DIPA's Response to TRAI Consultation Paper on "Rating of Buildings or Areas for Digital Connectivity"

PREAMBLE

1. At the outset, we would like to thank the Authority for bringing out this Consultation paper for discussion on the **Rating of Buildings or Areas for Digital Connectivity.** We appreciate the Authority for its constant efforts for improving the connectivity. **The Consultation Paper is a step towards putting in place the right regulatory arrangements, connectivity measures and appropriate tools to foster infrastructure deployment**. With regards to DIPA's response to the Consultation Paper, **the authority has put a disclaimer that the issues raised may have questions related to non-telecom entities. Since majority of the questions pertain to building by-laws, post brainstorming at our end, we have come to a conclusion that views of domain experts may be obtained for a holistic approach to the issue. Consolidated views on the issues have been listed in the subsequent paragraphs with reply to only specific questions where concerns of our Members are involved.**

2. In economically attractive areas, such as large towns and cities, infrastructure implementation happens almost naturally, because market forces act to meet demand. The picture, especially in rural and remote areas however, is often quite different, where economic, geographic and/or demographic barriers limit access to mobile network infrastructure; the result is large numbers of people remaining isolated from the digital world. Therefore, a holistic approach has to be adopted for proliferation of connectivity in the country.

3. IPs-I have played a significant role in making affordable telecom services available in India right since the year 2000 when the concept of Infrastructure Providers came into existence. The deployment of shared tower infrastructure by IPs-I led to rapid growth of mobile networks. Over the years, the telecom tower industry in India has emerged as a trendsetter in the infrastructure sharing. **However, with the issues being deliberated in the present Consultation Paper the business prospects of IPs-1 are likely to be severely affected. Globally, with technologies such as 5G rolling out there is an increase buzz around infrastructure sharing which can bring out substantial savings of both CAPEX and OPEX. The CP dwells upon disjointing certain aspects**

which have primarily been in the domain of IPs-1 and therefore a thoughtful review of the issues covered by the CP needs to be undertaken.

4. India is one of the largest and fastest growing markets for digital consumers and the rapid growth has been propelled by public and private sector alike. India's lower-income States are bridging the digital divide, and the country has the potential to be a truly connected nation by 2025. As India's digital transformation unfolds, it could create significant economic value for consumers, businesses, microenterprises, farmers, government, workers, and other stakeholders. Digital adoption by India's businesses has so far been uneven, but new digital business models could proliferate across most sectors. Some 60 million to 65 million jobs could be created by the productivity surge by 2025. In India's new and emerging digital ecosystems of the future—already visible in areas such as precision agriculture, digital logistics management, and digital healthcare consultations— business will have to find a new way to engage with customers.

5. India is on the road to becoming a $1 trillion digital economy by 2025 and 5G will play a major role. India's 5G subscriptions are expected to grow at exponential rate in next few years. By 2026, Global mobile 5G subscriptions will reach 4.1 bn, equivalent to 37.1% of total mobile subscriptions. In India, by 2026, mobile 5G services are forecasted to generate US$9.0 bn, equivalent to 37.7% of total mobile service revenue. India is progressing to become a $1 trillion digital economy by 2025 and 5G will play a major role. 5G will bridge digital divide for an inclusive digital economy.

6. Digital infrastructure and services are increasingly emerging as key enablers and critical determinants of a country's growth and well-being. With significant capabilities in both telecommunications and software, India, more than most countries, stands poised to benefit from harnessing new digital technologies and platforms to unlock productivity, as well as to reach unserved and underserved markets; thus, catalysing economic growth and development, generating new- age jobs and livelihoods, and ensuring access to next generation services for its citizens.

7. Digital connectivity infrastructure is a necessary enabler for mainstreaming upcoming innovative applications aimed at increasing productivity and well - being. For instance, Internet of Things (IoT) use cases require virtually ubiquitous access to digital connectivity services. Likewise, autonomous vehicles use cases require outdoor ultra - reliable and low - latency digital connectivity services, while Industry 4.0 use cases require

indoor ultra - reliable and low - latency digital connectivity services. 5G technologies encompass a variety of technical features suitable for these three use cases, which can be mapped, respectively, to the 5G three main use scenarios: massive machine - type communication (MMTC) , ultra - reliable low - latency communications (URLLC), and enhanced mobile broadband (EMM) . Taking 5G mainstream may require public intervention.

8. Regulation may be justified where a market failure can be demonstrated. The use of telecommunications is an amenity issue. Amenity in buildings has historically been regulated for reasons of occupant comfort, building useability and its linkages to health benefits. For the purposes of the NBC, amenity relates to the comfort and psychological well-being of building occupants, as well as the pleasantness of the environment within a building. The well-being of occupants can be materially affected by their access to telecommunications, including telecommunications connectivity.   Conversely, impediments to telecommunications services can reduce occupants' well-being and diminish their amenity of living and working. Market failure may occur when new buildings are constructed without adequate spaces and pathways that are required for fixed line telecommunications/OFC equipment and cabling, which would be needed to support the level of telecommunications services demanded by occupants.

9. In line with the rating of buildings based on Digital Connectivity as mentioned in the Consultation Paper, the buildings are also rated based on green energy. In India, the Green Building Code is a mix of many of codes and standards contained in the by-laws of the National Building Code, the Energy Conservation Building Code (ECBC) and in the norms set by the ratings programs, such as Leadership in Energy and Environmental Design-India (LEED-India), the standards and guidelines put down for the residential sector by the Indian Green Building Council (IGBC), TERI-GRIHA(**covered in details in the Consultation Paper**) and other such certifications as well as Bureau of Energy Efficiency (BEE). Basic and general guidelines for efficient energy usage in the National Building Code (NBC) do exist but they are merely guidelines.

Digital Connectivity Infrastructure

10. Digital connectivity infrastructure encompasses a wide variety of technologies enabling the transmission of data to virtually anywhere. Digital infrastructure has emerged as an equally or arguably a more significant infrastructure necessity, as compared to the

traditional infrastructure necessities such as power, water, and roads. The COVID-19 pandemic has not only shuffled the global order, but it has also provided an impetus to the ever-expanding digital infrastructure. As per the latest **Mbit report by Nokia** the **country has seen an increase of 31% in data traffic in 2021**. Also a **total of 40 million data users were added/upgraded in 2021**.

11. Economies across the globe are charting ways to make their digital infrastructure – which comprises the physical resources necessary for the use of data, computerised devices, methods, systems, and processes – more resilient, agile, and futuristic. India, being one of the most populous countries in the world, is uniquely positioned in the global landscape and has the potential to become a leading force in the new world order. With nearly 850 million Internet users in India, a host of indigenous digital services, platforms, applications, content, and solutions, are expected to transform the digital ecosystem. India could potentially see a fivefold increase in economic value from digital transformation by 2025, representing an attractive opportunity for global and local businesses, start-ups, and innovators to invest in emerging technologies (like AI, Blockchain, or drones) in ways that are customised to India's needs.

12. Providing good 'in-building' coverage plays an important role in attracting and retaining mobile subscribers. Ordinarily, coverage from the macro network extends into buildings but should be complemented by dedicated in-building solutions to improve the Quality of Service & for increasing the capacity of the network. Also, crowded areas like malls, airports, large commercial complexes need a dedicated system to handle the capacity requirements for the large number of calls at such locations. Also building rating gets connected if the telecom facilities are available and people are able to Work from Home/Anywhere/Office.

13. Moreover, national and international inter - institutional and cross - sectoral coordination can lay the foundation for significant cost and time savings in digital connectivity infrastructure deployments. International coordination is needed at the institutional and technical levels to facilitate the deployment of regional submarine digital connectivity infrastructure, thus bridging existing cross - border digital connectivity infrastructure gaps. Sharing digital connectivity infrastructure passive assets enables significant savings in costly assets that are not necessarily key revenue and quality drivers. Similarly, sharing digital connectivity infrastructure active assets enables additional significant cost savings while unlocking funds for offering more competitive qualities and prices in digital

connectivity services. Public sector – led initiatives such as dig - once policies leverage cross - sectoral coordination and information sharing on planned infrastructure deployment to enable significant cost and time savings. Nevertheless, besides regulatory obligations, infrastructure sharing can also be driven by private - sector stakeholders' mutual interest.

Focusing on Infrastructure

14. The right type and amount of telecom infrastructure is necessary for providing a variety of telecommunication services with desired Quality of Service. Besides timely availability of telecom services, one of the most important factors is that the choice of TSP should remain with the consumers. The entry of TSPs in premises is dependent upon the wish of the builder/developer/RWA. The speed of deployment is often hindered by building owners / building developers due to delay in negotiations or demand for exorbitant rents. At times, in-building telecom infrastructure is setup by a TSP or an IP-I through exclusive commercial agreement with the builder/developer /Resident Welfare Associations (RWA). Due to restricted access to the premises, the residents of the building are not able to avail the telecom services of the TSP of their choice; their choice is limited to the TSP(s), who could get the access to the building after entering into a commercial settlement with the builder. Thus, the residents get deprived of the benefits of competition. **This is one of the drawbacks of the present system.**

15. Those in charge of managing buildings often consider the need for an IBW or mobility solution but fear the technology is too costly or complex – and do not act on it. They may be halted by the perception of requiring complex engineering – or worrying that they do not possess a clear understanding of radios and the cabling technology associated with this type of network. Concerned by the prospect of 'yet another rip and replace' job, they do nothing, letting the building fall further out of date and less attractive to potential tenants.

16. Taking responsibility and engaging with the experts will likely set building managers' minds at ease. **Outsourcing the complications to neutral hosts who are domain specialists i.e. The Infrastructure Providers**, makes life easier, and they will often find out the solutions aren't as complex as they might have first thought.

17. IBS Solutions help in improving coverage and capacity inside the building. By offloading traffic from macro cell networks, in-building solutions ensure a higher quality of service with fewer dropped calls. By using small cells or DAS, it becomes possible to provide good coverage inside the building(s); it also minimizes the impact and interference from outside the building and helps in allaying the perceived risk from the relatively higher radiated power levels from macro sites. Therefore, for providing coverage and capacity particularly in large public/ commercial places like malls, airports, hotels, hospitals and enterprise offices, etc., installation of IBS/DAS at various locations may be required. In DAS, a number of TSPs can utilize the same antenna system, eliminating the need of installing multiple antennas distributed across a building. DAS solutions are transparent from a radio frequency (RF) perspective and radio access network (RAN) vendor-agnostic. A single passive DAS solution can be shared by multiple TSPs using different technologies and frequency bands. Service providers can simply "plug-in" and services are available. **A builder would have lack of awareness of the present and future technologies, hence the work should be left to specialists for which IPs-1 are ideally suited.**

18. IBS sharing reduces the total cost of ownership, since both the investment cost and the maintenance expenses are shared among several TSPs. With only one set of antennas and feeder, it offers significant benefits to the TSPs, without compromising the aesthetics of the building. One such example is the shared telecom network in Delhi Metro Network, where same "leaky cables" are being used by a number of TSPs for providing mobile coverage inside the Delhi Metro stations and tunnels. This enables multiple TSPs to provide services which in turn is beneficial for the consumer in terms of flexibility. **Sharing of infrastructure is thus a panacea for sustainability, cost and network performance optimization.**

19. Point of Entry (POE) planning is a critical part of a building's digital infrastructure, as it allows tenants to get connected quickly and reliably. Proper point-of-entry (POE) planning ensures that service providers can quickly and securely get tenants in your building connected and online. In many developments, these pathways can be designed to streets with minimal telecommunication infrastructure.

20. A building should have a well-planned, dedicated telecommunications room with enough space to host telecommunications equipment from multiple service provider(s). This is a baseline requirement in order to adequately service current and future tenants. The

equipment deployed within a common telecommunications room is mission critical. During the design phase, steps need to be taken in order to ensure its seamless operation.

21. Risers are essential structural elements used to connect the point-of-entry (POE) location at the base of the building to termination points on specific floors, so that cabling and access can be easily facilitated throughout the building. A riser pathway is a fundamental component to ensuring that a building can support future tenant technology requirements. The pathways themselves will be utilized for internet connectivity, in-building mobile solutions, and smart building technologies.

22. A fixed line connection requires a pathway suitable for the technology used by the available network infrastructure. The extent of a pathway will vary depending on the classification of a building and method used to provide access to telecommunications.

23. The pathway described should be technology agnostic, that is, the space is not intended to cater to one specific method of deployment. Fixed line telecommunications infrastructure may be provided over fibre optic, copper or hybrid fibre coaxial cable by a telecommunications carrier and could be the decision of the carrier or reflect an agreement a carrier may have with either a developer or builder. That is where the domain expertise of the IPs-1/TSPs come into play and creates ownership.

24. While there is no way of accounting for future technologies, a number of technologies could be relied upon to deliver telecommunications services. Notwithstanding technology choices, fixed line cabling will play a central role in meeting the demand for bandwidth.

25. The pace and impact of technology on commercial real estate has accelerated exponentially in the past 10 years. Think 5G, the Internet of Things (IoT) and Smart Building innovations: this is a phenomenon that shows no signs of slowing down.

26. **The planned rating of buildings is a step in the right direction. However, its implementation in a country like India needs to be planned in a phased manner and by domain experts. As per the latest data from TRAI, there is a vast gap between the urban tele-density (136.12) vs the rural tele-density (58.05). Thus, there is a need to focus on increasing the rural tele-density presently. Also, in case of urban areas, it would be prudent to implement the rating system initially in Tier-I metro cities.**

DIPA's Response to Issues for Consultation

Q.1. How can an ecosystem be created to design, deploy and evaluate DCI with good connectivity in a cohesive and timely manner? What would be the typical role and responsibilities of actors of the ecosystem? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

In building deployment is currently achieved through commercial agreements between the incumbent mobile operators and the building owner/building developer/Resident Welfare Associations (RWA). As such, the speed of deployment is often hindered by building owners/building developers delaying the negotiations or requesting exorbitant rents. There is a requirement to evolve a framework applicable to in-building facilities to enable the telecom operators/ infrastructure providers to obtain efficient access on reasonable terms and conditions. Failure to share infrastructure would unreasonably restrict competition. The proposed ecosystem would comprise of the following entities.

a. Infrastructure Providers can be either *Property Managers* or may have contractual agreement with them **who would own the DCI for the building** they are responsible for. **The IPs-1 have the requisite competency and are ideally suited to install and maintain it themselves. As a neutral host they can share their DCI with the TSPs on a non-discriminatory basis.** Owning of the assets by property managers may give control in their hands, not only in the initial stages of the network roll out but during its entire life cycle .

b. *DCI Designers* are certified professionals who have competence and possess desired qualifications to design networks for in-building solutions. Such professionals may directly take up the work or there may be firms who hire such professionals to carry out the work. **IPs-1 already have persons with requisite skills for design of in-building solutions**.

c. *DCI Engineers* are certified professionals who have competence and possess desired qualifications to implement the solutions designed for in-buildings. These could be outsider experts who could have specific tasks like signals mapping, coverage mapping etc. Such professionals may provide services directly or there may be firms who can hire such professionals to carry out the work. **IPs-1 have persons with requisite skills for implementation of in-building solutions.**

d.   *DCI Evaluators* may be empanelled agencies to measure and evaluate quality of network inside buildings. These agencies may have their own platforms, or they may be required to take services of a designated platform built for the purpose. However, there may be a need to have certain cross checks over the design evaluators

In view of above facts:

- For any ecosystem to work in cohesive and timely manner, the optimum number of actors need to be identified only those need to part of the ecosystem. More number of players will have counter effect.
- The creation of new eco-system should not dismantle the current effective system.
- Due to the need of fast paced deployments, there is a need to make a more meaner and effective system rather than making it more complicated and bloated.
- IP-1s have the technology and knowledge knowhow to design, deploy and evaluate the DCI with good connectivity. Involving new players will only delay as new players don't have this knowledge and will delay the upgraded DCI rollouts by years.
- Infrastructure Providers (also termed IP-1s) have been responsible for building the requisite Digital Communications Infrastructure(DCI) across the length and breadth of the country.
- The IP-1s also provide the requisite infrastructure for in-building solutions to cater to the needs of the consumers inside the buildings by creating mechanisms that ensure that in-building network is plugged with appropriate backhaul connectivity from all TSPs present in that area.
- The IP-1s of today are quite competent & capable of designing & deploying Digital Communication Infrastructure (DCI) in the country as they have the necessary competency and capability and hence should also be permitted to design, implement & evaluate the DCI.

Q.2. How would the ecosystem proposed in response to Question no.1 ensure that created infrastructure does not get monopolized? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

Infrastructure deployment is the capital intensive investment. There has to be RoI for the same. The sharing of infrastructure should be commercially agreement between deployer and other sharers. Taking the business acumen out of this will have only counter effect.

To check the issue of monopolization certain enabling provisions have been included in the Addendum to the Model Building Bye – laws 2016 issued in March 2022. Relevant provisions are stated below

As part of the Building Bye-laws the Builder/RWA should be mandated to ensure the following:-

1. Access to building as well as CTI facilities inside the buildings should be available on a fair, transparent and non-discriminatory manner for all Service providers/IP-1s.
2. The service providers/IP1s should have unrestricted access for maintenance work.
3. Charges (rentals/power rates etc.) levied to the TSPs/IP1s should be fair, transparent and non-discriminatory and should be on residential rates.

It is felt that incorporation of these in State/UT Building Byelaws will go a long way towards checking monopolisation.

Also IPs-1 are best suited and have been in this business for decades. The method of sharing is adopted by IPs-1 in a non-discriminatory manner so the monopolization concern is not there. Tower infrastructure companies provides an **Integrated Neutral Host Platform** that is used by diverse and often competing operators helping build a unique, scalable and successful business model for Telecom.

Q.3. How would the ecosystem proposed in response to Question no.1 enable DCI Designers to factor in the digital connectivity requirements of the existing and/or prospective users of the network? How can such requirements be gathered at the stage of construction of a new building or at the time of upgradation or expansion in case of pre-existing DCI? Please justify your response with rationale and suitable examples, if any.
DIPA's Response: Response to this is already covered in Response to Q1

Q.4. How would the ecosystem proposed in response to Question no.1 enable DCI Evaluators to get requisite information to evaluate and ensure that the designed or deployed network would meet the requirements of end users? Please justify your response with rationale and suitable examples, if any.
DIPA's Response: Response to this is already covered in Response to Q1

Q.5. How would the ecosystem proposed in response to Question no.1 ensure that upgrades and expansion of the DCI are done from time to time and continue to meet

rising demands? Please justify your response with rationale and suitable examples, if any.

DIPA's Response: Response to this is already covered in Response to Q1

Q.6. How would the ecosystem proposed in response to Question no.1 ensure that the TSPs' networks are planned, designed, deployed, and upgraded to serve the DCI requirements in a timely manner? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

- TSPs-IPs working model have worked magnificently and is the key factor for the India's successful Digital infrastructure story. There is no need for any new ecosystem specially if we want that networks are planned, designed, deployed, and upgraded to serve the DCI requirements in a timely manner.
- The IP1s of today are quite competent & capable of designing & deploying Digital Communication Infrastructure (DCI) in the country as they have the necessary competency and capability and hence should also be permitted to design, implement the DCI.

Capacity Building of skilled Professionals

Q.7. How can an ecosystem be created to build capacity requirements of skilled professionals such as DCI Designers, DCI Engineers, DCI Evaluators? What would be the typical role and responsibilities of actors of the ecosystem? Please justify your response with rationale and suitable examples, if any.

DIPA's Response: Covered in Q6 above

Q.8. How would the ecosystem proposed in response to Question no.7 ensure that relevant training courses are available in the country? Please justify your response with rationale and suitable examples, if any.

DIPA's Response: No Response

Q.9. Whether the training courses proposed in response to Question no. 8 are already being offered by any organisation or institution that can be recognized for the purpose? If yes, please provide a list of organisations offering such courses. If not, how specialized courses can be designed to meet the requirements? Please justify your response with rationale and suitable examples, if any.

DIPA's Response: No Response

Q.10. Is there a need to establish a council on the lines of "Council of Architecture" (CoA) to regulate minimum qualifications, additional specialized courses and practice of DCI profession in the country? Please justify your response with rationale and suitable examples, if any.
DIPA's Response: No Response

Q.11. Whether the requirements of additional specialized courses and practices of profession would vary depending upon the size of work or kind of work involved in a particular DCI project? Please justify your response with rationale and suitable examples, if any.
DIPA's Response: No Response

Creation of Digital Platform to hire services of professionals and procure products
Q.12. Whether creation of a digital platform to hire services of professionals would help Property Managers in creation of DCI? Should there be a feedback mechanism to assess quality of services delivered by professionals? Please justify your response with rationale and suitable examples, if any.
DIPA's Response: Response to this question is covered in Response to Q1

Q.13. Whether creation of a digital platform for procurement of certified products would help Property Managers in creation of DCI? How would the certified products for the purpose of DCI be identified and updated on the platform? Please justify your response with rationale and suitable examples, if any.
DIPA's Response: Response to this question is covered in Response to Q1

DCI ownership and upkeep models
Q.14. What may be the possible models of DCI ownership and its upkeep? Whether co-ownership models would help in aligning incentives in realising connectivity that would meet expectations of the end users from time to time? Should there be a need to specify terms and conditions for entities owning and responsible for upkeep of DCI to function in a fair, transparent and non-discriminatory manner? Please justify your response with rationale and suitable examples, if any.
DIPA's Response:

Digital Infrastructure providers have desired capabilities for DCI upgradation and its upkeep. They would meet expectations of the end users from time to time. Building owners may not be possessing the required specific skillset.

As per a research survey by Commscope '*Wireless in Buildings: What building Professional Think'*, Building owners aren't always pushing for In Building Works(IBW), in part, because there is a lack of clear evidence that they'll lose prospective tenants by not offering connectivity . And, while residential tenants expect cellular coverage in their homes, business enterprises tend to put more value on IT infrastructure, sometimes forgetting that connection to a 3G/4G wireless network is just as critical.

It's important to demonstrate some kind of payback, somehow quantifying the benefit of making a space/building more attractive to prospective tenants, commercial or residential. If they're going to invest in something as significant as an IBW solution, building owners and operators need to know they're going to see a reduction in their operating expenditures (OpEx), for example, or they're going to enjoy a higher value on their property per square footage.

One model that's currently being given a great deal of consideration, and is already being used successfully within large venues such as shopping malls and stadiums, is the employment of a neutral host management provider (IP-1 in our case). It also addresses the issues regarding ownership/monopolization

In such cases, the ownership of the system is shifted from the carrier to the third-party service provider (IP-1)who then assumes all financial, regulatory, legal and technical responsibility for deploying, installing and maintaining the system . Access to the system is leased to one or more operators which, as well as generating more revenue, ensures that more tenants and visitors are able to access their carrier's network without the need to roam.

It's likely that building owners would be willing to adopt this model, as it's flexible and delivers a tangible return on investment, but its success would depend on the size and nature of the venue itself. The larger the venue, for example, the more people could be concentrated in a given area, making it more attractive for the neutral host and the operators involved.

Building owners who may be tempted to replicate this neutral host model themselves **should be aware that maintaining it requires a specific skillset on an ongoing basis/lifetime**. **Established neutral host providers(IP-1s) know the financial models needed to make it profitable, and how it needs to work; they know the formulas . It is their core competency, after all.**

An additional benefit is that increased awareness of the neutral host model and its potential returns is likely to lead to greater discussion by businesses of wireless coverage in general.

Enabling new Ecosystem by Technical requirement specifications for DCI in Building Codes (NBC)

Q.15. As one solution might not be suitable for all types of buildings, whether current requirements stipulated in the National Building Code of India, 2016 would be required to be evolved and prescribed ab initio to make it more appropriate for DCI requirements? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

- Yes, current requirements stipulated in the National Building Code of India, 2016 would be required to be evolved with the help of DoT, MoHUA, etc.

- Telecom and ICT i.e. digital connectivity infrastructure requires a separate classification on the line of classification of buildings for "Fire and Safety". The general practices which are applicable for civil and electrical work would not be sufficient to design and deploy a digital connectivity infrastructure. **Buildings can be specifically classified for digital connectivity infrastructure on the basis of various factors like area, height, density, type of construction and type of use**.

- TRAI's earlier recommendations on **'In-Building access by TSPs'** need to be incorporated in Building Laws and more importantly ensuring their implementation. Few of them are reproduced below:

  a) "*DoT should take up the matter with the Ministry of Housing and Urban Affairs to ensure that Suitable provision for the creation of Common Telecom Infrastructure (CTI) inside the newly constructed public places like Airports, commercial complexes and residential complexes, should form part of the Model Building Bye-Laws*"

  b) *"Government should ensure that the essential requirement for telecom installations and the associated cabling is formed part of National Building Code of India (NBC), being amended by Bureau of Indian Standards (BIS)."*

  c) "No building plan should be approved without having a plan for creation of CTI including the duct to reach to the telecom room inside the building. (Rec. 2(iv))" and "Completion certificate to a building to be granted only after ensuring that the CTI as per the prescribed standards is in place."

- Role of the National Building Code of India and Building Bye Laws **will be more to give legal backing to the ecosystem required for digital connectivity** including associated requirements such as developing solutions using certified products and tools, deploying solutions by certified professionals and evaluation of the network by empanelled or certified agencies.

TRAI in its Monograph titled 'Quest for a good quality network inside Multi- Storey Residential Apartments' of September 2020 has mentioned :-

One size doesn't fit all Solutions must be specifically designed for the case. For example, the requirements would be very different in each of these cases: 1. a tall, multi-storeyed residential building; 2. a mall; 3. a cluster of row houses; and 4. an office complex or building.

An antenna system on ground-based (external) towers may be adequate for row houses but fail to reach the higher floors of a tall building. A mall may require good coverage for supporting voice calls, but not nearly the same bandwidth for data connectivity as an office of equivalent floor-area.

In a work-from-home scenario, where adults and children alike need stable and high bandwidth connectivity everywhere, nothing but a network engineered to suit the flat might deliver the needed experience.

Q.16. Whether NBC needs to prescribe a separate classification of buildings for the purpose of DCI? If yes, which factors should be considered to make such a classification? If not, how to accommodate DCI specific requirements in the existing classification of buildings by the NBC? Please justify your response with rationale and suitable examples, if any.

The National Construction Code(NCC) of Australia follows a classification system that broadly categorises buildings into 10 building Classes and uses this as a means of categorising occupant risk associated with a building's use. The term single-dwelling unit (SDU) is used by the telecommunications industry to describe a single detached dwelling, similar to a Class 1 building as defined by the NCC.

A residential building containing more than one 'dwelling' is termed 'Multiple-Dwelling Unit' or MDU by the telecommunications sector and is a reference to either horizontal or vertical multiple dwelling construction. For the purposes of the NCC, a horizontal MDU could equally be considered a Class 1 building where each dwelling was separated by a fire-resisting wall.

However, where a residential vertical MDU contains one dwelling above another, or other common space, it could be considered a Class 2 or 3 building, or Class 4.

- The National Building Code of India classifies the buildings as under
  1. Residential
  2. Educational
  3. Institutional
  4. Assembly
  5. Business
  6. Mercantine
  7. Industrial
  8. Storage
  9. Hazardous

  The Residential buildings are further sub divided as

  A-1 Lodging or Rooming Houses

  A-2 One or two Family private dwellings

  A-3 Dormitories

  A-4 Apartment Houses

  A-5 Hotels

  The guidelines for DCI will vary for each of these types and will need to be worked out.

- As Model Building Byelaws 2016, issued by Ministry of Housing and Urban Affairs (MoHUA) classify buildings based on **use of premises or activity, design or height, features, safety due to maintenance level**. **Same can be used for DCI**.

Q.17. Whether there is a need to include DCI Professionals as Persons on Record as typically done in building bye laws or development regulations? Or registration with the Council proposed in Question no. 10 would suffice to practice profession across the country as followed in the case of Architects? Please justify your response with rationale and suitable examples, if any.

DIPA's Response: Response already covered in Q1

Q.18. How can the clearances or approvals required for DCI at various stages of construction of building may be incorporated in building bye laws? In typical building bye laws, there are provisions for getting clearances from central government e.g., in case of civil aviation, defense and telecom being a central subject, what role can be played by the central government in giving such clearances or granting such approvals? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

Yes the clearances or approvals required for DCI at various stages of construction of building may be incorporated in building bye laws. This will help to remove ambiguity and also mitigate the issue of alignment of central and state provisions over same subject area.

Need to introduce a special class of Infrastructure Providers

Q.19. Is there a need to introduce a special class of Infrastructure Providers to create, operate and maintain DCI for a building or cluster of buildings in ownership models suggested in response to Question No. 14? What should be the terms and conditions for such special Infrastructure Providers? Should such terms and conditions vary depending upon type, size and usage of buildings? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

Infrastructure providers are well able and capable for the creation, operation and maintenance of Digital connectivity infrastructure (DCI) for a building or cluster of buildings, there is no need to introduce a special class of Infrastructure providers exclusively with a limited charter. Rather, as mentioned in the **National Digital Communications Policy (NDCP-2018) there is a need to '*Encourage and facilitate sharing of active infrastructure by enhancing the scope of Infrastructure Providers (IP) and promoting and incentivizing deployment of common sharable, passive as well as active, infrastructure*'. IPs-1 are most suited to ensure Quality of Service(QoS), adherence to SLA conditions, coverage and ownership issues.**

Q.20. What are the initiatives or practices being taken in other jurisdictions outside India with regard to rating of buildings from a DCI perspective? Please share details and suggest how similar processes can be created in India?

DIPA's Response:

S.No.	International Models
1	In 2015 the **Greater London Authority** launched the **Mayor's Digital Connectivity Rating Scheme.** The scheme rates the quality of digital connectivity in offices, giving transparency to tenants and allowing landlords to improve their buildings.
2	WiredScore is an international organisation which assesses, certifies and improves digital connectivity and smart technology in homes and offices on a global scale. Smart Score was created in collaboration with the owners and users of the world's most advanced properties. The certification provides clarity on what constitutes a smart building from a functionality perspective and guidance on how to implement one from a technological stand-point. The technological foundations of a smart building are based on tenant digital connectivity, Building systems, landlord Integration network, governance, cyber security and data sharing.
3	SPIRE is the industry's smart building program that holistically measures building technology and performance. The SPIRE Self-Assessment online tool can evaluate building intelligence and performance based on an expertly curated, objective and holistic framework across six major criteria, including power and energy, health and well-being, life and property safety, connectivity, cybersecurity and sustainability. The SPIRE Verified Assessment and Rating offers a complete smart building evaluation with the opportunity to earn a Smart Building Verified Mark and a plaque to proudly display the Verified Mark.
4	LEED (Leadership in Energy and Environmental Design) is widely used green building rating system in the world. Available for virtually all building types, LEED provides a framework for healthy, highly efficient, and cost-saving green buildings. LEED certification is a globally recognized symbol of sustainability achievement and leadership. LEED helps investors meet their ESG goals by providing investors with the robust and globally recognized green building framework to measure and manage their real estate performance. LEED helps investors implement management practices to prioritize building efficiency, decrease operational costs, increase asset value and ensure productivity, comfort, health and wellbeing for occupants.

5	Green building rating tools – also known as certification – are used to assess and recognise buildings which meet certain green requirements or standards. Rating tools, often voluntary, recognise and reward companies and organisations who build and operate greener buildings, thereby encouraging and incentivising them to push the boundaries on sustainability. They kick-start the market by setting standards that then in turn elevate the ambition of government building codes and regulation, workforce training, and corporate strategies.

In India GRIHA system is used. GRIHA is an acronym for Green Rating for Integrated Habitat Assessment. GRIHA is a Sanskrit word meaning – 'Abode'. Human Habitats (buildings) interact with the environment in various ways. Throughout their life cycles, from construction to operation and then demolition, they consume resources in the form of energy, water, materials, etc. and emit wastes either directly in the form of municipal wastes or indirectly as emissions from electricity generation. GRIHA attempts to minimize a building's resource consumption, waste generation, and overall ecological impact to within certain nationally acceptable limits / benchmarks.

GRIHA attempts to quantify aspects such as energy consumption, waste generation, renewable energy adoption, etc. so as to manage, control and reduce the same to the best possible extent.

GRIHA is a rating tool that helps people assesses the performance of their building against certain nationally acceptable benchmarks. It evaluates the environmental performance of a building holistically over its entire life cycle, thereby providing a definitive standard for what constitutes a 'green building'. The rating system, based on accepted energy and environmental principles, will seek to strike a balance between the established practices and emerging concepts, both national and international. The GRIHA council conducts various courses for training professionals working in the green building industry.

ICRIER may be considered to be included for working out the modalities.

Something akin may be developed for rating of buildings/areas for digital connectivity.

Q.21. Is there a need to introduce Rating of buildings from the perspective of DCI that may help in nudging the Property Managers to strive for collaboration with other

stakeholders to meet the digital connectivity expectations of the users of the building? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

- Introduction of Rating of buildings from the perspective of DCI in terms of NBC, 2016 should help the end users to judge and take decision whether particular building will be able to cater their digital connectivity requirements.

- The ratings will definitively provide an advocacy for having the updated and best DCI in the buildings to have the best of experience in digital connectivity for the end users.

Q.22. In case, rating is introduced as a voluntary scheme, is there a need to monitor the progress? If progress is not satisfactory, would there be a need to launch campaigns and awareness drive to encourage Property Managers to come forward for rating? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

- We will like to mention and emphasize here that awarding the rating will itself be big incentive and will attract the end users.

- There will be a need to monitor the progress during the incubation period.

- The awareness campaigns are needed more for the end users to create demand which will automatically encourage to ensure for proper rating of the building.

Q.23. Should the voluntary scheme of rating be extended to cover cities, towns and villages and even states? Would such a scheme help in encouraging local and state authorities to facilitate TSPs in creation or in improving outdoor as well as indoor DCI? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

- Any scheme should be extended to cover cities, towns and villages.

- This should be made part of National Building Code of India, 2016 and model building bye laws which will encourage local and state authorities to facilitate TSPs in creation or in improving outdoor as well as indoor DCI

Q.24. If in response to the Question No. 23 answer is yes then what framework should be introduced to rate cities, towns, villages and states, and how weightages can be assigned to different aspects of indoor and outdoor connectivity? Please justify your response with rationale and suitable examples, if any.

Rating as a mandatory requirement for specific classes of buildings

Q.25. Is there a need to make rating a mandatory requirement for specific classes of buildings such as public transport hubs, government buildings or any building of public importance etc.? If yes, which type of buildings should be covered under this category? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

Yes, DIPA is in agreement that there may be a need to make rating a mandatory requirement for specific classes of buildings such as public transport hubs, government buildings or any building of public importance etc. The main reason is to ensure better connectivity for end users and meet the ever rising footfall in these places.

The type of buildings which should be covered under this category are:

1. Buildings with public offices having high footfalls of citizens

2. Buildings with public offices having responsibility of handling citizens grievances

3. Buildings with public offices with servers for websites having heavy e-traffic.

Q.26. What should be the time plan to rate buildings falling under the mandatory category and is there a need to prioritize some buildings within the mandatory category to make it more effective? Whether existing buildings falling under such classes are required to be dealt differently? Please justify your response with rationale and suitable examples, if any.

Q.27. Is there a need to designate a nodal official for building(s) falling under the mandatory category to comply with the rating related requirements? What actions are proposed to be taken in case of non- compliance? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

- IP-1s have the technology and knowledge knowhow to design, deploy and evaluate the DCI with good connectivity. The IP-1s of today are quite competent & capable of designing & deploying Digital Communication Infrastructure (DCI) in the country and to comply with the rating related requirements.
- The compliance with NBC, 2016 should be sufficient as being in mandatory in nature.

Changes required in laws dealing with the development of areas or construction of buildings

Q.28. Is there a need to amend legal provisions under various laws, bye laws dealing with development of land and buildings or areas including forest areas, cantonment areas, port areas, panchayat areas, municipal areas etc. to facilitate creation of DCI and ratings of the buildings or areas? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

Yes, there is a need to amend legal provisions under various laws, bye laws dealing with development of land and buildings or areas including forest areas, cantonment areas, port areas, panchayat areas, municipal areas etc. to facilitate creation of DCI and ratings of the buildings or areas. The reasons for the same are:

1. The powers and functions related to land and buildings are vested with states as seventh schedule. This lead to complicated interpretation for provisioning of digital connectivity inside buildings.

2. Areas such as forest areas, cantonment areas, port areas, panchayat areas, municipal areas etc are governed by important Acts of parliament/ State legislature. There is always a need to provide for enabling provisions in these acts as well as in Acts/ rules governing the DCI.

Role of Regulator in New ecosystem

Q.29. In case a voluntary scheme for rating is to be introduced or rating is notified as mandatory for specific classes of buildings then what should be the role of TRAI or DoT? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

To begin with rating of buildings could be introduced for government buildings, The new Parliament complex is at an advanced stage of construction and is supposed to be equipped with state of the art wired and wireless communication systems. **Commencing the rating system with the rating of new parliament building would be an ideal start to the process.**

While DoT may not have much role to play in the system of rating , TRAI will form an important entity. The scope of tests such as drive tests should specifically need to be enhanced to include the buildings. Use of drone technology may be considered, This will also work as an audit of DCI Evaluators. TRAI needs to come out with specific guidelines on the same.

Q.30. Whether creation of "Regulatory Sandbox" to carry out experiments or demonstrate capabilities of innovative solutions to improve digital connectivity would be helpful to make changes in existing policies, laws or regulations? What should be the terms and conditions to establish a regulatory sandbox? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

- Regulatory sandbox usually refers to live testing of new products or services in a controlled environment. Regulatory sandbox is used where regulators face the challenge of nurturing innovation without over-regulating but at the same time protecting consumer interests.

- Many countries have adopted a "Regulatory Sandbox" based approach where the regulator works closely with emerging Fintech firms. In India, RBI has used this for Fintech.

- **But situation in DCI industry is totally different**. Here the players like **TSPs and IP-1s are fully updated and equipped** with the latest products and services. There is **no need for regulatory checks and controlled** environment. The self-assessment and self-declaration by the DCI owners (IP-1s/TSPs) should be sufficient and good enough for the compliances.

Operationalization of rating framework

Q.31. Is there a need to establish a Certificate Issuing Authority to award ratings to buildings from DCI perspective? If yes, what should be the structure of such an authority? If not, who can be assigned the role to perform this function? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

There is no need to establish a Certificate Issuing Authority to award ratings to buildings from DCI perspective. The occupancy certificate certifying compliance with NBC, 2016/ Town planning authority and DCI requirements should be sufficient.

Q.32. Whether the authority suggested in response to Question no. 31 may use reports from DCI evaluators to award ratings? To ensure reliability of reports from DCI Evaluators, should Certificate Issuing Authority need to conduct periodic audits of DCI evaluators? Please justify your response with rationale and suitable examples, if any.

DIPA's Response: No Response

Terms and conditions for using awarded ratings including provisions for its renewal, revocation & penal provisions in case of misuse

Q.33. What should be the terms and conditions for using ratings awarded to a building(s) from a DCI perspective? What should be the validity period of awarded ratings? Do you envisage any situations under which an awardee of ratings might be

required to get the ratings renewed before the validity period? Please justify your response with rationale and suitable examples, if any.

DIPA's Response: Already covered in response to Q31

Q.34. Whether in the initial stages of introduction of the rating system, validity should be for a shorter time period, and later it may be increased as evaluation system matures? Should the validity period be dependent on the type of buildings? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

The buildings presently are evaluated as per the NBC code. With evolving technologies a 10 year duration would be ideal which may thereafter be revised based on the feedback received and development of the ecosystem.

Q.35. Whether the process of renewal of rating should be the same as the process defined to get rated first time or it may be incremental? Or renewal process may be dependent upon the grounds on which it is being renewed e.g. expiry of validity period, introduction of new technology, introduction of new spectrum band(s), introduction of new services(s) etc.? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

The renewal process may be dependent upon the grounds on which it is being renewed e.g. expiry of validity period, introduction of new technology, introduction of new spectrum band(s), introduction of new services(s) etc.

Q.36. Whether the provisions to make an appeal should be introduced to give an opportunity to the applicant to make representation against the decisions of the Certificate Issuing Authority? What should be the time frame for preferring the appeal in case of disagreement with the rating assigned and its disposal? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

Already covered in response to Q31

Q.37. If somebody is found to be using ratings in an unauthorized manner, what legal actions are proposed to be taken against such entities? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

The penal provisions under NBC, 2016 should be applicable and all the offenders should be handled as per provisions of law in there.

Adoption of Digital Tools & Platforms, AI/ML Models to co-design and co-create DCI

Q.38. Whether creation of a digital platform that allows stakeholders to co-design and co-create DCI would be helpful to realise better, faster and cheaper solutions? Whether technologies and tools such as AI, ML would be helpful in achieving this objective? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

- The designing and creation of DCI requires high degree of specialization. As IP1s are well versed and skilled in the process, the creation of DCI will be done a timely manner to support the rising demand.

- The IP1s are responsible, empowered and technically well suited to meet the requirements of the consumers for the provisioning of Digital Communications Infrastructure as they are ready to upgrade/adopt any new/futuristic technology as the demand comes in.

- The IP1s also provide the requisite infrastructure for in-building solutions to cater to the needs of the consumers inside the buildings by creating mechanisms that ensure that in-building network is plugged with appropriate backhaul connectivity from all TSPs present in that area.

- The IP1s of today are quite competent & capable of designing & deploying Digital Communication Infrastructure (DCI) in the country as they have the necessary competency and capability and hence should also be permitted to design, implement & evaluate the DCI.

Typical processes involved in rating of a building

Q.39. What should be the typical process to rate a building? Whether terminologies and steps involved in the rating process need to be standardized? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

Taking the note from "GRIHA Rating", the following Rating Process can be suggested:

1. **Online registration**: The project team can initiate the registration process by filling the EOI Form available on the website. The process of registration is completed after the successful payment of registration fees by the project team.

2. **Orientation workshop**: The registration is followed by an orientation workshop conducted by officials, which intends to provide detailed information of the rating along with an elaborate explanation to all the criteria, and post addressing project-specific queries of the teams.

3. **Due diligence I**: The site visit should be conducted by officials to validate sustainable measures adopted during the construction phase. It will be scheduled when the project is carrying out above plinth level work such as column and slab construction.

4. **Due diligence II**: The second site visit may be conducted by the officials to validate internal finishes, electrical, plumbing, and mechanical components installed during the construction phase. It is scheduled post completion of the building structure work.

5. **Submission of documents:** As the project is nearing completion, the project proponent will upload the documents for all criteria on the online panel using the username and password provided at the time of registration.

6. **Preliminary evaluation:** Preliminary evaluation is carried out by a team of professionals from rating agency and external evaluators, who are experts in their respective fields recognized by agency.

7. **Final due diligence:** The final site visit should be conducted by the rating officials to verify the submitted documentation with on-site implementation. The visit is done once the project is complete and all equipment and systems are installed and commissioned.

8. **Final evaluation:** The rating officials along with external evaluators shall then evaluate the final round of submitted documentation and the final site visit report in response to

the preliminary evaluation. The final rating may be awarded based on the final evaluation and should be valid up to 5-10 years.

9. **Additional due diligence DCI awareness drive:** The officials may conduct an additional due diligence visit post the final rating, for green awareness and education amongst project occupants. This visit aims to impart basic knowledge and understanding on green buildings and their way of working.

10. **Rating renewal**

Q.40. Whether the process of rating would vary based on the types of buildings? If yes, then what factors or aspects of a building would matter or impact the outcome of rating? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

The rating should be in alignment with national standards and guidelines such as the National Building Code of India 2016 (NBC), together with other relevant regulations pertaining to specific topics.

Q.41. Which objective methods should be used to evaluate the DCI? How can various aspects of performance to evaluate the quality can be combined together? Please justify your response with rationale and suitable examples, if any.

Q.42. Which subjective methods should be used to evaluate perceived quality of DCI? Whether survey techniques can be improved considering penetration of smartphones? Whether improved techniques can help in providing insights and actionable items to improve DCI? Please justify your response with rationale and suitable examples, if any.

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Q.43. Would combining the parametric values or results of objective and subjective methods be helpful in assessing digital connectivity that is closer to the perceived quality of experience? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

Traditionally, the telecommunications industry has relied on QoS as the principal descriptor of the overall performance of their network services. QoS has been defined from a system perspective subordinating the user's response entirely to the influence of the telecommunication system. Even though the 'network-centric' approach for QoS has allowed mobile operators to deploy their network infrastructure and guarantee acceptable service levels, the correlation between network performance and good user experience is not direct, This is because QoS deals only with technical aspects, ignoring the other elements impacting users' perception. Meanwhile, the goal of QoE is to interpret and understand end-to-end quality including human users' point of view. According to the Qualinet project, QoE can be defined as '*the degree of delight or annoyance of the user of an application or service. It results from the fulfilment of his or her expectations with respect to the utility and/or enjoyment of the application or service in the light of the user's personality and current state*'

This definition remarks that QoE in communications services is influenced by content, network, device, application, user expectations, and context of use. For perceived quality of DCI it will be essential for TRAI which currently has defined QoS parameters to deliberate upon defining QoE parameters.

Q.44. How advanced technologies such as Artificial Intelligence (AI), Machine Learning (ML) etc. might be useful to make the evaluation process more nuanced and suitable for the purpose? How can AI/ML models evolve from the inputs of measurement and evaluation being carried out in other parts of the city, state or Country? Please justify your response with rationale and suitable examples, if any.

DIPA's Response:

Network performance management, security and health management tools all use ML to power better analytics. ML-based tools are excellent at learning normal network behaviour and highlighting relatively abnormal actions. The tools implement one or more computational models, such as neural networks or genetic algorithms, to improve a pattern-matching algorithm. ML tools can help with moment-by-moment traffic management, as well as longer-range capacity planning and management. After the tools identify when traffic spikes in some paths or fails to flow in others, they can send automated or manual direct management responses to correct the error.

Beyond management in the moment, ML tools can also predict traffic trends in ways that help guide future decisions. Network professionals should evaluate situations where it could be beneficial to use a ML tool to determine traffic flows.

Combining ML-driven analytics with other AI tools, like natural language processing, can make interacting with the systems easier and faster. Network engineers can create virtual assistants to help network administrators diagnose and fix network issues. Additionally AI/ML tools could also be customized for predictive models for capacity and coverage.

Q.45. Any other issue which is relevant to this subject? Please justify your response with rationale and suitable examples, if any.

Nil