

NASA releases images from James Webb Space Telescope (GS Paper 3, Science and Tech)

Why in news?

- The James Webb Space Telescope began releasing a new wave of cosmic images, heralding a new era of astronomy.
- It revealed the clearest image to date of the early universe, going back 13 billion years.



Details:

- In the latest images, the telescope has revealed stunning details of the **Southern Ring planetary nebula** that were previously hidden from astronomers.
- The extraordinary images show the last moments of a star as it delivers a final performance of light, gas and dust before bowing out of the universe.

What are nebulae?

- Planetary nebulae are the **shells of gas and dust** ejected from dying stars. The James Webb Telescope's powerful infrared view brought this nebula's second star into full view, along with exceptional structures created as the stars shaped the gas and dust around them.
- These new details from the late stages of a star's life will help better understand how stars evolve and transform their environments.
- These images also reveal a cache of distant galaxies in the background. Most of the multi-coloured points of light seen here are galaxies not stars.

What happens when a star 'dies'?

- The 'death' means that a star, which is essentially a gigantic hot ball of gases, has run out of its nuclear fuel primarily helium and hydrogen. What happens to the star after it's death depends on its size or mass.

Supernova:

- Bigger stars (at least five times the mass of our sun) collapse on themselves and the outer layers explode in a 'bang', a phenomenon known as '**supernova**'. Supernova is the largest explosion known to man.

- After a supernova explosion, a ‘neutron star’ the collapsed core of the star is left behind. If there’s sufficient mass, a black hole is formed.
- A black hole is a spot in space where gravity is so strong that even light cannot escape its pull. The gravity is so strong because matter has been squeezed into a tiny space.

Planetary nebula:

- Smaller stars (like our sun), however, die less dramatically. As their nuclear material (hydrogen) is used up, they expand (instead of collapsing) to become ‘red giants’.
- They do this by fusing helium in their cores, before shedding their outer layers, often forming a ‘planetary nebula’. The star’s core continues to ‘live on’ as a ‘white dwarf’, which cools off over billions of years.

The southern ring nebula:

- Two cameras aboard the James Webb Telescope captured the images of the Southern Ring Nebula, formally known as **NGC 3132**, which is approximately 2,500 light-years away. One light year is approximately 9 trillion km away from the earth.
- The star in the centre of the picture above has been sending out rings of gas and dust for thousands of years in all directions, and the James Webb Space Telescope has revealed for the first time that this star is cloaked in dust.
- The stars and their layers of light are prominent in the new image from Webb’s Near-Infrared Camera (NIRCam) on the left, while the image from Webb’s Mid-Infrared Instrument (MIRI) on the right shows for the first time that the second star is surrounded by dust. The brighter star is in an earlier stage of its stellar evolution and will probably eject its own planetary nebula in the future.

About James Webb Space Telescope:

- The NASA led the telescope's development in collaboration with the European Space Agency (ESA) and the Canadian Space Agency (CSA).
- Launched in December 2021 from French Guiana on an Ariane 5 rocket, Webb is orbiting the Sun at a distance of a million miles (1.6 million kilometers) from Earth, in a region of space called the second Lagrange point.
- Here, it remains in a fixed position relative to the Earth and Sun, with minimal fuel required for course corrections.
- Webb's primary mirror is over 21 feet (6.5 meters) wide and is made up of 18 gold-coated mirror segments. Like a camera held in one's hand, the structure must remain as stable as possible to achieve the best shots.
- After the first images, astronomers around the globe will get shares of time on the telescope, with projects selected competitively through a process in which applicants and selectors don't know each other's identities, to minimize bias.

The JWST observatory is equipped with the following instruments:

- Near Infrared Camera (NIRCam)
- Near Infrared Spectrograph (NIRSpec)
- Mid Infrared Instrument (MIRI)
- Fine Guidance Sensors/Near Infrared Imager and Slitless Spectrograph (FGS/NIRISS)

One Health: What it is & how it can be implemented in India

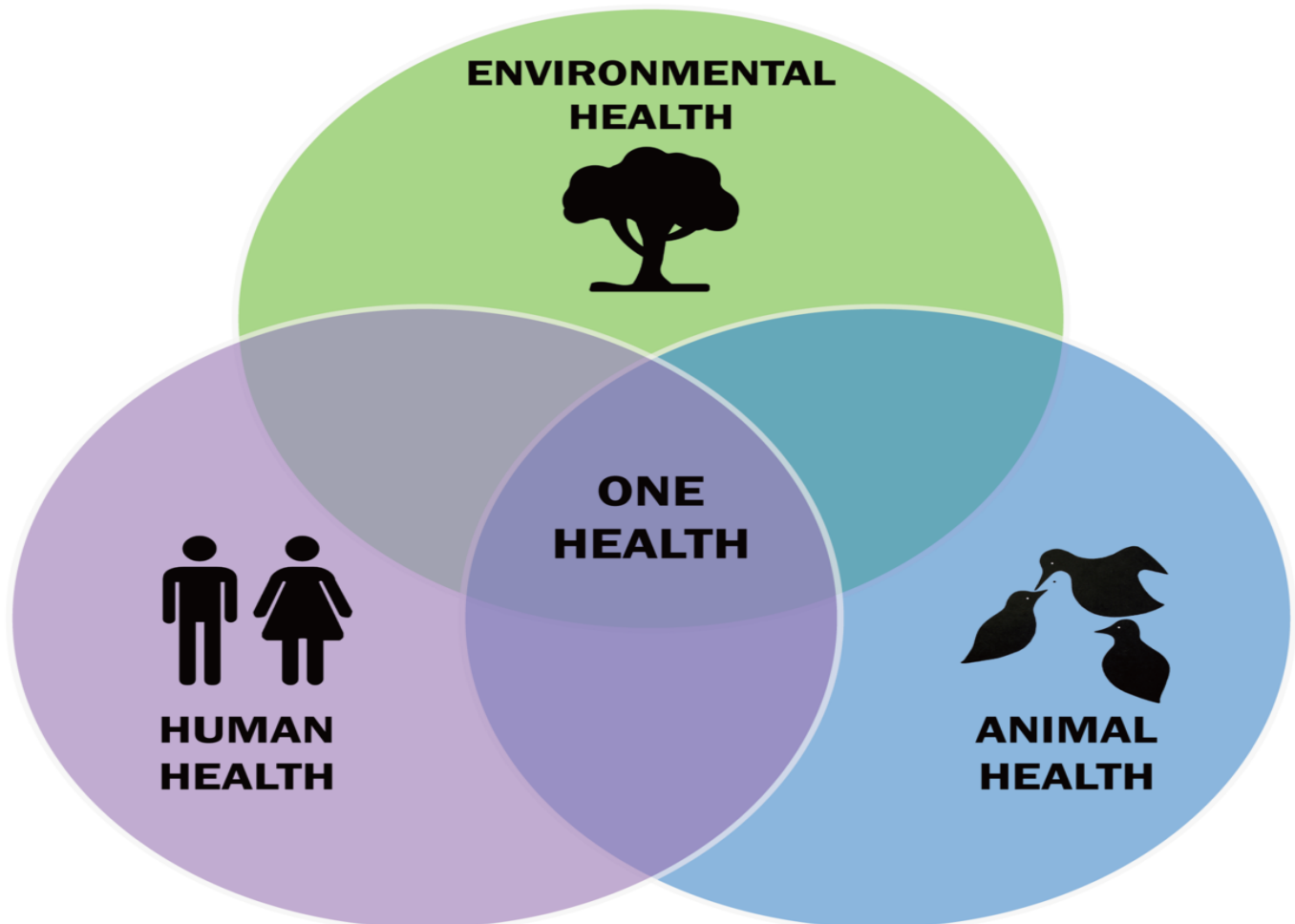
(GS Paper 2, Health)

Why in news?

- The **Food and Agriculture Organization of the United Nations (FAO)**, the **World Organization for Animal Health (OIE)** and the **World Health Organization (WHO)**, under their **tripartite agreement** and in **collaboration with the United Nations Children's Fund (UNICEF)** and the **World Bank**, have developed a joint strategic framework to **implement the One Health approach**.
- The framework aims to **assist national authorities** in initiating steps to strengthen efforts towards the control of zoonoses and AMR in a comprehensive manner through collaborative activities among various sectors for a healthier and productive human and animal population co-existing in a safe environment.

Background:

- ‘Pandemic-preparedness plans’ are already under consideration among major international bodies to thwart pandemic in the future. The multi-disciplinary approaches of ‘One Health’ are central to these plans.
- The core of the One Health approach is rooted in **acknowledging and understanding the interdependence of human and natural systems** to obtain optimal health for people, animals and the environment.
- About 60 per cent of the known infectious diseases in humans and **75 per cent of all emerging infectious diseases** are **caused by pathogens that originate in animals**, according to the Centers for Diseases Control and Prevention.



One Health can have the following benefits:

- a) Reduce potential threats at the human-animal-environment interface to control diseases that spread between animals and humans
- b) Tackle anti-microbial resistance (AMR)
- c) Ensure food safety
- d) Prevent environment-related health threats to humans and animals
- e) Protect biodiversity

One Health concept:

- The One Health concept is not new but its importance to address the **complex health and environmental challenges** has become more prominent in recent years.
- This is because potential solution to these problems can only be understood when **human, animal, and environmental health questions are evaluated in an integrated** and holistic manner rather than in siloed approaches.

- An important aspect of such an integrated approach is the systematic collection of data on the occurrence of infectious diseases and related behaviours in both humans and animals.

Implementation:

- Improved collaboration, coordination and commitment of relevant sectors to minimise the impact of these diseases on human health is also a salient feature.
- The implementation of One Health can be driven by **policies** (legislations and regulations, financing), knowledge sharing, institutional collaboration, **joint programmes and operational plans**, advocacy and awareness amongst policy makers and professionals, engagement of civil society and active community participation.

Efforts by India:

- In India, efforts have been made to bring human and animal health together. There have been instances of **collaboration at national and state levels** to combat specific diseases or to overcome disease outbreaks such as the **national influenza pandemic committee** to control avian influenza, rabies in the Tamil Nadu and other states.
- Institutes like the Indian Council of Medical Research (ICMR) and the Indian Council of Agricultural Research (ICAR) have collaborated for joint research priorities, mostly to control disease outbreaks and also at individual levels between human and animal health researchers as well as practitioners.
- The **Integrated Disease Surveillance Project, launched in 2004** for disease outbreak detection and rapid response functions, has generated several information on flow of certain disease outbreaks but the programme has been unable to integrate human and animal (livestock and wildlife) surveillance.

Road Map to Combat Zoonoses (2008):

- A multi-disciplinary **Road Map to Combat Zoonoses (2008)** was laid to create an integrated mechanism for surveillance, detection and treatment of zoonoses.
- It identified several strategies for research and actions, but an integrated surveillance, involving human, domestic and wildlife for long-term monitoring on a large scale have failed to materialise. As a result, the burden and dynamics of emerging and re-emerging infectious diseases is yet to be understood.
- But recently, there have been several proactive steps which acknowledge the relationships between biodiversity loss, changing land use patterns and zoonotic diseases.

National Mission on Biodiversity and Human Well-being :

- The **National Mission on Biodiversity and Human Well-being** built on a framework that integrates biodiversity, ecosystem services, climate change, agriculture, health, bio-economy and capacity-building in the realm of biodiversity science has one mission component that explicitly links biodiversity to human health through the One Health approach.

Dedicated Centre:

- The Government of India decided to set up a **dedicated centre under ICMR to contain zoonotic diseases** — the **Centre for One Health at Nagpur**, and also constituted a 'National Expert Group on One Health' to promote multi-sectoral, transdisciplinary, collaboration and co-operation to adopt and implement a One Health framework in India.
- In the past, India has combatted several zoonotic diseases and has a robust institutional network for biomedical research, which can lead and operationalise the One Health approach.

The strategy element involves:

- a) Improving the capacity for public health actions in major stakeholders human health, animal health and environment management
- b) Understanding and responding to the drivers that threaten health; optimising the effectiveness of public health systems in achieving these goals within each sector
- c) Institutionalise strong, continuous and mutually beneficial coordination and collaboration between all stakeholders through multi-disciplinary and multi-institutional joint planning and implementation.

Way Forward:

- For One Health science, it is important to develop databases and models with a consolidated approach of ecologists, field biologists, epidemiologists and other scientists.
- Therefore, a nexus of science, social science, indigenous knowledge and policy at national, state and local levels can put forward strategies and institutions for implementation of One Health.

Create more jobs, revamp employment policy

(GS Paper 3, Indian Economy)

Why in news?

- The Government of India has recently announced its plan to create 10 lakh government jobs in the next 18 months. Of about 40 lakh sanctioned posts, 22% posts are now vacant and the Government will fill these posts in 18 months.
- Though the announcement has been called a “historic step in the interest of the youth” and as “raising a new hope and confidence among youth”, the plan has serious problems.



Vacancies:

- There are as many as 8.72 lakh positions that were vacant in various departments of the Central government, according to the Ministry of State in Personnel, Public Grievances and Pensions.
- If various positions in public sector banks, the defence forces and police, the health sector, central schools and central universities, and the judiciary are added, then the number touches about 30 lakh posts. This number does not include vacancies in State government jobs.
- As sanctioned posts broadly indicate the required posts needed to run a government, it appears that this government is perhaps facing a serious shortage of staff, which is then causing long delays in work, corruption and maybe other inefficiencies.
- The Government, however, has not made any complaints about such shortages in recent years.

‘Quality’ as issue:

- Another major concern is about the quality of employment that will be generated through this plan. The share of contract workers in total government employment has been increasing rapidly in recent years, from 11.11 lakh in 2017 to 13.25 lakh in 2020 and to 24.31 lakh in 2021.

- In addition, there are “**honorary workers**” such as **Anganvadi workers**, their helpers, accredited social health activist (ASHA) workers, etc.
- These employees of the government earn a lower salary (consolidated wages), and are not entitled to “decent work” conditions (International Labour Organization recommendations) including a minimum package of social security.
- The Government must ensure that the employment generated under its plan will be of a standard quality. There has been no assurance so far on this by the Government.

High Unemployment:

- The total labour force in the country stands at 437.2 million (April 2022 data). At a labour force participation rate of 42.13%, the unemployment rate of the youth is about 20% at present.
- Given the backlog of about 30 million unemployed people and an annual addition of 50 lakh-70 lakh workers every year (World Bank), the dimensions of India’s unemployment problem today are formidable.
- The generation of a mere 10 lakh jobs in the next 18 months is too little. This scheme of the Government will hardly provide any relief to the youth of the country; and will not have much of an impact on the present unemployment problem.

Need for Government intervention:

- It is important to note here that the performance of the private sector in creating employment opportunities has remained dismal.
- Currently, when the economy is still struggling to overcome the shocks caused by the novel coronavirus pandemic, and when private final consumption expenditure has not crossed the pre-pandemic level, **private firms are being seen to be managing their profit margin by cutting costs** (in the form of rationalising wage bills).
- In this situation it is all the more important for the Government to ensure as many jobs as possible.

Focus on basic needs:

- As is claimed, if the Government is really in ‘mission mode’ to provide employment to the unemployed, and to the youth, it will have to do much more than what has been announced. To start with, the Government will have to create more employment within the
- Government. Recent national and international reports and rankings have shown that **India is lagging far behind most other countries in terms of health and nutrition**, particularly women and children, in education, literacy and skills, holistic care of children in early childhood and later; drinking water and sanitation, and other basic infrastructure, etc.
- The **Government will have to take responsibility for meeting these basic needs** without depending on privatization, at least for the bottom 40% of the population.
- The first task for the Government would be to take much better direct care of basic well-being, human development and human resource development, and the basic infrastructure of the bottom population without privatisation in these areas.

Reorient the industrialisation policy:

- Another major task would also be to reorient the industrialisation policy to **focus on labour-intensive sectors of the economy**, and **promote Micro, Small and Medium Enterprises (MSMEs) and informal production** by ensuring better technology and higher productivity, providing finances (including working capital) and pushing further cluster development for all industries that have the potential.

Urban employment:

- And, finally, considering the fact that the urban economy has been badly hurt by the pandemic, a carefully designed **urban employment guarantee programme** would be most desirable to create ample urban employment avenues for urban youth.
- This programme will have to be different from the rural employment guarantee programme.

The urban programme should include:

- a) **basic urban services**, where the youth would get special training so that they can be absorbed in the mainstream economy;
- b) **day-care centres set up for childcare** to enable women to reduce their unpaid services and to ensure quality care for children; and
- c) **infrastructural gaps filled in under construction work** to facilitate quality urban life.

Way Forward:

- If the gesture of filling vacant posts in the Government is part of a mission employment, it will have to be followed by radical changes in the Government's employment policy.
- Let us hope that people of India will be able to discern the motives behind the gesture, and assess the Government's performance accordingly.

The scale of municipal finances is inadequate

(GS Paper 2, Polity and Constitution)

Context:

- The 74th Constitution Amendment Act was passed in 1992 mandating the setting up and **devolution of powers to urban local bodies (ULBs)** as the lowest unit of governance in cities and towns. Constitutional provisions were made for ULBs' fiscal empowerment.
- Recently, the Indian Institute for Human Settlements (IIHS) analysed data from 80 ULBs across 24 States between 2012-13 and 2016-17 to understand ULB finance and spending, and found some key trends.

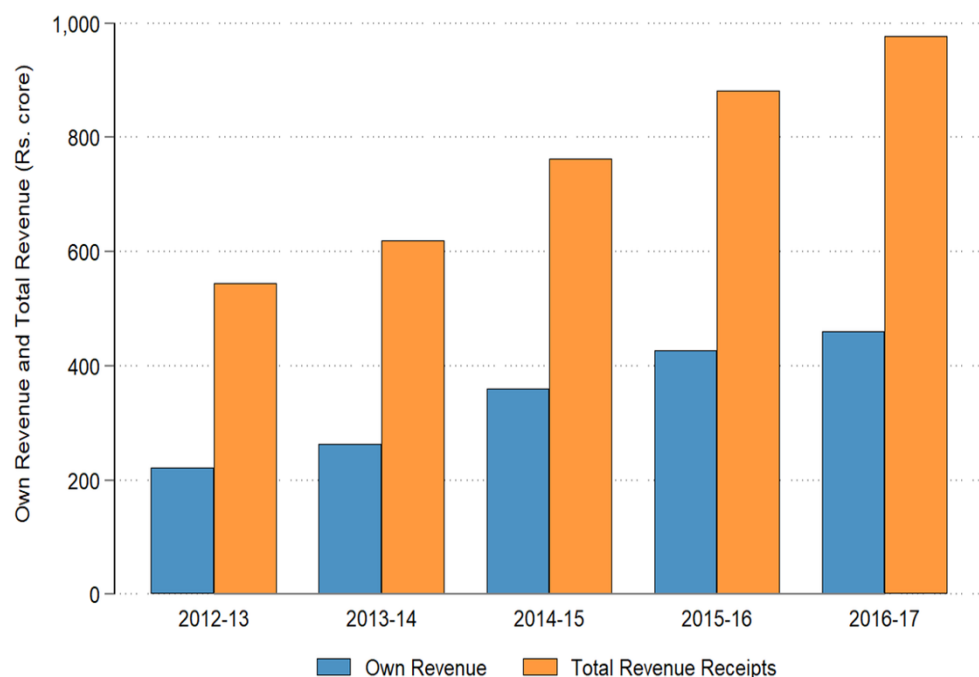
Challenges:

- However, three decades since, **growing fiscal deficits, constraints in tax base expansion, and weakening of institutional mechanisms** that enable resource mobilisation remain challenges.
- Revenue losses after implementation of the Goods and Services Tax (GST) and the pandemic have exacerbated the situation.
- Comprehensive data sets on municipal finance are important to understand and counter these challenges, but few exist at the city level.

Share of own revenue:

- The first is that **ULBs' own sources of revenue were less than half of their total revenue**, with large untapped potential.
- The ULBs' key revenue sources are **taxes, fees, fines and charges, and transfers from Central and State governments**, which are known as **inter-governmental transfers (IGTs)**.
- The share of own revenue (including revenue from taxes on property and advertisements, and non-tax revenue from user charges and fees from building permissions and trade licencing) to total revenue is an important indicator of ULBs' fiscal health and autonomy.
- This ratio reflects the ULBs' ability to use the sources they are entitled to tap, and their dependency on IGTs. Cities with a higher share of own revenue are more financially self-sustaining.

Own Revenue vis-a-vis Total Revenue



Graph showing the comparison of own revenue vs total revenue for the years from 2012-13 to 2016-17, based on estimates from the 80 ULBs. Source : IIHS 2022

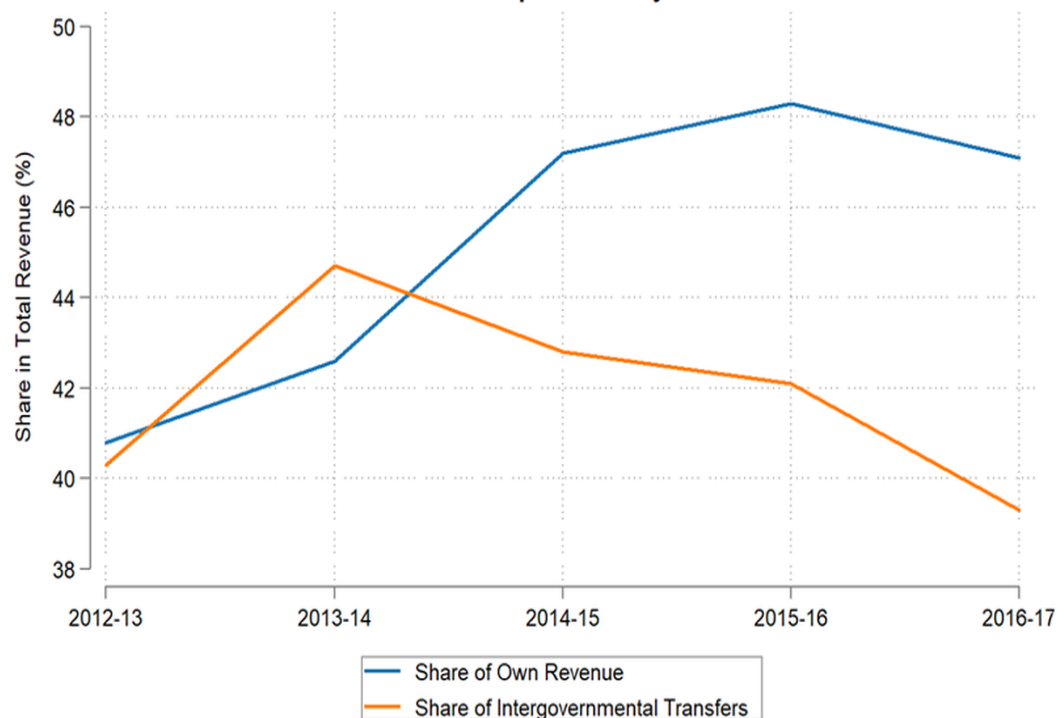
Findings:

- The study found that the ULBs's own revenue was 47% of their total revenue. Of this, tax revenue was the largest component: around 29% of the total. There was a 7% increase in own revenue from 2012-13 to 2016-17, but ULBs still lacked revenue buoyancy as their share in GDP of own revenue was only 0.5% for the five-year period.
- Property tax, the single largest contributor to ULBs' own revenue, accounted for only about 0.15% of the GDP.
- The corresponding figures for developing and developed countries were significantly higher (about 0.6% and 1%, respectively) indicating that this is not being harnessed to potential in India. Estimates suggest that Indian ULBs' can achieve these levels.
- It is essential that ULBs leverage their own revenue-raising powers to be fiscally sustainable and empowered and have better amenities and quality of service delivery.

Dependent on IGTs:

- Second, many ULBs were highly dependent on IGTs.
- Transfers from the Central government are as **stipulated by the Central Finance Commissions** and through grants towards specific reforms, while State government transfers are as grants-in-aid and devolution of State's collection of local taxes.

Revenue Dependency of ULBs



Findings:

- Most ULBs were highly dependent on external grants between 2012-13 and 2016-17, IGTs accounted for about 40% of the ULBs' total revenue.
- Stable and predictable IGTs are particularly important since ULBs' own revenue collection is inadequate.
- While dependence on IGTs dipped over the years due to modest increase in own revenue, the scale of IGTs in India remained at around 0.5% of GDP, which is far lower than the international average of 2% to 5% of GDP.
- This can be improved by increasing the revenue assigned to ULBs from the State governments, and by **allocating a share of the State and Centre's GST proceeds to ULBs**. This will cushion ULBs' balance sheets as they mobilise their own revenue and explore market-based instruments. IGTs can also incentivise ULBs to deliver better service quality and maintain fiscal discipline.

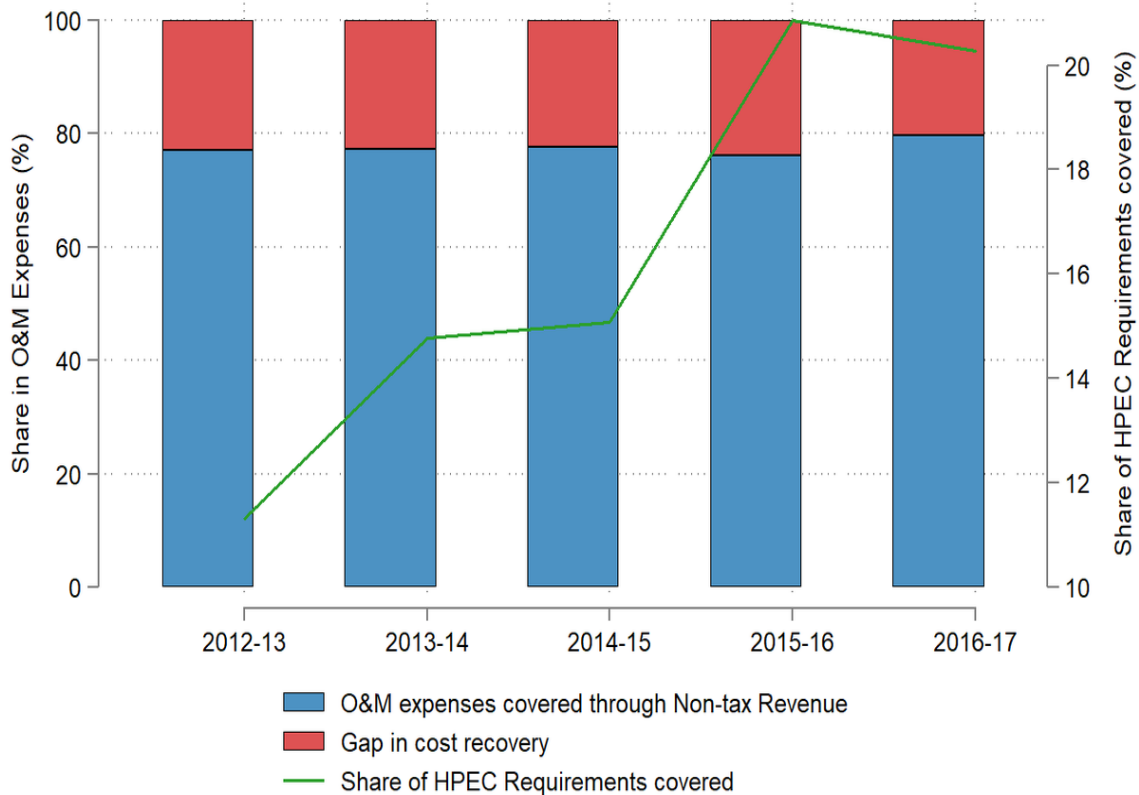
Tax revenue:

- Third, tax revenue is the **largest revenue source for larger cities**, while smaller cities are more dependent on grants.
- There are considerable differences in the composition of revenue sources across cities of different sizes.
- Class I-A cities (population of over 50 lakh) primarily depend on their own tax revenue, while Class I-B cities and Class I-C cities (population of 10 lakh-50 lakh and 1 lakh-10 lakh, respectively) rely more on IGTs.

Operations and maintenance:

- Fourth, **operations and maintenance (O&M) expenses** are on the increase but still inadequate. O&M expenses are crucial for the upkeep of infrastructure and for maintaining quality of service delivery.
- The share of O&M expenses in ULBs' total revenue expenditure increased from about 30% in 2012-13 to about 35% in 2016-17.
- While the expenses were on the rise, studies indicate that they remained inadequate. For instance, O&M expenses incurred in 2016-17 covered only around a fifth of the requirement forecast by the High-Powered Expert Committee for estimating the investment requirements for urban infrastructure services.

Gaps in O&M Expenditure



- O&M expenses should ideally be **covered through user charges**, but total non-tax revenues, of which user charges are a part, are insufficient to meet current O&M expenses.
- Cost recovery for services such as water supply, solid waste management, transportation and waste water management are thus clearly inadequate.
- The **non-tax revenues were short of the O&M expenditure by around 20%**, and this shortfall contributed to the increasing revenue deficit in ULBs. Increasing cost recovery levels through improved user charge regimes would not only improve services but also contribute to the financial vitality of ULBs.

Way Forward:

- The scale of municipal finances in India is undoubtedly inadequate. A ULB's realised own revenue resources are far below the estimated potential.
- Tapping into property taxes, other land-based resources and user charges are all ways to improve the revenue of a ULB.
- IGTs assume significance in the fiscal composition of ULBs, and a stable support from Central and State governments is crucial till ULBs improve their own revenues. Measures need to be made to also cover O&M expenses of a ULB for better infrastructure and service.