (and a few others), sectoral GDP is estimated either by labour-input method (labour productivity – as proxied by GVA per worker, multiplied by the number of workers) or by apportioning by the state to the district. The unavailability of adequate data to estimate GDP of smaller geographical areas prevents the use of the bottom- up approach.

Table 3: Use of labour input or apportioning method to estimate GDP

Economic sector	GSDP (State estimates)	District Domestic Product (State estimates)
Manufacturing by public corporations	Yes	Yes
Manufacturing by private corporations	-	Yes
Manufacturing by households	Yes	Yes
Electricity*	Yes	Yes
Gas*	Yes	Yes
Water-supply*	Yes	Yes
Recycling and sanitation (Remediation)*	Yes	
Construction*	Yes	Yes
Trade, Repair Services, Hotels and Restaurants: Public and private corporations (excluding quasi-corporations)	Yes	Yes
Trade, Repair Services, Hotels and Restaurants: Private unincorporated sector (Quasi-corporations and household sector)	Yes	Yes
Railways	Yes	Yes
Transport by means other than Railways and Storage: Public and private corporations (excluding quasi-corporations)	-	Yes
Transport by means other than Railways and Storage: Private unincorporated sector (Quasi-corporations and household sector)	Yes	Yes
Communication and Services related to Broadcasting: Public and private corporations (excluding quasi-corporations)	Yes	Yes
Communication and Services related to Broadcasting: Private unincorporated sector (Quasi-corporations and household sector)	Yes	Yes
Financial services	Yes	Yes
Real Estate: Public and private corporations (excluding quasi-corporations)		Yes
Ownership of Dwellings: Public and private corporations (excluding quasi-corporations)	-	Yes
Real Estate: Private unincorporated sector (Quasi-corporations and household sector)	Yes	Yes
Ownership of Dwellings: Private unincorporated sector (Quasi-corporations and household sector)	-	Yes
Public administration and defense	Yes	Yes
Other services: Public and private corporations (excluding quasi-corporations)	-	Yes
Other services: Private unincorporated sector (Quasi-corporations and household sector)	Yes	Yes

Note: 1. This is documented on the basis of review of State and District GDP estimate of five states. These are Telangana, Himachal Pradesh, Punjab, Rajasthan and Maharashtra. There may be state specific variation. However, we have tried to capture the predominant characteristics from these measures. 2. All primary sector GSDP for state and districts are calculated by production approach 3. * - These sectors are generally divided into (i) General govt. department and Public corporation (ii) Private corporate and Private unincorporated. 'Yes' mark is given if labour input and/or apportioning method is used in any one segment.

5. Proposed approach and methodology

5.1. Overall approach

The approach suggested to estimate the city GDP is a top-down 'labour input' approach. Essentially, the labour productivity (GVA per worker) is multiplied by the number of sectoral workers to arrive at sectoral GDP estimates. While the broad approach is based on 'labour input', there may be specific variations at places depending upon sectoral or data issues.

As observed in Section 3, the simplest approach of estimating the city level GDP is to multiply the average per-capita GDP derived from the GSDP with the population of the city. The method assumes that average per-capita GDP and economic activities are uniform across all the cities in a state. For example there will be no difference between city A and B's GDP if they belong to the same state and if their population is the same even if they have unique and distinctive economic structures. That makes the method unsuitable for real life application.

To correct for distinctive economic structures between cities, the city GDP could be estimated by apportioning the sector-wise GSDP, based on workers' productivity and the sector-wise number of workers in the city. It is better than the first approach, provided we have reliable estimates of sector-wise GSDP at the state level as well as workforce size at the city level.

Another approach is to multiply the average annual consumption expenditure of the state or district with the population of the city. This method, does not account for the share of savings. It would also be difficult to have a sense of economic structure or characteristics of a city based on the consumption method.

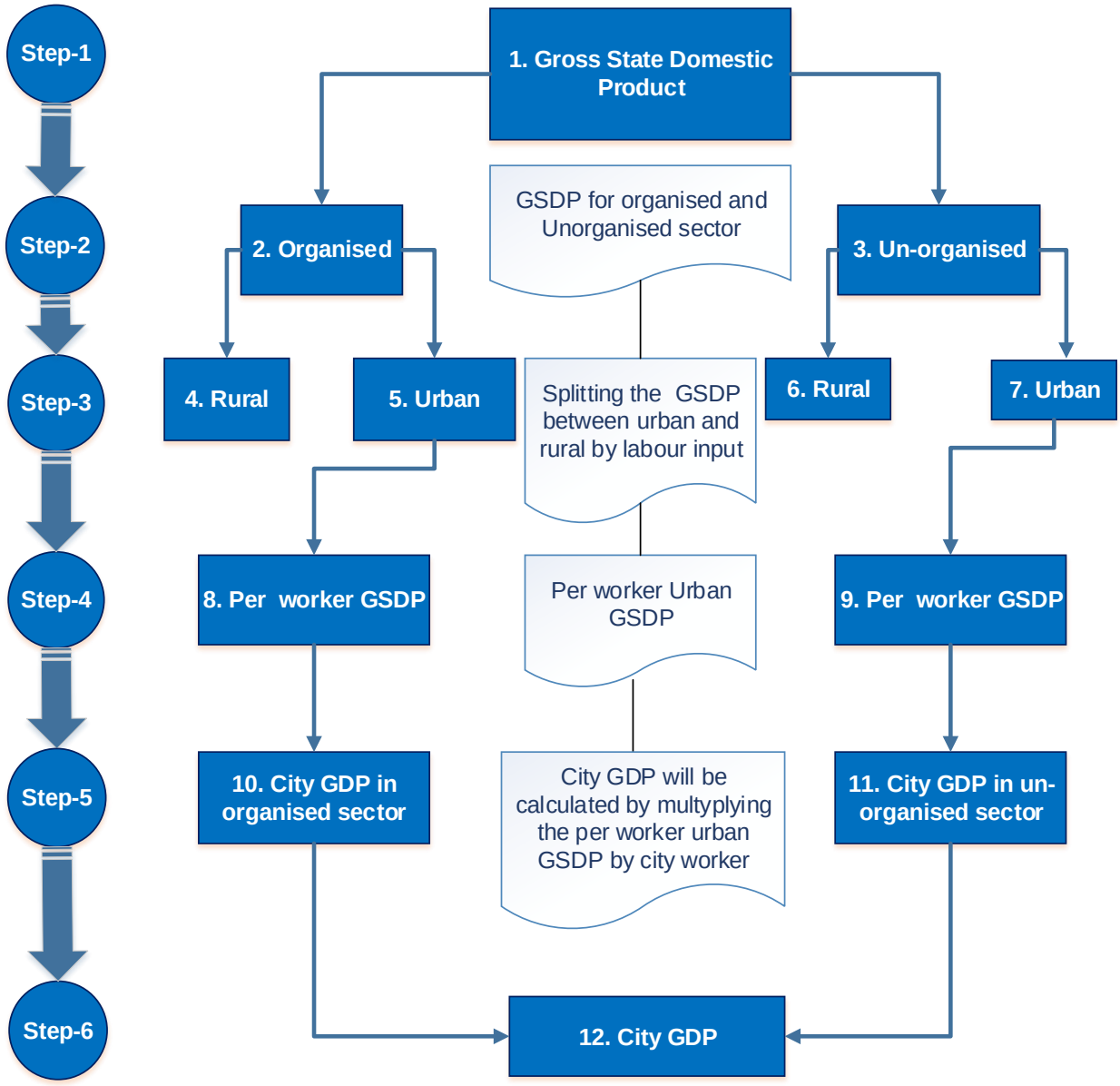
A fourth approach is to apportion the GSDP by using other indicators like business volumes of banks, GST collections, Direct Tax collections etc. in the state and in respective cities, provided such data are available at city level at periodic intervals. However, it would not be very straightforward to derive city GDP from such proxy indicators though tracking the momentum may be possible. While using sophisticated econometric models one can establish certain relationship, it comes with its own technical and non-technical challenges.

In this study, we propose to use a variant of second approach with certain modifications to account for productivity differentials across cities. That is the city GDP will be estimated by labour-input method, based on workers' productivity and the sector-wise number of workers in the city. Spatial productivity differentials between cities can be captured through collection of auxiliary information from various published sources. We are proposing an adjustment factor using a Productivity Differential Index (PDI) based on economic and infrastructure indicators.

To reiterate, the proposed method would produce an approximate value of City GDP, using the labour input method, which is most frequently used in calculation of sub-national GDP. With availability of better data sets, these approaches could be further refined to arrive at better estimates as is standard practice in national income estimates.

In the following diagram, we represent our approach for the sake of ease of understanding.

Figure 1: Overall Approach to estimate City GDP



5.2. Proposed Methodology

Obtain the GSDP data:

City GDP shall be calculated by using labour input method. It will be calculated, subject to data availability, by compilation category for organised and unorganised sectors[5]. The first step is to obtain the GSDP estimates of organised and unorganised sectors separately for each of the compilation categories from the respective state DES. It is understood that – such estimates are available at the DES offices. This will be confirmed during the execution phase.

Split the GSDP into 'rural' and 'urban' components:

Once we have the organised and unorganised sector GSDP data, at the state level, by compilation categories, we need to split each sector by rural and urban shares. This will be done by the labour input method using employment and value added per worker from NSS EUS 2011-12 and NSS ES 2010-11 respectively.

Specifically, the total GVA per worker for urban and rural areas by organised and unorganised sector, will be multiplied with the number of workers in each sector. This will give us the total GVA in the state for every sector for each compilation category. Subsequently, we will arrive at multiplier factors to divide the state Gross Domestic Product *(GDP)* into rural and urban shares[6]. The multiplier factor (say, $\lambda 1$ and $\lambda 2$) will be calculated by taking the share of urban GVA in total GVA for organised and unorganised sectors respectively.

The NSS ES 2010-11 does not cover the Primary sector, Construction and Govt. enterprises. In the absence of GVA data in these cases, we may calculate the multiplier by taking other proxies like rural and urban workers share in organised and unorganised sectors derived from the NSS EUS 2011-12.

Arrive at per worker Urban GSDP by economic activity:

The multipliers will be applied on state GSDP data for the latest year to obtain the urban GSDP of the state for each compilation category. After getting the urban GDP of the state, per worker urban GSDP will be calculated by dividing the urban GSDP with the number of urban workers. The urban workforce for the latest year will be calculated by applying the worker participation rate (WPR) 2011-12 on the projected state population for the latest year. We will use the same distribution of workforce as given in the NSS EUS 2011-12 across

[5] In a recent consultation with various stakeholders, it was discussed that organised and unorganised sector break-up may not be necessary in the context of this study. This is a welcome suggestion and during the course of this study, the team will examine this aspect.

[6] We will take the worker size class criteria to split the industries into organized and unorganized following the suggestions of NCEUS (2008).

organised and unorganised sector, and industry group on the projected workforce for the latest year.

Arrive at city GDP by economic activity:

After getting the per worker urban GSDP, we will multiply it with the number of city workers to get the city GDP for each compilation category in organised and unorganised sector and finally sum it up to arrive at aggregate city GDP. There may be sample size issues while calculating the city workforce from the NSS EUS. To overcome the problem, we may pool the center and state sample to make it a sizable sample size for estimation. Besides, we will also explore other datasets that may provide estimates for workers at the city level (like economic census, population census etc.).

5.3. Accounting for spatial differences in productivity

Spatial differences in productivity between different cities may not be fully captured through the above method, even though the difference in lieu of city workforce and rural - urban sectors will be captured. To overcome this challenge, we propose to calculate an adjustment factor by using a 'Productivity Differential Index'.

Numerous factors affect productivity differentials between cities. These may be cultural, social and ethnographical factors as well infrastructure (physical and social), skill and type of workforce, type of enterprises (own account enterprises and establishment), ownership of enterprises (state owned or privately owned), industry group etc. There are tangible factors (visible/measurable) and intangible factors (difficult to measure like cultural bias) that come to play. There is no way one can capture all these aspects. Even if for the time being we set aside the soft factors, productivity differential due to nature of enterprise and physical and social infrastructure could be captured.

A. Productivity Differential Index as per nature of enterprise

We are proposing to develop a Productivity Differential Index (PDI). There is a risk of increasing its ambit by way of incorporating too many variables and losing the differential power of the index. Therefore, we will construct the PDI in a parsimonious manner:

$$PDI = f(Industry\ Type, Ownership\ Type, Enterprise\ Type, Industry\ Size)$$

Step A: We will use all-India (or state specific) data to calculate a measure of efficiency, called the Aggregate Efficiency Value (AEV). For example, this could be partial or composite productivity of labour and capital with or without control variables.

Step B: We will then distribute the AEV values by industry type, ownership type, enterprise type and size to calculate an average AEV which would be known as productivity differential index (PDI). It would be in a form of a large matrix with each cell representing a specific combination of characteristics.

Step C: The PDI values shall be applied on the city GDP to reflect the efficiency aspect depending upon the economic structure of the city.

B. Productivity Differential Index as per infrastructure development

Social infrastructure like school, college, health facilities etc. are critical human capital augmenting factors. However, given the free flow of human capital in the country, we assume this not to be a binding constraint for productivity augmentation. The factors that can be taken into account include available physical infrastructure like roads, ports, electricity etc. We can collect those datasets from various published and official sources and can construct an index to apply it on city GDP as a correction factor.

5.4. Additional Moderators

As an additional correction factor to city GDP, we may use auxiliary information by constructing an index of city dynamism. The index would provide an indication of city activity momentum by aggregating various fast-moving indicators of the city's economic activity. It would be designed in a way that captures city's level of economic activity, year on year, and also allow comparison across cities. However, the challenge is to obtain such data at the city level as micro level information is quite sparse.

City-level economic activity is already being measured in countries like USA (Chicago Fed National Activity Index, Detroit Economic Activity Index, Indexes of Coincident Economic Indicators (CEI) for the New York-New Jersey Region), Canada (CIBC Metropolitan Economic Activity Index), which use an assortment of macro-variables, viz, population growth, employment growth, housing resales, building permits, payroll data, average working hours, etc. In India too, efforts have been made to estimate city economic activity through night-lights (Economic Survey (MoF), IDFC).

We propose below a list of indicators that can potentially be useful in the construction of the index. An appropriate aggregation methodology would be employed to group these indicators into sub-categories to form one consolidated summary measure of economic activity. However, final inclusion of the variables would be decided on the basis of data availability, frequency and observed momentum.

Table 4 gives a list of indicators for city level economic activity index.

Table 4: Proposed List of Indicators

Category	Indicator	Source
Population	Projected Net addition to workforce [in age group: 15 to 59 years]	Census of India (Classification of workers by age group is available at District Level*)
Agriculture	Sales at Mandis/markets	Agmarket (Ministry of Agriculture and Farmers Welfare)
Industries	GST returns filed/TDS deducted	Commercial Tax Department/GSTN/Income Tax department
	No. of new Factory Permits	Respective City Municipal Corporations/ Municipal Bodies (Registrations data) and Ministry of Corporate Affairs
	No. of New Company Registrations	

Category	Indicator	Source
	No. of New Trade Permits	
	No. of New Hawker Registration	
	New Corporate Headquarters Established	Ministry of Corporate Affairs
Electricity	No. of new metered connections (industrial and residential)	Respective City Municipal Corporations/ Municipal Bodies and DISCOMs
	Electricity charges collected by utilities	
Water	No. of new metered connections (industrial and residential)	Respective City Municipal Corporations/ Municipal Bodies, Water Board
	Total water consumption by consumer category	
Communication	No. of new telephone/mobile connections (industrial and residential)	Telecom Regulatory Authority of India (circle-wide data)
Construction	No. of new construction permits filed	Respective City Municipal Corporations/ Municipal Bodies (Registrations data)
Automobile	New vehicle registrations (an indicator for vehicle sales)	Regional Transport Office/Automobile Associations
Fuels	Consumption of Petrol/Diesel	Petroleum Planning & Analysis Cell (State wise data available)/ Oil Marketing Companies
Trade	Inter-State Movement of Goods-Freight transport (Using GST E-WayBill data)	Respective state's Commercial Tax Department
Financial and Insurance activities	Deposit and Credit Growth	RBI (District Level Data Available)*
Real Estate	Property Registration Data (Residential and Commercial)	Municipal Corporation (Registrations)*
	Housing Price Index	National Housing Bank
Travel	Railway/Air passenger arrivals	Directorate General of Civil Aviation, Indian Railways
Education	Enrolment at Primary Level	Unified District Information System for Education (DISE), MHRD
	Enrolment in Higher Education Institutes	MHRD
Economic Activity	Night Luminosity	Various publicly available satellite imagery

6. Way forward

We will be forming a Technical Advisory Committee (TAC) with officials from statistical agencies (Centre and State), subject matter experts, city representatives, academia/researchers within a month from the release of this paper. We solicit responses from all the concerned stakeholders within a month as well. The TAC and the Technical Study Team (TST) shall jointly discuss all the feedbacks/suggestions and suitably address those in the methodology. We will be finalising the methodology within three months of release of this framework. Within three months from the finalization of the methodology, the TST shall produce the first set of city GDP estimates for the review of TAC.

Annex 1: Summary of Stakeholder consultation

The study team has consulted various experts including Niti Aayog while preparing this framework document for city GDP[7]. There were several constructive suggestions received during such interactions which have been incorporated in the methodology section or clarified here in this section. The consultation process is still underway. Going forward, there will be several rounds of consultations with all the important stakeholders for this assignment.

Some of the major suggestions are summarised below:

Spatial productivity differentials: It is observed that cities may exhibit differential productivity level depending upon the nature of industry, level of infrastructure development as well as availability of various intermediate inputs etc. Therefore, it should be taken into account in the study; [Note: This suggestion has been incorporated in the proposed methodology. This will also take care of the observation on spatio-temporal aspect of city GDP.]

Sample size: It is observed that sample size may be small for various cities in the NSSO data. Therefore, adequate sample must be taken into account. [Note: Team has addressed this by way of proposing to use the workforce participation rate from NSSO or from similar database while using the census population to arrive at actual workforce. Moreover, the team is proposing to use pooled sample instead of only central sample wherever it is feasible and available.]

Organised and unorganised sector: Some experts observed that a differentiation between these sectors may not be necessary for this exercise; while others commented that bringing out such differences may be a critical aspect. For example, organised and unorganised sectors face differential scale and technical efficiencies. Finance which is a core requirement to grow a business is not evenly distributed or available in the similar fashion to organised and unorganised sectors. Therefore, there may be some differences in productivity between organized and unorganized sector. [Note: the Team has noted this point and shall take appropriate measures while analyzing the data. If there is no significant difference between

[7] While preparing this consultation paper, the DFID supported Technical Assistance to Smart Cities (TASC) Team benefitted from the interactions with NITI Aayog, experts from Indicus Foundation and Institute for Competitiveness, Prof. Luis Bettencourt, The University of Chicago, Prof. Partha Mukhopadhyay and other representatives of civil society/academia/researchers/ corporates/govt. officials. While the team has made every attempt to suitably address the comments/feedbacks received, the approach proposed in this document is solely by the TASC Team of this study (Dr. Govindaan Raveendran, Dr. Manoranjan Pattanayak, Nidish Nair, Ajaya Kumar Naik, Devkanya Chakravarty)

both the sectors or if identical data is not available from across the states, such distinction may be done away with.]

Using District GDP data for city GDP construction: It is observed that instead of taking state GDP, we can possibly look at district GDP and use appropriate measures to distribute it across cities in a district. [Note: For all the states, district GDP is not available. Also, it is not available in the same price series and periodicity. Moreover, different states follow different methodology to construct district GDP. Therefore, its suitability for city GDP construction needs to be explored more.]

Use additional information: It is suggested that multiple other high frequency data such as credit flow, telecom, rail, air transport etc could be used. [Note: Team has already incorporated these in the methodology. These would be considered subject to data availability in a uniform manner for all the cities.]

Develop an index for city economic activity: There are suggestions that instead of city GDP, a city economic activity index could be constructed. [Note: Team has already incorporated in the methodology. However, the objective of this assignment is to arrive at city GDP estimates which can be used for various policy purposes. Therefore, only an index would not serve the purposes.]

Using GIS or nightlight data: There are suggestions that GIS information or nightlight data could be used for city GDP construction. [Note: While such information could provide additional information, it is yet to be used in a large scale by statistical agencies for sub-national GDP measurement. Besides, it's efficacy in the context of India is yet to be proved. Given the share of unorganized sector and type and size of cities, these measures may not provide an unbiased estimates.]

Limits of city: Various points raised on city geography/boundary. It is suggested that it should be clarified what a city means for this study. [Note: It was clarified that a city would be defined according to the Census demarcation and not by municipal limits following the approach of NSSO.]

Annex 2: CSO Compilation categories and concordance with NIC 2008

Sl. No.	Compilation Category	NIC 2008
	Agriculture, forestry & fishing	
1.1.	Crops & Livestock	01
1.2.	Forestry	02
1.3.	Fishing & aquaculture	03
2.	**Mining & quarrying**	**05-09**
3.	**Manufacturing**	
3.1.	***Manufacturing of food products, beverages and tobacco***	
3.1.1.	Production, processing and preservation of meat, fish, fruit, vegetables, oils and fats	101-104
3.1.2.	Manufacture of dairy products	105
3.1.3.	Manufacture of grain mill products, etc. and animal feeds	106+108
3.1.4.	Manufacture of other food products	107
3.1.5.	Manufacture of beverages	11
3.1.6.	Manufacture of tobacco products	12
3.2.	***Manufacturing of textiles, apparel & leather products***	
3.2.1.	Manufacture of textiles + cotton ginning	13+01632
3.2.2.	Manufacture of wearing apparel, except custom tailoring	14-14105
3.2.3.	Manufacture of leather and related products	15
3.3.	***Manufacturing of metal products***	
3.3.1	Manufacture of Basic Iron and Steel + Casting of iron and steel	241+2431
3.3.2.	Manufacture of basic precious and non-ferrous metals + Casting of non-ferrous metals	242+2432
3.3.3.	Manufacture of fabricated metal products, except machinery and equipment	25
3.4.	***Manufacturing of machinery and equipment***	
3.4.1.	Manufacture of electronic component, consumer electronics, magnetic and optical media	261+264+268
3.4.2.	Manufacture of computer and peripheral equipment	262
3.4.3.	Manufacture of communication equipment	263
3.4.4.	Manufacture of optical and electronics products n.e.c	265+266+267
3.4.5.	Manufacture of Electrical equipment	27
3.4.6.	Manufacture of machinery and equipment n.e.c	28
3.4.7.	Manufacture of Transport	29+30
3.5.	***Manufacturing of other goods***	
3.5.1.	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting material	16
3.5.2.	Manufacture of paper and paper products	17
3.5.3.	Printing and reproduction of recorded media except publishing	18
3.5.4.	Manufacture of coke and refined petroleum products	19

Sl. No.	Compilation Category	NIC 2008
3.5.5.	Manufacture of chemical and chemical products except pharmaceuticals, medicinal and botanical products	20
3.5.6.	Manufacture of pharmaceutical; medicinal chemicals and botanical products	21
3.5.7.	Manufacture of rubber & plastic products	22
3.5.8.	Manufacture of other non-metallic mineral products	23
3.5.9.	Manufacture of furniture	31
3.5.10.	Other Manufacturing	32
3.5.11.	Repair and installation of machinery and equipment	33
4.	**Electricity, gas, water supply and other utility services**	
4.1.	Electricity	351
4.2.	Gas – Manufacture & distribution	352+353
4.3.	Water Supply	36
4.4.	Sewerage, waste management and remediation activities	37,38,39
5.	**Construction**	**41,42,43**
6.	**Trade, repair, hotels & restaurants**	
6.1.	**Trade & repair services**	
6.1.1.	Trade and repair of motor vehicles (including motor cycles) and retail sale of automotive fuel	45+473
6.1.2.	Wholesale trade except of motor vehicles and motor cycles + Wholesale of lottery tickets	46+92001
6.1.3.	Retail trade except of motor vehicles and motor cycles + retail sale of lottery tickets	47-473+92002
6.1.4.	Repair of computers and personal and household goods	95
6.2.	**Hotels & Restaurants**	**55, 56**
7.	**Transport, storage, communication & services related to broadcasting**	
7.1.	**Transport**	
7.1.1.	Transport via Railways	491
7.1.2.	Road transport	492
7.1.2.1.	Mechanized Road Transport	492-49226-49232
7.1.2.2.	Non-mechanized Road Transport	49226+49232
7.1.3.	Water Transport	50
7.1.4.	Air Transport	51
7.1.5.	Services incidental to transport	522
7.2.	**Storage**	**521**
7.3.	**Communication & services related to broadcasting**	
7.3.1.	Postal activities	531
7.3.2.	Courier activities	532
7.3.3.	Activities of cable operators	61103
7.3.4.	Telecommunication	61-61103
7.3.5.	Recording, Publishing and Broadcasting services	58,59,60
8.	**Financial Services**	**64,65,66**
9.	**Real estate, ownership of dwellings and professional services**	
9.1.	**Real estate and ownership of dwellings**	**68**
9.1.1.	Real Estate activities	68 – 681 (p)

Sl. No.	Compilation Category	NIC 2008
9.1.2.	Ownership of dwellings	681 (p)
9.2.	**Professional services**	
9.2.1.	Computer and information related services	62,63
9.2.2.	Professional, scientific and technical activities (including R&D)	70 to 75
9.2.3.	Administrative & support service activities and other professional activities	
9.2.3.1.	Legal activities	691
9.2.3.2.	Accounting & book keeping activities	692
9.2.3.3.	Rental and leasing services	77
9.2.3.4.	Administrative and support services excluding rental and leasing services	78 to 82
10.	**Public Administration and defense**	**84**
11.	**Other Services**	
11.1.	Education (including coaching and tuition)	85
11.2.	Human health activities and care services with/without accommodation	86,87,88
11.3.	Recreational, cultural and sporting activities	90,91,92 (-92001, 92002),93
11.4.	Activities of membership organisations	94
11.5.	Personal Services & Other Services, n.e.c	
11.5.1.	Washing & cleaning of textiles and fur products	9601
11.5.2.	Hair dressing and other beauty treatment	9602
11.5.3.	Custom tailoring	14105
11.5.4.	Other personal service activities	9609,9603
11.6.	Private households with employed persons	97

Annex 3: Possible Compilation Category

Sl No.	Sector	NIC Codes
1	Agriculture-Crop production	011+012+013+015+016+021+022 +023+024
2	Animal Production & Fishing	014+017+031+032
3	Mining & Quarrying	Section B
4	Manufacturing	Section C
5	Electricity, Gas & Water Supply	Section D + Section E
6	Construction	Section F
7	Trade	Section G
8	Transport & Storage	Section H
9	Accommodation & Food Services	Section I
10	Information & Communication services	Section J
11	Financial & Insurance services	Section K
12	Real Estate activities	Section L
13	Professional, Scientific & Technical activities	Section M
14	Public administration & Defense & Administrative Support Services	Section N and O
15	Education	Section P
16	Health & Social work	Section Q
17	Arts, Entertainment & Recreation & other service activities	Section R + Section S
18	Activities of households as employers	Section T
19	Activities of Extra-Territorial Organizations & bodies	Section U

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