

10 Gram Panchayat Development Plan (GPDP): An Opportunity for Funding Rural Internet Connectivity in India

Sarbani Banerjee Belur⁷⁹, Abhishek Raj⁸⁰ and Ritu Srivastava⁸¹

10.1 Abstract

Internet connectivity has become important for socio-economic development of any region, especially the rural and remote regions. However, a major population of the world including India still remains unconnected to the internet. The traditional ‘top-down’ approach for enabling connectivity has proved to be insufficient for rural and remote areas. In this paper, we discuss an alternative ‘bottom-up’ sustainable multistakeholder model for enabling connectivity in rural India which has an active involvement of the village community through ‘Gram Panchayats’ (also known as Village Council). We also discuss the funding mechanism for this model through ‘Gram Panchayat Development Plan (GPDP)’. We suggest that ‘Internet for Development’ be included as one of the cross-cutting development areas in the GPDP to fund access to the internet in villages.

10.2 Introduction

The Internet is considered to be the decisive technology of the information age (Castells, 2014). No longer is access to the internet a luxury only, it has proven to be a necessity for socio-economic development in both developing and developed countries (World Bank, n.d.; Song et al., 2018, p. 8). Broadband (or high-speed) internet access is a powerful tool not only for delivering essential services such as education and healthcare but also offering increased opportunities for women empowerment and environmental sustainability, and contributing to an enhanced transparency and accountability of government (World Bank, n.d.). Research suggests that an increase of 10 percent in mobile broadband penetration yields an increase of 1.8 and 2.0 percent in GDP respectively for

79 Sr. Research Scientist, IIT Bombay & Asia Regional Coordinator, Association for Progressive Communications (APC), sarbanibelur@iitb.ac.in.

80 Researcher, The Centre for Internet and Society, abhishekrj2020@gmail.com.

81 Independent Researcher & Director, Jadeite Solutions, ritu.instablogs@gmail.com.

middle and lower income countries (Katz & Callorda, 2018). Stressing upon the importance of the internet, the United Nations General Assembly (UNGA) in its 2030 Agenda for Sustainable Development has listed down 'Universal and affordable access to the Internet' as a Sustainable Development Goal (SDG).⁸²

However, this goal is still far from being achieved. As of January 2021, there were 4.66 billion active internet users (AIU) worldwide ~ 59.5 percent (Johnson, 2021) of the global population. The situation in India is not encouraging either. As of March 2021, there were 778.09 million (Telecom Regulatory Authority of India [TRAI], 2021) broadband subscribers in India and an internet subscriber density (total internet subscribers per 100 population) of 60.73 (TRAI, 2021). With a rural and urban internet subscriber density of around 36.24 and 107.30 (TRAI, 2021) respectively, a digital divide is clearly evident between rural and urban India. The rural connectivity solution in India is entrapped in a vicious cycle. Barriers and challenges pose difficulty for internet penetration in rural areas thus discouraging usage of internet services. Low adoption of internet services results in poor Return-on-Investment (RoI) for service providers which in turn discourages internet coverage in rural areas. Hence, even if connectivity would reach the villages in India due to technological advancement, it would be difficult to sustain itself at the village level without a sustainable funding model.

The Government of India, in order to increase internet penetration as well as bridge the rural-urban digital divide, has undertaken various initiatives under the umbrella of Digital India (Department of Telecom, 2019). Among such initiatives, BharatNet Optical Fibre Network⁸³ and Prime Minister Wireless Access Network Interface (PM- WANI) are notable. BharatNet, earlier known by the name of National Optical Fibre Network (NOFN), is a flagship project of the Government of India which aims to link 2,50,000 'Gram Panchayats (GPs)'⁸⁴ to optical fibre network (Bharat Broadband Network Limited [BBNL], n.d.). BharatNet provides a middle-mile connectivity from Block Headquarters⁸⁵ to

82 See SDG 9. Accessible at <<https://www.un.org/development/desa/disabilities/envision2030.html>>.

83 To know more about Bharat Net, please see <<http://bbnl.nic.in/>>.

84 "Gram Panchayat" is an administrative unit in the local self-government system of India. It may consist of one or more villages depending upon the population size of villages. Bharat Net provides connectivity at 'Gram Panchayat' offices. For more details on Gram Panchayats and local government system in India, see Section 3.2.

85 Blocks are the second level in rural local self-government.

GPs. To extend services at the Gram Panchayat level, any service provider or a government agency can connect to the at block optical line termination (OLT) location from where the traffic is carried to GP level on the Bharat Net middle-mile (BBNL, n.d.). However, the service provider has to build their own last-mile to extend the services to the end consumers (BBNL, n.d.). As such large-scale deployments like BharatNet involve significant cost to the governments, and hence the connectivity needs to be sustainable (Belur, 2018, p. 150). But, due to an unevenness in demand and supply (Belur, 2018, p. 150), the uptake of Bharat Net by commercial service providers has been on a lower side. Thus, despite the efforts, last-mile access is still missing in the rural and underserved region. Other than Bharat Net, PM-WANI initiative aims to elevate wireless internet connectivity in the country by setting up public models of Wi-Fi hotspots. These hotspots can then provide entrepreneurship options for people in the rural areas.

Notably, the models which have been used to provide connectivity have mostly followed a 'top-down' approach. In these models, involvement of local people who are the ultimate beneficiaries, is lacking; the sole focus has been on creating a customer base and a return on investment (Belur, 2018, p. 150). When the local and regional needs are side-lined, these models are bound to be unviable and unsustainable (Belur, 2018, p. 150). Thus, to connect rural India with the internet, a sustainable model with an active involvement of the village community is required.

In this paper, we aim to analyze how an active involvement of 'Gram Panchayat' and the village community can help build a sustainable connectivity model in rural India. More specifically, we analyze how the finances available through 'Gram Panchayat Development Plan (GPDP)' can be utilized to improve internet access in the villages. Alongside, we also present a sustainable economic model based on the 'Public Private Panchayat Partnership (4-P) model' and its viability for financing rural connectivity.⁸⁶

This paper is structured as follows. In the first section, we introduce the problem statement, status of connectivity and the digital divide, and analyze it against the limitations of the traditional top-down model of connectivity. In the second section, we discuss an alternative partnership model for enabling connectivity in rural regions of India.

⁸⁶ This model was proposed in (Belur, 2018) and (Belur et al., n.d.).

We call this model the “4-P model”. This model follows a ‘bottom-up’ approach and involves village administration and community. In the third section, we discuss rural development and national and state-led financing mechanisms available for Gram Panchayats in India. We present a case for including ‘Internet for Development (I4D)’ in the Gram Panchayat Development Plan (GPDP). The paper concludes with important discussion points paving the road ahead for financing rural connectivity in India.

10.3 ‘4-P Model’: The need for a ‘bottom-up’ approach with involvement of rural local government

There is no denying that access to the internet is crucial for socio-economic development of a country, and especially the development of rural areas. However, the findings of an internet needs assessment survey suggested that just enabling connectivity is not enough for the villages (Belur et al., n.d.). What is required is the ownership of the network by the village authorities so that local and regional needs get prioritised (Belur, 2018, p. 151). The involvement of the community can be helpful in maintenance of the network as well as for keeping the security of the devices (Belur, 2018, p. 151). In this section, we discuss how seeding community networks⁸⁷ to grow in the last mile can be a potential solution to the absence of a business model by coming up with a sustainable economic model for rural broadband in India. The objective is two-fold in nature. The first is to ensure that there is decent and sustainable Return-on-Investment (ROI) for the investor and at the same time, a nominal user subscription cost for the end user. As broadband subscribers are expected to increase in the future, the model needs to take into consideration the expected growth in demand and at the same time be lucrative enough for Internet Service Providers (ISPs). This can be achieved by: (a) Using economic or cost-saving technology options so that the investment cost is low. (b) Having a partnership with the government so that some part of the operating expenditure can be borne. (c) Partnering with the ‘Gram Panchayats’, so that we involve the local people and train them to make this model self-sustainable.

⁸⁷ See <<https://comconnectivity.org/>>; <<https://www.intgovforum.org/multilingual/content/dynamic-coalition-on-community-connectivity-dc3-0>> to know more about community networks>.

10.4 Case of Gram Marg, IIT Bombay

An impact analysis of Internet usage study in three villages where Internet connectivity was provided for a duration of one year by Gram Marg,⁸⁸ an IIT Bombay project, suggested that if villagers are digitally aware and can avail Internet to use E-Governance services in their own village, they do not mind paying for the Internet. By availing services in the village itself, the villagers save time and money which they would have otherwise spent visiting the block headquarters to access the e-Governance services. Researchers in the Gram Marg project also tested the villagers' readiness to pay for the Internet. Given the situation that these villages had no Internet connectivity, the villagers calculated the total amount which they saved from not travelling to the block headquarters. They calculated a fixed amount of INR 150 (approx. 2 USD) monthly for the Internet in their village.

However, without a sustainable economic model at the village level, the Internet connectivity, even though it reached the villages, was not able to sustain itself in the village. Thus, two important players enabling connectivity were identified a) the private telecom operator who provides the bandwidth and b) a government office (Gram Panchayat office) that uses the internet to enable E-Governance services to the villagers. Two important conclusions derived from the impact study were first, the need for a sustainable funding model wherein Gram Panchayats can own the connectivity network and second, lucrative business models can be enabled influencing standard of living and entrepreneurship opportunities for growth. Further investigation of the financing options by the Gram Panchayat was also studied. The availability of funds and the discretion to spend makes the Gram Panchayat to be an equal partner who can enable connectivity and internet services in the village.

There have been several types of public-private-partnership (PPP) models, such as BOT (Build Operate Transfer) model, BTO (Build Transfer Operate) model and Joint Venture model. The Telecom Regulatory Authority of India (TRAI) has recommended a PPP model for the Bharat Net project. The project is being executed by BSNL,

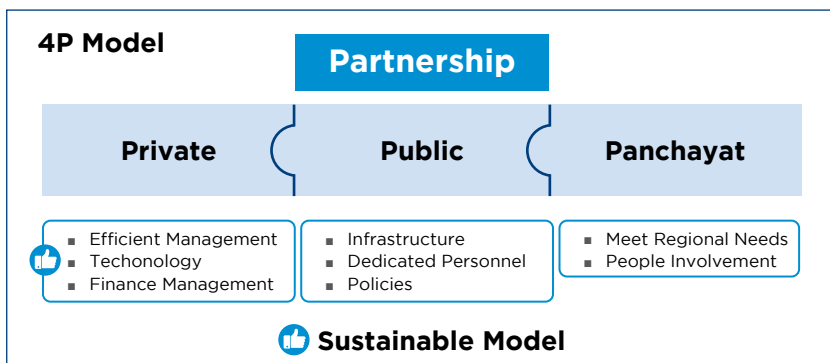
⁸⁸ To know more about Gram Marg, see <<http://grammarg.in/>>.

RailTel and Power Grid. In the BOT model, the private service provider provides the initial capital to build, maintain and operate the service for a certain contract period. During this period, the government provides a concession, and then takes back control over the service once the contract period has expired. In the BTO model, the private service provider builds the infrastructure and then transfers the service to the public sector owner. The owner then operates the service. In the joint venture model, the investment is done by both the private service provider and the public sector. For instance, BharatNet has been operating based on the BOT model in which connectivity is provided only to the Gram Panchayat or the village council office without reaching the villages. However, in the absence of a sustainability approach this connectivity is neither extended nor explored for entrepreneurial opportunities. To solve this issue, 'Gram Panchayat' was identified as one of the stakeholders due to the following reasons:

1. It is the only local government body that can take the onus and responsibility of the connectivity in terms of operations and management.
2. They have the ability to finance.
3. They can customise the connectivity as per the needs of the people.

The model formulated after including Gram Panchayats is known as the "Public Private Panchayat Partnership (4-P) Model" for providing sustainable rural connectivity and can be figuratively shown below in Fig 1.

Figure 1. 4P Model



Source: Reproduced from (Belur et al., n.d.)

Some of the important features of this model as discussed in (Belur, 2018, 153) are:⁸⁹

- Introduction of the Panchayat (i.e., the village administration) in the partnership model alongside the private and public partners.
- A ‘bottom-up’ approach which has an active involvement of villagers, and focuses on the local and regional needs with regard to connectivity.
- Participation of Panchayat adds value to the partnership model, as it is elected by the people of the village and represents village administration. Additionally, it has the backing of district administration and state government here.

Box 1: Revenue Generation as part of 4-P Model⁹⁰

The Gram Marg Team created a test-bed in 25 villages of Palghar district. In order to test the sustainability of the 4-P model, the villages were divided into two groups with a different revenue generation method.

Group-1: Local ISP-based revenue model

In the 15 villages cluster (the first group), the revenue model is through the local ISP. The local ISP has enabled 2 Mbps bandwidth at each Gram Panchayat office and gets directly paid by the Gram Panchayat. The local ISP further sells the bandwidth inside the village as part of its marketing strategy and generates revenue from the connectivity. The Gram Panchayat office pays a fixed price of INR 1000 (USD 14) for 2 Mbps of bandwidth. This cost includes the bandwidth cost, operation and maintenance of the link and device cost if the device needs replacement due to damage. However, as the Gram Panchayat office does not use the entire bandwidth, the unused bandwidth is sold to the villagers in the form of ‘pay as you use’ daily coupons of a duration of one-hour each costing INR 10 (14 USD cents). This connectivity is accessed at the Gram Panchayat office. It has been observed that on an average, 5-10 people use the internet

⁸⁹ The features discussed here are adapted from (Belur, 2018, 153)

⁹⁰ Adapted from (Belur, 2018, 155)

at the Gram Panchayat office per day, which totals to INR 50 to INR 100 (70 USD cents to USD 1.40) per day and results in a monthly income of INR 1500 – INR 3000 (USD 21 – USD 42). This contributes to the monthly revenue of the Gram Panchayat. Out of this amount, INR 1000 is paid to the local ISP. The Gram Panchayat office further plans to use the accumulated amount for development activities within the village.

Group-2: CSC-VLE focused revenue model

The second set of 10 villages has a Village Level Entrepreneur (VLE) focused revenue model where ‘CSC Wi-Fi Choupal’ has acquired 30 Mbps bandwidth from a local ISP and distributes the same to different villages depending on internet use and number of customers in each village. The VLEs maintain the network in these villages and sell bandwidth to the villagers in the form of coupons based on the fixed pricing plan. The monthly customer base of the VLEs include new customers as well as returning customers. The revenue plan of the VLEs has been devised in a way that it maximises profit for the VLE, thereby providing incentive to perform. It has been observed that of the coupons sold per month, 40% of the coupons sold are of INR 10 (14 USD cents) in value, which gives 500 Mb of data for 10 days. The next popular coupon amount is INR 100 (USD 1.40) purchased by 22% of villagers, which is valid for 28 days, and which gives 12 GB of unlimited data.

Revenue information suggests that in those villages where there is a substantial use of internet data and a large customer base, the monthly revenue generated by the VLE is in the range of INR 5000 to INR 6000 (USD 70 to USD 84). In other villages, the monthly revenue generated is INR 3000 to INR 4000 (USD 42 to USD 56) on average.

10.5 Rural Development Plan and Financing Models for Connectivity in South Asia

Participation of people in the governance of the nation is the essence of democracy for any country. Decentralisation is the prime

mechanism through which democracy becomes truly representative and responsive. Decentralised rural development would succeed only with decentralised planning.

In the following sub-section, we give examples from rural development plans of South Asian countries for enabling rural Internet connectivity, and afterwards provide an overview of the village administration system in India i.e., ‘Panchayati Raj’ and discuss Gram Panchayat Development Plan (GPDP).

10.5.1 Initiatives by Governments in South-Asian region to enable connectivity

Governments in the South-Asian region have devised initiatives for bringing rural connectivity under rural development plans/models. The Indonesian government, through the Ministry of Communication and Informatics (MCI), endeavours to provide evenly distributed information and communications technology (ICT) infrastructure within the archipelago, including rural areas. The Palapa Ring, a broadband backbone project, was accomplished in 2019, with fibre optics covering 12,000 km, connecting the western, central, and eastern parts of Indonesia (BAKTI, 2018). As part of Bedugul Declaration inspired by Bali Bangkit movement (Lukman, 2021), an action plan has been drafted for setting up the internet infrastructure and utilization of digital platforms developed by community-based internet infrastructure. This action plan also puts its efforts to promote the cultural advancement of rural communities as well as health services and the COVID-19 pandemic mitigation. Rural resource network (RRN) is the concept in Bangladesh (Islam et al., 2006) to connect telecentres of different villages in the country. Thus, each telecentre acts as Wireless Rural Points (WRPs) which are further connected with the central Wireless Access Point (WAP). Using the existing telecommunication and IP backbone infrastructure reduced the cost of deploying new backbone in rural regions of the country. In the Republic of Nepal, the government through its Nepal Telecommunications Authority has created the Rural Telecommunication Development Fund⁹¹ to bring internet connectivity to public institutions, including schools, public hospitals, municipalities, etc.

91 See: <<http://mail.nta.gov.np/old/en/rural-telecommunication-development.html>>.

In the next section, we discuss village administration, development plans, and finances.

10.5.2 Gram Panchayat Development Plan (GPDP) in India

Gram Panchayats in India are the grassroot level institutions working for the betterment of the people living in rural areas. Over the last few decades, several initiatives have taken place for democratic decentralization and development of rural regions in India. The Gram Panchayats have been providing the institutional mechanism for such decentralized rural development.

The Gram Panchayat is an institution under the 'Panchayati Raj' system: a South-Asian political system present mainly in India, Pakistan, Bangladesh and Nepal (Ananth, 2014). 'Panchayati Raj Institutions' (PRI) are an institution of rural local self-government and form the last-tier of multi-order federalism in India (Alok, 2013). The Constitution (73rd Amendment) Act, 1992 (73rd CAA) accorded the constitutional status to PRIs in India, and envisaged a three-tiered local government i.e. at the village (Gram Panchayat), intermediate (Intermediate Panchayat⁹²) and district levels (District Panchayat).⁹³ The 73rd CAA has accelerated the decentralization with greater devolution of powers to Panchayats.

The Central Government and state governments, in recent times, have laid stress on participatory planning-process at the grassroots level. Notably, GPs are also constitutionally mandated for the preparation of development plans for economic development and social justice utilizing the resources available to them (Ministry of Panchayati Raj, n.d.). In order to scale up the planning activities in rural local bodies across all states/UTs, the Ministry of Panchayati Raj (MoPR) launched a 'People's Plan Campaign (PPC)' to formulate a Gram Panchayat Development Plan (GPDP). MoPR issued Guidelines and manuals for preparation of GPDP taking into account the evolving scenarios of increased allocations under the Fourteenth Finance Commission (FFC)⁹⁴ and different flagship schemes for convergence

⁹² The nomenclature varies from state to state. e.g. Block Panchayat, Taluka Panchayat, etc.

⁹³ See Article 243-B of Constitution of India.

⁹⁴ The Finance Commission is constituted by the President of India under article 280 of the Constitution, mainly to give its recommendations on distribution of tax revenues between the Union and the States and amongst the States themselves. The terms of references of fourteenth finance commission, inter-alia, mandates the Commission to recommend "the measures needed to augment the Consolidated Fund of a State to supplement the resources of the Panchayats and Municipalities in the State based on the recommendations made by the Finance Commission of the State.

of resources (Ministry of Panchayati Raj, n.d.). The guidelines issued by the Ministry of Finance (MoF) for release and utilisation of grants recommended by FFC for local bodies stipulate that Gram Panchayats have to prepare proper plans for the functions devolved to them under the state laws, before incurring any expenditure under the FFC award.⁹⁵ Thus, Gram Panchayats across the country are expected to prepare and submit context-specific and need-based Gram Panchayat Development Plans (GPDP) (Press Information Bureau [PIB], 2020). These plans are expected to bring together both the citizens and their elected representatives in the decentralized planning processes, and are expected to reflect the development issues, perceived needs and priorities of the community, including that of the marginalized sections (Press Information Bureau [PIB], 2020).

As part of 'Intensive Participatory Planning Exercise (IPPE)', MoPR has mandated convergence of MGNREGA⁹⁶ and NRLM⁹⁷ along with FFC grants to bring out participatory planning for works and labour budgets. FFC has recommended two components - Basic Grant and Performance Grant for transfer of funds to the GPs in the ratio 90:10 respectively. The distribution of FFC grants among GPs is to be carried out as per State Finance Commission's (SFC) norms where available. Otherwise, the grant is distributed on the basis of population and geographical area (90 per cent and 10 per cent weights, respectively). The rest of the financial resource comes from Own Source and flows from other state and centrally sponsored schemes that would enlarge the Financial Resource Envelope for Panchayat. Thus, the Resource Envelope (Ministry of Panchayati Raj, 2016) at a GP includes the following financial resources:

- 1.** Grants from the Union Government based on the recommendations of the Central Finance Commission: Basic Grant and Performance Grant.
- 2.** Devolution from the State Government based on the recommendations of the State Finance Commission as per Article 243 I.

95 See para 4 of MoF Guidelines for Release and Utilisation of Grant recommended by FoFC for Rural and Urban Local Bodies, Issued by Ministry of Finance. Accessible at <<https://panchayat.gov.in/documents/20126/0/Guidelines%2815%29.pdf/83817540-5e00-4bce-9309-852bd6699ace?t=1554109970591>>.

96 See <<https://nrega.nic.in/netnrega/home.aspx>> to know about MGNREGS>.

97 See <<https://nrlm.gov.in/outerReportAction.do?methodName=showIndex#gsc.tab=0%20to%20know%20about%20NRLM>>.

3. Loans / Grants from State Government.
4. Programme-specific allocation under Central and State Sponsored Schemes and Additional Central Assistance.
5. Own Source Revenues – taxes, non-tax, rents, fees for markets and ponds, user charges etc.
6. MGNREGS.⁹⁸
7. Community contribution (Cash / Kind/Labour).
8. Corporate social responsibility funds.

10.5.3 Challenges in GPDP and rural financing model

The 73rd CAA described in Section 3.2 inserted the eleventh schedule in the Constitution of India, which lists down the functions of a Gram Panchayat. This schedule contains 29 subjects which cover issues related to 1) Poverty; 2) Education; 3) Sanitation; 4) Water Supply; 5) Public Health; 6) Local Economy 7) Natural Resource Management; 8) Issues of special groups / persons with disabilities / issues of SCs and STs / aged persons / children etc.; 9) Gender issues; 10) Migration; 11) Road Construction; 12) Rural Housing; and 13) Public distribution system, etc. Article 243 G empowers the GP by enabling the state governments to devolve powers and authority including those matters listed in the eleventh schedule for planning and implementation of schemes for economic development and social justice.

As per the Guidelines of MoPR, the GPDP planning process has to be comprehensive and based on the participatory process, which inter alia involves the full convergence with Schemes of all related Central Ministries / Line Departments related to 29 subjects enlisted in the Eleventh Schedule of the Constitution. Thus GPDP covers the development status of the GP based on the 29 subjects of panchayat listed in the Eleventh Schedule (Ministry of Panchayati Raj, 2016). The gaps in the sector of rural electrification and internet connectivity have been mitigated by taking support from various schemes of the Central Government in a comprehensive District and Block Panchayats planning.

According to the report 'Utilization and Impact Evaluation of 14th Finance Commission' (Institute of Economic Growth, 2020), a fair percentage of the Gram Panchayat offices do not have internet connections. Many

98 See: <<https://nrega.nic.in/netnrega/home.aspx>>.

GPs are having internet connections through broadband and under CSC programmes, but they are not functioning in many cases. Only 13% of panchayats have telephone facilities. For data entry purposes, panchayat officials need to visit block development offices. It is clear that the data entry based on 29 subjects of panchayat are directly dependent on the availability of internet services at the panchayat office, yet access to the internet services is not covered as part of Panchayat's subject.

Moreover, the availability of the internet has not been considered across development parameters but has only been considered under key parameters of banking or ATM services. Thus, the availability of internet infrastructure goes completely missing in education, public health, public distribution systems and the development of other subjects in GPDP. In addition to this, monitoring and evaluation of the development plan is instructed to geo-mapping and geo-tagging of infrastructure. Without internet connectivity, this activity is unable to be accomplished.

The various activities involved in the whole process of GPDP preparation such as conducting surveys, awareness generation/raising, holding of Gram Sabha meetings etc. may also require to be modulated according to the Covid-19 pandemic related situation by adopting online methods. All training(s), whether they are State level, District level or field level, for PPC will be conducted through online digital mode as far as possible.

When most of these activities are undertaken through online channels, the question arises that **'Why BharatNet, the national broadband project, is not leveraged as part of the village development plan, GPDP?'** BharatNet, under the vision of Digital India, initiated by Government of India (GoI) in 2017 to connect 250,000 GPs with the internet and improve digital services. Taking BharatNet's connectivity as a backbone, it is easy to adopt online activities, including data entry, village level surveys, geotagging of villages, and further conducting online training and enabling schools and public health facilities with internet.

10.5.4 Towards a sustainable funding model: The Case for Including 'Internet for Development' in GPDP

Provided the importance of the internet for development of villages and the role that Gram Panchayats can play in enabling internet

connectivity, it is unfortunate that internet connectivity does not still find a place in the development plan of Gram Panchayats. As mentioned earlier in Section 3.2., GPs are expected to formulate a GPDP. 'Internet for Development' can be included in this GPDP, which could aid in getting the finances required to enable connectivity in the villages.

A sample GDP would look like:

**Table 1. Inclusion of 'Internet for Development' in GPDP:
A sample**

Sr. No.	Category	Amount
1	Street Lights	c1
2	Roads	c2
3	Water Taps	c3
...
n	Internet for Development	cn

(Source: By authors)

We have developed three different scenarios to implement and execute village connectivity through the sustainable '4-P' model. There are two important cost indicators which need to be analyzed properly for understanding sustainability of any model: Capital Expenditure (CAPEX) and Operational Expenditure (OPEX).

In the table below, we provide three possible implementation and execution scenarios for connectivity in a village through the 4-P Partnership model.

**Table 2. Implementation and Execution scenarios of
connectivity in a village**

1st Scenario	2nd Scenario	3rd Scenario
<ol style="list-style-type: none"> CAPEX can be included in 5-years GPDP as 'Internet for Development' OPEX includes bandwidth charges and VLE salary (if there is VLE system) Local ISPs/ VLEs will generate the OPEX 	<ol style="list-style-type: none"> CAPEX and OPEX investments under a 50:50 ratio between Local ISPs/VLEs and Gram Panchayats. The revenue generated will be shared under a 50:50 ratio. 	<ol style="list-style-type: none"> The local ISPs/ VLE invest in both CAPEX and OPEX and generate revenue from it.

(Source: By Authors)

We have modelled CAPEX and OPEX for enabling connectivity. They are presented in the form of tables (3-5) below.

In the next table, we provide monthly OPEX incurred per village in enabling connectivity.

Table 3. Monthly OPEX per village

Sr. No.	Category	Amount (INR)	Amount (USD) ⁹⁹	Quantity	Cost (INR)	Cost (USD)	Note
1	VLE Operation and Maintenance (O&M) Cost per village	1,500	20.05	1/mo.	1,500	20.05	4 Field Engineers
2	Bandwidth cost per month per village	5,833	77.98	1/mo.	5,833	77.98	3,50,000 INR per year. We can consider serving approx. 5 villages.
3	VLE O&M cost on equipment	1,000	13.37	1/mo.	1,000	13.37	Including devices, cables and solar equipment
4	Electricity Bill of GP	500	6.68	1/mo.	500	6.68	Per month

(Source: By Authors)

Table 4. Government Expenditure

Sr. No.	Category	Year 1	Year 2	Year 3	Year 4	Year 5
1	Government Expenditure	CAPEX + Bandwidth charges for 6 months	OPEX (per month)	OPEX (per month)	OPEX (per month)	OPEX (per month)
2	Cost (INR)	3,40,000-4,90,000	8,833	8,833	8,833	8,833
2a	Cost (USD)	4545.37-6550.68	118.09	118.09	118.09	118.09

(Source: By Authors)

[*Note: Per user/village cost is Rs. 140; Cost is variable according to the tower used per village. Use of defunct tower at GP premise will reduce the cost further]

⁹⁹ Rate for conversion 1 USD= 74.73 INR

In the below table, we provide the CAPEX investment requirement for connectivity in the village.

Table 5. CAPEX to be proposed in GPDP

Sr. No.	Category	Amount (INR)	Amount (USD)	Quantity	Cost (INR)	Cost (USD)	Note
1	Equipment (Per Village)	2,00,000	2673.75	1	2,00,000	2673.75	4 Backhaul AP including 1 drop (50k), 6 outdoor APs for mesh inside village (40k), Power, Battery, Backups, cables, etc. (70k), firewall (20k), Miscellaneous (20k)
2	Bandwidth cost (Per month per village)	5,833	77.98	1/ mo.	5,833	77.98	3,50,000 for 20 Mbps per year which comes out to be 29,166. We can consider serving approx 5 villages. Thus, per month pr village= 29,166/5
3	Field work and installation	10,000	133.69	1	10,000	133.69	Per month
4	Tower Cost (3,6.9 meters)	50,000	668.44	1	50,000	668.44	One-time
5	Tower Cost (15 meter)	2,00,000	2673.75	1	2,00,000	2673.75	One-time
6	VLE salary (if appointed) per village	5,000-10,000	66.84-133.69	1/mo.	5,000-10,000	66.84-133.69	

(Source: By Authors)

[Note: Either 3,6,9 meters, OR 15-meter tower can be used]

10.6 Discussion and Conclusion

Gram Panchayats (Village Council) are the main government institutions in the last mile. The members of the Gram Panchayat are nominated by the people of the villages and are answerable to the people. The advantage of including Gram Panchayats in the business model is because of their ability to focus on connectivity based on the needs of the communities they serve and their ability to finance through the GPDP. If Gram Panchayats take up the initiative to connect themselves through the GPDP funds, it will help the Government of India to enable connectivity to the unconnected villages much faster. A connected Gram Panchayat can also help in expansion of internet connectivity by various licensed stakeholders like ISPs, local ISPs and Village Level Entrepreneurs (VLE). In addition to this, different entrepreneurship models can be initiated as well as E-Governance services, banking services and ATMs can be implemented in the villages.

Further, the eleventh schedule in the Constitution of India which contains the powers and responsibilities of Panchayats can be amended to include 'Internet for Village Community Development' as a subject. This would provide more autonomy and thus enable Panchayats to solve their connectivity-related problems.

Specifically in times of COVID-19, most of the systems and processes are transforming from offline mode to online mode. This makes it imperative to see 'Availability of Internet Infrastructure' as cross-cutting or horizontal-section instead of it being taken as one of the vertical sections within the infrastructure pillar. If internet connectivity is improved, it would be possible to combine internet-related work of different schemes operating at the GPs.

To conclude, in this paper we attempted to address the issue of a sustainable funding model for connectivity in rural and remote regions. In the process, we discussed the importance of the internet for socio-economic development, especially the rural areas. We also highlighted the low connectivity in rural India, the digital divide existing between rural and urban India, and how the traditional top-down approach has not been able to improve connectivity in such areas. We emphasized the importance of the involvement of the

community in solving their connectivity problems, and provided an alternative 4-P model based on a bottom-up approach with involvement of Gram Panchayat. And finally, we analyzed how Gram Panchayat Development Plans can be utilized to fund internet connectivity in village.

10.7 References

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