

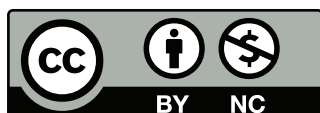
# Problem descriptions and background information guide for the creative problem solving and communication skills course



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**Problem descriptions and background  
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## Creative Problem Solving

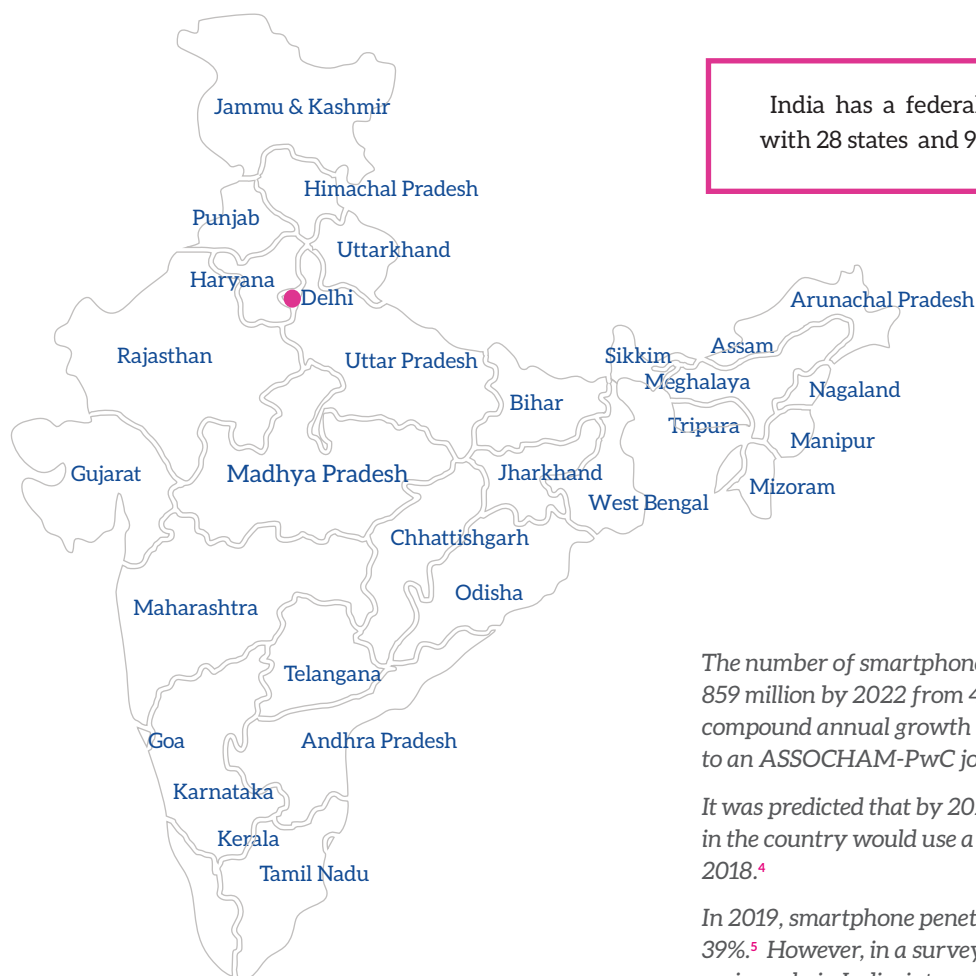
Worldwide, companies, organizations, and political leaders have to deal with problems for which there are no concise and clear solution strategies. The solution possibilities for this type of problems appear to be infinite. This is where Maastricht University's Creative Problem-Solving (CPS) comes in handy: a process that can help us with problems asking for a creative solution. CPS is a structured process that involves breaking down a problem into several pieces to understand it, generating ideas to solve it, and evaluating the generated ideas to find the most effective solution. The course helps students to (a) apply different creative thinking techniques that foster creative problem-solving at the right moment in the creative problem-solving process; (b) solve a real-life problem in a creative and innovative way; (c) analyse and reflect on how personal, team and contextual factors can promote or inhibit creativity; (d) implement the acquired knowledge and skills on creative problem-solving in different settings and courses.

## About the collaboration

The Digital Empowerment Foundation (DEF) in partnership with Bertelsmann Foundation has collaborated to develop the challenge scenarios for Maastricht University's creative problem solving course. This leverages DEF's 16 years of experience in delivering multi-year development programmes in connecting the underserved through information and communication technologies for development initiatives and providing access to information. DEF is present in over 300 rural and underserved locations in India and works across 6 thematic areas: Access and Infrastructure, Education and Empowerment, Governance and Citizen Services, Markets and Social Enterprise, Knowledge Hub and Network, and Research and Advocacy. This is complemented by the Bertelsmann Foundation's expertise in providing analysis and solution to the most pressing economic, political and social challenges impacting the United States and Europe through its research, debate forums, and multimedia tools.

## About India

India is a federal republic governed through a democratic parliamentary system. It is the world's most populous democracy with a multi-party system. The Indian economy is the 7<sup>th</sup> largest by nominal GDP (Gross Domestic Product) and the 3<sup>rd</sup> largest by purchasing power parity. India has the largest growing electronics market in the world and is expected to grow from 41 per cent CAGR (Compound Annual Growth Rate) from 2017-2020. However, despite positive macro-economic growth indicators India continues to exhibit pervasive inequalities across historical fault lines of gender, caste, and religion with diverging trends in inequality gaps, according to studies by the World Inequality Lab and Oxfam India Inequality Report 2018. India has deep and pervasive socio-economic inequality intersected by class and caste with deep intersectional marginalisation. Average income of Forward Caste (FC) households stand at 1.4 times the national average. The per capita income of forward castes is more than double that of Scheduled Castes (SC) and Scheduled Tribes (ST) and approximately 76 per cent higher than Muslims. Brahmins have the highest levels of adult education. They are ahead by 5.6 years from STs, 4.8 years from SCs, 4.9 years from Muslims, 3.7 years from Other Backward Caste (OBCs), and 1.2 years from other FCs. Despite affirmative action policies aimed at ameliorating past injustices resulting from India's caste hierarchical social structure, the divide between FCs and the rest have been increasing without



showing a converging trend<sup>1</sup>. The relative growth for lower castes is either stable or declining along with poor education outcomes. Further, it ranks 100th out of 119 countries in the Global Hunger Index 2017 with high prevalence of child mortality rates among SCs and STs in the comparative perspective. Gender disparity persists across all categories beyond caste- and religious-based inequalities. Thus, it is important to understand the inequality beyond income, wealth, and consumption and in terms of access to basic services like education, health, food, equitable livelihood opportunities, and social security<sup>2</sup>.

DEF has been actively using Information and Communication Technologies for Development (ICT4D) in order to work towards equitable opportunities by reducing information asymmetries. Its on field experience has shown that despite extremely positive predictions about increasing smartphone penetration in the country, it continues to lag in rural areas. Low uptake in rural and especially underserved areas are driven largely by affordability, shared usage, lack of functional literacy. Overall:

India has a federal governance structure with 28 states and 9 Union Territories

The number of smartphone users in India is expected to double to 859 million by 2022 from 468 million users in 2017 growing at a compound annual growth rate (CAGR) of 12.9 per cent, according to an ASSOCHAM-PwC joint study.<sup>3</sup>

It was predicted that by 2022, 36 per cent of mobile phone users in the country would use a smartphone, up from 26 per cent in 2018.<sup>4</sup>

In 2019, smartphone penetration in India is expected to stand at 39%.<sup>5</sup> However, in a survey on internet usage in emerging economies only in India, internet usage stood below 50%. According to the same study, gender wasn't a strong predictor of technology adoption. But the opposite was true in India, where men (34 percent) were much more likely than women (15 percent) to own smartphones. India's gender gap appears to be growing, moreover — it's 10 points wider than it was just five years ago, when 16 percent and 7 percent of men and women reported owning smartphones, respectively.<sup>6</sup>

As of 2015, 18.21 per cent of India's overall population owned a smartphone, a figure that is set to rise to over 25 per cent by 2017. Android was the most commonly installed operating system in India in December 2016, with the Google-backed company holding almost 77 per cent of the country's smartphone OS market share.

This increase in smartphone penetration in India is mirrored by the fact that India's share of the global smartphone market is forecast to more than triple between 2013 and 2017 to reach over 10 per cent. In the last quarter of 2016 alone, over 25 million units of smartphones were shipped in India, a figure that stood at just over 10 million in all of 2011. A survey conducted in 2017 showed that 9 per cent of mobile users in India listened to music on their phones and 49 per cent visited a social network.<sup>7</sup>

3. [https://www.business-standard.com/article/news-cm/number-of-smartphone-users-in-india-likely-to-double-to-859-million-by-2022-119051000458\\_1.html](https://www.business-standard.com/article/news-cm/number-of-smartphone-users-in-india-likely-to-double-to-859-million-by-2022-119051000458_1.html)

4. <https://www.statista.com/statistics/257048/smartphone-user-penetration-in-india/>

5. [https://www.indiatimes.com/technology/news/smartphone-users-in-india-smartphone-penetration-is-set-to-reach-373-million-users-in-2019\\_-360475.html](https://www.indiatimes.com/technology/news/smartphone-users-in-india-smartphone-penetration-is-set-to-reach-373-million-users-in-2019_-360475.html)

6. <https://venturebeat.com/2019/02/05/pew-south-korea-has-the-worlds-highest-smartphone-ownership-rate/>

7. See supra note 4

1. Bharti, N.K. (2018). Wealth inequality, class and caste in India, 1962-2012. World Inequality Database: World Inequality Lab.

2. Oxfam. (2018). India inequality report 2018: Widening gaps. Oxfam India.



# Challenge Scenarios

Two challenge scenarios were developed for this course:

## 1. ACCESS TO INFORMATION ON SOCIAL PROTECTION:

Access to information relies as much on institutions as on the medium of transmission. An information ecosystem comprising of requisite technology, reach, usability, and stakeholder engagement and value chain is integral to the functioning of strong institutions.

## 2. CONNECTIVITY IN TELECOM DARK AREAS:

Access to connectivity is well recognized as an enabler of socio-economic development and can help in addressing many of the barriers that presently persist in marginalized societies.



## Challenge Scenarios

# Access to information on social protection



## Background

Target 16.10 of the Sustainable Development Goals (SDGs) places a responsibility to ensure public access to information and protect fundamental freedoms, in accordance with national legislations and international agreements as a pathway to SDG 16 – Peace, Justice and Strong Institutions. Access to information relies as much on institutions as on the medium of transmission. An information ecosystem comprising of requisite technology, reach, usability, and stakeholder engagement and value chain is integral to the functioning of strong institutions. Access to information is crucial in ensuring access and participation especially in public administrative intervention aimed at ameliorating social and economic exclusion.

The Indian Constitution places a positive responsibility on the government to transform social relationships based on historical social structures through the removal of untouchability and prohibition of forced labour, thereby providing the Right to Equality, Right to Freedom, Right Against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, and Right to Constitutional Remedies. This is complemented by the Directive Principles of State Policy aimed at securing social and economic democracy by directing the State to ensure social, economic, and political justice for its citizens. Flowing from these constitutional foundations, though India has an expansive matrix of social protection schemes at Central and State level it invests a meagre 1.3 per cent of its GDP towards social protection (excluding healthcare) and is one of the lowest spenders among Asian countries. In societies deeply marred by socially stratified economic inequalities, social protection provides a pathway to equitable development and non-delivery is tantamount to the denial of constitutionally mandated rights and justice towards socio-historical marginalisation that denies excluded communities from access to equitable opportunities for social and economic inclusion.

Despite India's meagre spending on social protection, even the funds so allocated do not reach the target populations that serve to entrench deeper inequalities within the Indian society. This is a combination of a lack of strong local governance institutions to respond to the challenges of last mile service delivery<sup>8</sup>, public service delivery bottle-necks, and

8. Last mile service delivery in this context refers to reaching the most marginalised and underserved, remote, and rural locations and populations by government and public service delivery.





inadequate information and communication infrastructure and practices. Multiple DEF baseline research across its diverse locations have shown that despite rising smartphone penetration and lowering data prices there is marginal use of smartphones with internet connection that is reported to have good quality of service and are used for access to information.

Currently in terms of access to information landscape in India, the Right to Information (RTI) Act confers rights on the ordinary Indian citizen to demand information related to the government and governance. RTI requests have exposed corruption, called power to account, and empowered the disenfranchised. They have exposed the diversion of public funds earmarked for historically marginalised groups (Scheduled Castes and Scheduled Tribes) towards the preparations of Commonwealth Games; exposed the nexus of corruption between politicians, bureaucrats, and military officials in real estate; showed how small holder owners of lands whose lands were aggregated by the State government and offered up to a private foundation for construction of a university were never given the opportunity to be heard. The RTI Act has demonstrated very powerful instances of citizen empowerment and is a product born out of a long and arduous grassroots movement for seeking public accountability<sup>9</sup>. However, the Right to Information Act, 2005 'mandates timely response to citizen requests [emphasis added] for information. Concurrently, the public administration has a responsibility to incorporate an information ecosystem with the public service delivery infrastructure to create awareness about their availability for citizens, especially the most marginalized.

## Problem definition

Imagine a village in rural India with a population of 5000 that has low levels of literacy, high incidence of poverty with average monthly income of INR 5000 (EUR 62). Smartphone penetration stands at 15 per cent, internet connectivity is patchy and unreliable. The economy depends on agriculture and most of the inhabitants are smallholder farmers or agricultural labourers with high gender gap in workforce participation. There is also a prevalence of seasonal unemployment. Most of the population is unbanked (i.e. without a bank account) and crops are unsecured. The Central and State governments have numerous social protection schemes to address education, livelihoods, easy credit, insurance, social security – pension, encouraging women participation etc. among others. However, a baseline survey shows that only 0.1 per cent have applied for social protection schemes and 1.5 per cent are aware of them. Therefore, how do you increase social protection coverage through access to information in such a context?

9. For a brief history of the RTI in India, please refer to <http://mkssindia.org/about/>

## Challenges and constraints

**Policy:** The Government of India's Digital India initiative (<https://digitalindia.gov.in>) aims to focus on infrastructure, services, and empowerment in order to deliver a digital enabled and efficient e-governance ecosystem. One of the mission mode projects under this flagship policy initiative is the Common Service Centre (CSCs) which are information and communication technology (ICT) fixed access points in rural areas to provide information and service delivery to underserved Indian citizens. A highlight of the CSCs is that it will offer web-enabled e-governance services in rural areas, including application forms, certificates, and utility payments such as electricity, telephone and water bills apart from Government-to-Citizen services. CSCs are run through private operators through public-private partnerships. However, in most of the rural areas CSCs are non-functional due to low demand and affordability. Due to unilateral price setting by service operators, the price of services provided are set quite high and skewed towards the wealthy in a given location. This leaves the largest proportion of rural and underserved populations outside the ambit of access and participation. CSC IDs<sup>10</sup> are given to individuals who have the required facilities to run a CSC and are not geographically restricted. The government has no way of monitoring where a CSC ID holder is operating from. Often CSCs locate themselves in the town or block level and very often next to each other in the same location, thereby reducing the impact of its intended purpose of bridging digital and information divides since community members still have to travel a considerable distance to access their services, which are often concentrated in a given location. This often entails loss of a day's pay if the entire day is spent in travelling to the CSC. Further, under the BharatNet initiative, the aim was to connect all 250,000 gram panchayats [trans. Village Administration]<sup>11</sup> in India to the Internet under the Digital India project. In 2018, the government allocated a further Rs. 10,000 crores (approx. \$1.4 billion) towards completing this project. On 31 December 2017, Phase I of BharatNet, targeting 100,000 gram panchayats, was said to be completed. "The Bharat Broadband Network Ltd (BBNL) Annual Report 2016-2017 states that equipment has been installed in 100,364 gram panchayats; 96,039 gram panchayats are "service ready"; 59,124 are "service open"; and 103,768 panchayats have end-to-end connectivity. The BBNL website [as of 16 May 2018] marks over 105,000 gram panchayats as "service ready". Since these categories of service ready, service open, and end-to-end connectivity were not defined, the DEF research team decided to conduct a spot check of the status of 269 "service ready" gram panchayats in 19 districts in 13 states.

Three questions were posed:

1. Does the panchayat office have BharatNet internet connection?
2. Has the BBNL device been installed at the panchayat office?
3. Has BBNL internet connectivity ever worked at any point since its installation?

*Reports showed that "only 50 (18.6 per cent) of the 269 gram panchayats had BBNL device installed and internet connection up to the Panchayat Bhawan [Panchayat Office]. And only 31 (11.5 per cent) of them had "functional" but slow internet connection. These working connections were in four panchayats in Jharkhand, 3 in Madhya Pradesh, 17 in Maharashtra, 6 in Rajasthan and 1 in West Bengal. In Kalyanpur panchayat in Rajasthan, internet connectivity is limited to panchayat officials for 4-5 hours a day."*

*Further, assessment of the government's claim that all 597,464 villages in India have*

10. CSC identification numbers are provided after registration of the common service centre. It provides license to operate the given CSC and provide the range of services offered under CSCs including but not limited to signing up eligible individuals for central and state social protection schemes.

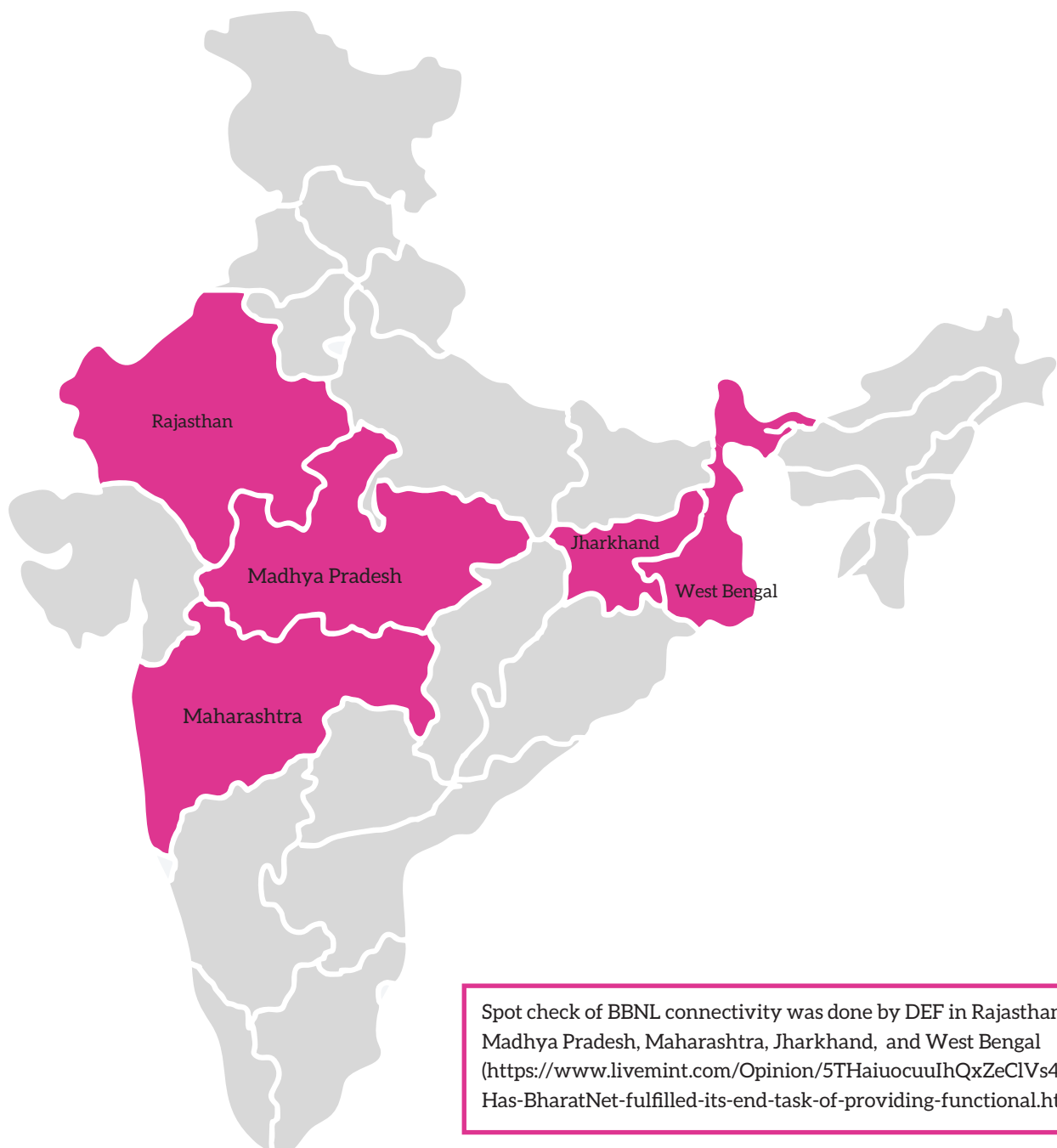
11. Gram panchayats are the last and smallest unit of local governance in India. India has a federal structure and is divided into States. For administrative purposes each State is divided into districts. Each district is further divided into blocks. Each block is further divided into *panchayats* or elected village administrations. Therefore, India > States > Districts > Blocks > Panchayats.



electricity shows that “linking a village to the power grid simply means that basic distribution infrastructure is in place, electric cables have been laid in public institutions, and 10 per cent of the households are ‘electrified.’”

Moreover, despite an impressive array of apps developed for dissemination of information to rural areas it fails to take cognisance of the practical realities of unreliable or low connectivity and low access to smartphones.

**Practice:** Lack of connectivity and smartphone penetration along with low affordability of data and devices constrain access to information initiatives. This is coupled with a lack of digital literacy as well as functional literacy and deepening poverty. Existing social structures inhibit active women’s participation. This results in double marginalisation for women in already under-resourced settings thereby serving to disempower them even further. It prevents the benefits of social protection from being inclusive.



Spot check of BBNL connectivity was done by DEF in Rajasthan, Madhya Pradesh, Maharashtra, Jharkhand, and West Bengal (<https://www.livemint.com/Opinion/5THaiuocuulhQxZeClVs4K/Has-BharatNet-fulfilled-its-end-task-of-providing-functional.html>)

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## Challenge Scenarios

# Connectivity in telecom dark areas



## Background

Access to connectivity is now well recognized as an enabler of socio-economic development, and can help address many of the barriers that presently exist for marginalized members of society. However, the 2016 International Telecommunication Union's (ITU) State of Broadband report points out that there are still about 3.5 billion people out of 7 billion people on the planet who are still not connected to the Internet. Empowering individuals who are living in remote areas is only possible if Internet connectivity is not only available but also affordable enough to allow access to the wide range of information available on the Internet. Access to connectivity is well recognized as an enabler of socio-economic development and can help in addressing many of the barriers that presently persist in marginalized societies. Major telecommunication companies do not venture into remote rural areas due to the high investment involved in setting up infrastructure and prospective low returns on such. This along with cumbersome licensing requirements becomes one of the significant barriers behind low connectivity affecting underserved areas. With most telecom companies unwilling or unable to build infrastructure in far-flung and rural areas, large swathes of the world have remained in media darkness. Evidently, most of those who are excluded from digital ecosystems are people who are largely at the bottom of the pyramid and reside in rural or inaccessible areas. They are people who have not been connected by the mainstream Internet Service Providers (ISP), and people who may have to wait a long time to be connected. Over the years, community network providers have proved to be great enablers for bridging the digital divide. In India, Community Networks involve deploying line-of-sight wireless technology and low-cost Wi-Fi equipment which utilize the unlicensed 2.4 GHz and 5.8 GHz spectrum bands to create community-owned and operated wireless networks. To further localize the initiative, the project was used to strengthen grassroots expertise by training community members in wireless technology, enabling those in the field not only to run and manage these networks but to transfer knowledge to others in the community.

## Problem definition

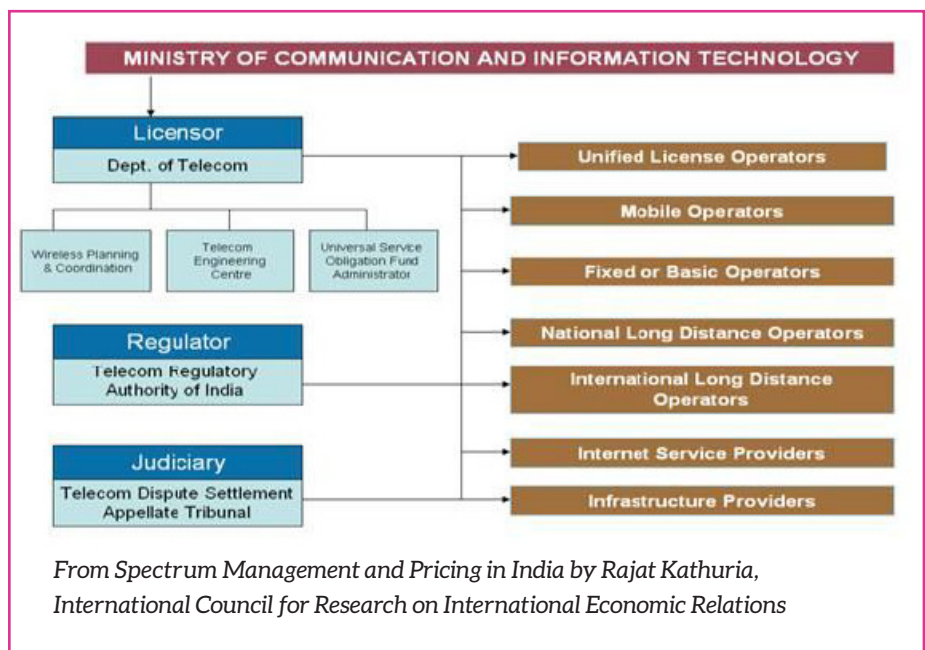
Imagine a village of traditional handloom weavers with a population of 20,000. Their art is dying due to powerlooms which can operate in high volumes. Their linkages to market are limited. Households are involved in the family business of handloom weaving, which has been passed down from generation to generation. Income is

drying up, formal education is low, and so is smartphone and digital penetration. The village is located in a telecom dark area i.e. an area with limited or no connectivity and patchy network coverage. Sustainability and survival of the art and livelihoods are only possible through digital upskilling, digital marketing, and e-commerce connectivity. A group of youth with help from a local NGO personnel pool resources to buy two laptops and CAD Design software. However, they are unable to use their resources for advancement of their work due to lack of connectivity. Therefore, how would you solve the problem of connectivity to ensure to ensure digital, social, and economic inclusion of the community in question?

## Challenges and constraints

**Policy:** One of the greatest issues hampering the growth of community networks is lack of sufficient and cheap backhaul connectivity<sup>12</sup>. India has one of the largest and densest populations in the world, and the demand for broadband from new users is high, partly owing to the availability of audio and video content via broadband. This means that there needs to be a large number of Wi-Fi hubs with strong backhaul connections serving a limited number of users. At present, however, this is largely not the case, which is why most – though not all – public Wi-Fi initiatives show disappointing performance.

Spectrum management and regulation is the collective responsibility of more than one agency in India. There are different bodies handling spectrum licensing, regulation, pricing, and the levy of penalties, and some bodies have only an advisory role. Aside from the complexity of spectrum regulation, any institution or individual applying for an ISP license, is required to engage with all the regulatory bodies listed. The large number of institutions that are involved in the licensing process leads to an increase in waiting time, unnecessary bureaucratic hurdles, and associated costs.



12. Backhaul connectivity refers to intermediate links between the core network or backbone network and smaller sub-networks that operate at the edge of the internet. It is the part of the network that interacts with the global internet. Cell phones communicating with a single cell tower constitute a local subnetwork; the connection between the cell tower and the rest of the world begins with a backhaul link to the core of the internet service provider's network (via a point of presence). A backhaul may include wired, fiber optic and wireless components. Wireless sections may include using microwave bands and mesh and edge network topologies that may use a high-capacity wireless channel to get packets to the microwave or fiber links.





In addition, if any NGO, small organisation, or individual wants to provide last mile Internet connectivity, they either have to become a franchisee of an existing ISP and bill via the ISP, or share their private Internet connection at their own risk due to the grey areas of the licensing requirements in India. In the case of the franchisee model, the entity also needs to store user logs for which they need a local data server, which adds to the technical burden which exceeds the management capability of many small entities.

According to Department of Telecommunications (DoT) guidelines, the height of any telecommunications tower should be 5 meters from the roof of an approved building or 30 meters from the ground. If the height of the tower exceeds that, then ISPs require Standing Advisory Committee on Radio Frequency Allocation (SACFA) clearance. If the aerial distance between the tower and an airport is within 7 kilometres, then ISPs also need the approval from the Airports Authority of India (AAI) – and there are other requirements in case of defence lands and borderlands, however most airports are in metro cities.

As ISPs are the only entities that are eligible to apply for SACFA clearance, entities that are acting as franchisees with ISPs which need to establish towers of more than 5 meters above the roof of a certified structure/building cannot apply for SACFA clearance. This adds to the challenges for small organisations to provide last mile connectivity, creating regulatory grey areas, which could lead to prosecution under the current law.

Another pressing issue hampering the growth of public Wi-Fi services in the country is over-regulation in other related areas. The limitation on the interconnection of the PSTN (Public Switched Telephone Network) with voice over IP (VoIP/SIP) networks for small providers is one area in particular that limits the viability of local community initiatives by impacting traffic, volume, and speed of service.

**Practice:** A variety of technical challenges have been encountered in the course of deploying Wireless for Communities (W4C) Community Networks (CN). These include:

- The accepted service level target is Triple-A compliance, however the technical and logistical issues can make this difficult. Maintenance of Triple-A compliance requires technical support and access to data centres, which are expensive and often difficult to access from rural areas or small towns. This is an additional technical hurdle for small ISP providers who may struggle to maintain the data centre or to receive technical support.
- The unlicensed 2.4 GHz bands have lately become very noisy and crowded in urban areas due to the high penetration of WLAN and other devices that are communicating in the same frequency range, such as microwave ovens, cordless phones, and Bluetooth devices. The 5.8 GHz unlicensed bands provide the advantage of less

interference and higher bandwidths, but links are usually shorter due to the higher adsorption rate of these frequencies resulting in greater signal loss.

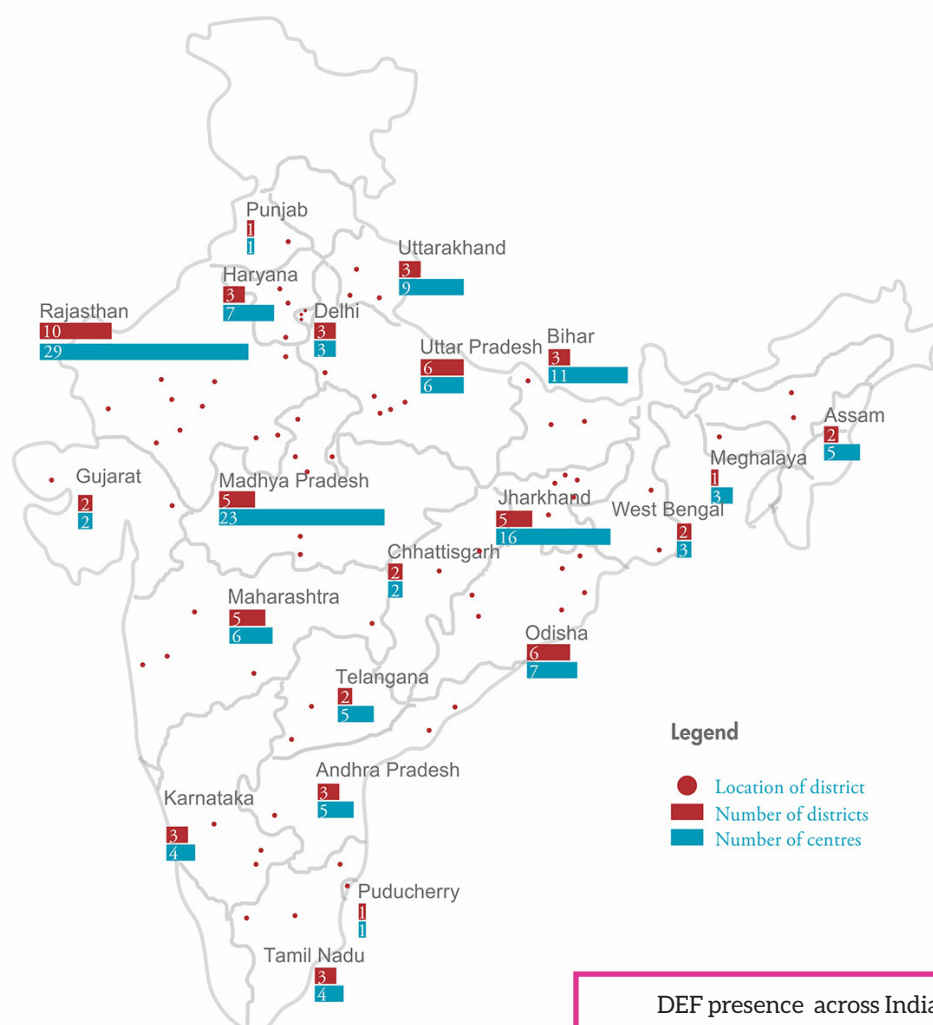
- In DEF's experience in particular, transmitting Internet connectivity from the ISPs base transceiver station (BTS) to the W4C hub station is another challenge. In urban areas, even if the required bandwidth is available at the BTS, an ISP will not provide power (5-10 W) for wireless equipment, or share the tower for client devices. The ISP will simply provide Ethernet out (a 10-30 meter Ethernet wire) and not provide any support for the further laying of cable and infrastructure. Maintaining a wireless Internet tower during the monsoon (rainy) season is high-risk due to severe thunderstorms, and this problem will likely grow with the increasingly worsening effects of global climate change. It is also difficult to protect wireless equipment, so the community networks supported by DEF have to maintain extra equipment along with a system backup file to restore a damaged network. This increases the burden on small ISPs, as they need to maintain extra equipment with system backup files to restore the network if needed.
- Even if a small organisation provides Wi-Fi connectivity in rural areas, the purchase of a leased line from any ISP is a time-consuming process. This requires three-level coordination with all stakeholders who are providing the backhaul bandwidth, and it can take about three-to-four months or longer.

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## Guiding questions for the creative problem solving process

- How would you structure your model?
- What would be the considerations you would factor in structuring your model?
- Who is your target group of beneficiaries and what is the number you hope to reach?
- How is your solution going to help your target group?
- What are the resources you would require and how would you get access to those resources?
- Who would be the stakeholders you need to engage in meeting the objectives of your solutions and how would you engage them?
- What would be duration of the project and what is the justification for the duration?
- How would you innovatively deal with policy and regulatory challenges?
- What would be your long-terms plans for sustainability?
- How would you transfer ownership to the community?
- What is the intended impact at the end of intervention?
- How would you make the solution scalable and replicable?





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