FINAL PROJECT REPORT

Wireless for Unconnected

Submitted to – Internet Society
Submitted by – Digital Empowerment Foundation

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Internet Society

DEF
DIGITAL EMPOWERMENT foundation

WIRELESS FOR COMMUNITIES

LIST OF ACRONYMS

DEF - Digital Empowerment Foundation
ISOC – Internet Society
W4C – Wireless for Communities
Panchayat- Local Village Authorities
Aanganwadi- Village level Mother and Child Care Center
CHC- Community Health Center
SC- Schedule Caste
ST- Schedule Tribe
IIRC- Internet information Resource Center

Executive Summary

The report provides an overview of and presents the key lessons learnt in the ISOC funded project "Wireless for Unconnected" program implemented by Digital Empowerment Foundation. The target areas were- Harur (Tamilnadu), Nuh (Haryana), Tauru (Haryana), Punhana (Haryana) and Tumkur (Karnataka).

A feasibility study was conducted in all the 5 locations to assess the various components of setting up the community networks in the targeted areas. The initial activities were community mobilisation, identification of wireless trainers, installation of community networks and capacity building workshops with wireless trainers, community members and local administration.

Hence, the project aimed at promoting digital inclusion and help create community development opportunities. Also, to providing Internet access to the people, the project helped establish Internet Information Resource Centres which will act as a stable information access point for people living in those communities.

Installation of Community Network by Wireless Trainers in Nuh, Haryana

Introduction

In the current Digital Era, all Government policies are available online to be accessed by the beneficiaries, but, due to lack of internet, they are unaware of the online process or even the general existence of these schemes and policies. Therefore, to promote digital inclusion and help create community development opportunities, Digital Empowerment Foundation with Internet Society (ISOC), implemented a project named " Wireless for Unconnected". It was a 9-month project implemented from September 15, 2020, in seven marginalized locations Nuh (Haryana), Dharmapuri (Tamilnadu) and Bhaktiyarpur (Bihar). The project covered 4000 households in seven identified areas. These locations were internet dark zones which lack access to education, information, entitlements, and rights.

Activity Sequence

The project followed a sequence of inter-related activities that were conceived as part of the project design and evolved as the project progressed. The flowchart in Fig. 1 depicts the activities that have been conducted under the project in 9 months.

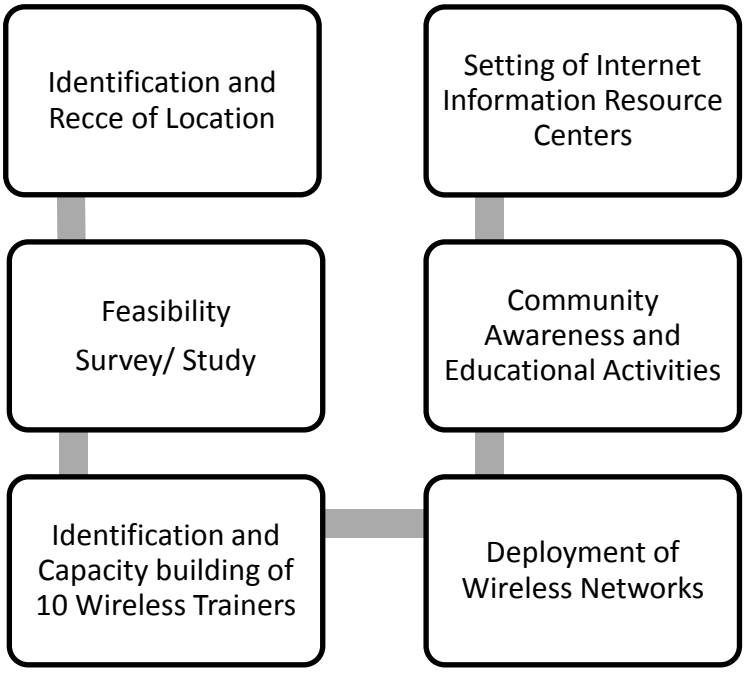


Fig:1- Activities Sequence Flowchart

Locations identified:
Locations listed below have been identified on the basis of internet accessibility, the feasibility of the implementation and their needs.

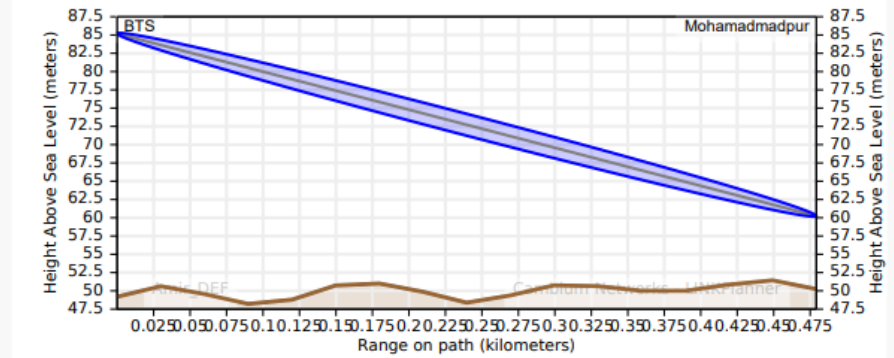
S.No	State	Block/Location, District	Complete Address
1	Tamilnadu	Sittilingi, Dharmpuri	Tribal Health Initiative, Near Mariyamman Temple, Sittilingi, Dharmpuri, Tamilnadu
2	Haryana	Tauru, Nuh	Vill-Pachgaon, PO-Tauru, Tehsil-Tauru, Nuh
		Nuh, Nuh	Vill-Kairaka, PO-Sudaka, Tehsil-Nuh, Nuh
		Punhana, Nuh	Vill-Phalaindi, PO-Shahchokha, Tehsil- Punhana, Nuh
3	Bihar	Bhaktiyarpur	Mohammadpur Panchayat Bhawan. Tehsil- Bhaktiyarpur, Patna
			Daulatpur, Tehsil- Bhaktiyarpur, Patna
			Mirdhachal, Tehsil- Bhaktiyarpur, Patna

Conducting the feasibility study:
The feasibility study has been conducted in the target locations. The study comprised of understanding the critical parameters required to set up the wireless network infrastructure. The range of the internet reach, performance of the internet - speed, climatic conditions, materials requirements, site for installing the antenna were some of the parameters considered during the feasibility study. Below are the findings of feasibility study: **-**

State	Location	*Latitude*	*Longitude*	*Feasibility*
Tamilandu	Sittilingi, Dharmpuri	11.90321N	078.61995E	*Feasible*
Haryana	, Nuh	28.067 N2841.188	77.1091 E77632.754	*Feasible*
	Dhulatpur, Nuh	27.88056 N275250.016	77.14821 E77853.55	*Feasible*
	Phalindi, Nuh	25.453251	85.555032	*Feasible*
Karnataka	Tumkur	13.37948N	077.21751E	*Not Feasible*
Bihar	Mohammadpur, Bhaktiyarpur	25.45641N	085.55845E	*Feasible*
	Daulatpur	25.51129N	085.22377E	*Feasible*
	Mirdhachal	25.45622N	085.55369E	*Feasible*

Summary	
Link Name	BTS to Mohamadmadpur
Profile Type	Line-of-Sight
Equipment Type	PTP670
Maximum Obstruction	0 meters
Link Distance	0.479 kilometers
Free Space Path Loss	101.31 dB
Excess Path Loss	0.00 dB
User IP Throughput Expectation Aggregate	Aggregate 452.23 Mbps assuming PTP-670 Series running the 670-03-12 software
RF Frequency Band	5.8 GHz (5725 to 5850 MHz)
RF Channel Bandwidth	45 MHz

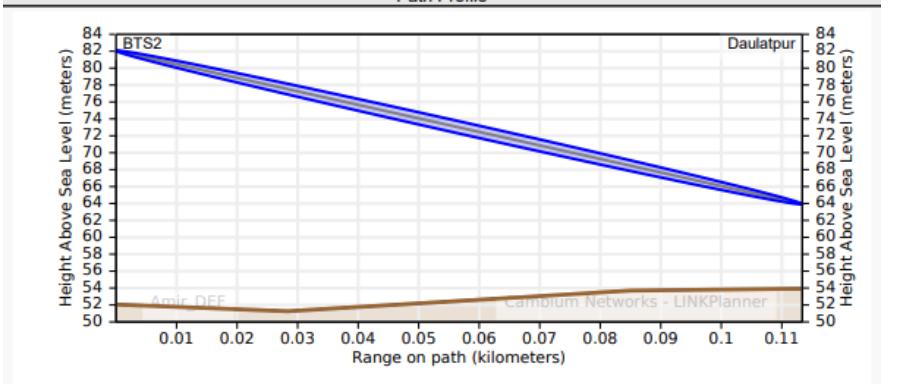
Path Profile



Graph 1:- Feasibility of Mohammadpur, Bhaktiyarpur, Bihar

Summary	
Link Name	BTS2 to Daulatpur
Profile Type	Line-of-Sight
Equipment Type	PTP670
Maximum Obstruction	0 meters
Link Distance	0.113 kilometers
Free Space Path Loss	88.79 dB
Excess Path Loss	0.00 dB
User IP Throughput Expectation Aggregate	Aggregate 452.23 Mbps assuming PTP-670 Series running the 670-03-12 software
RF Frequency Band	5.8 GHz (5725 to 5850 MHz)
RF Channel Bandwidth	45 MHz

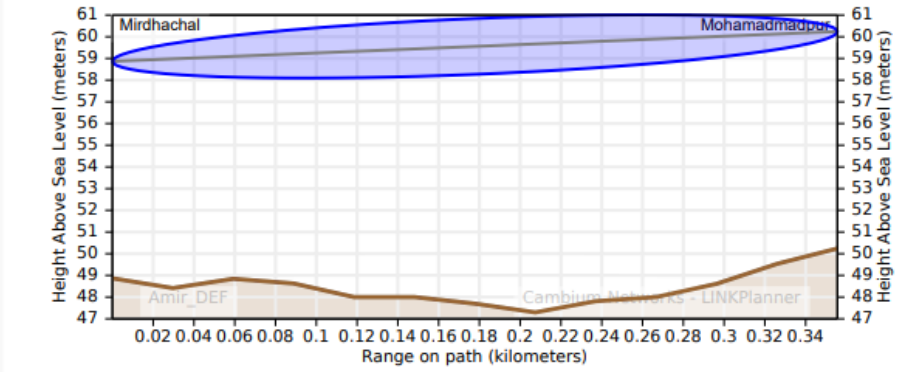
Path Profile



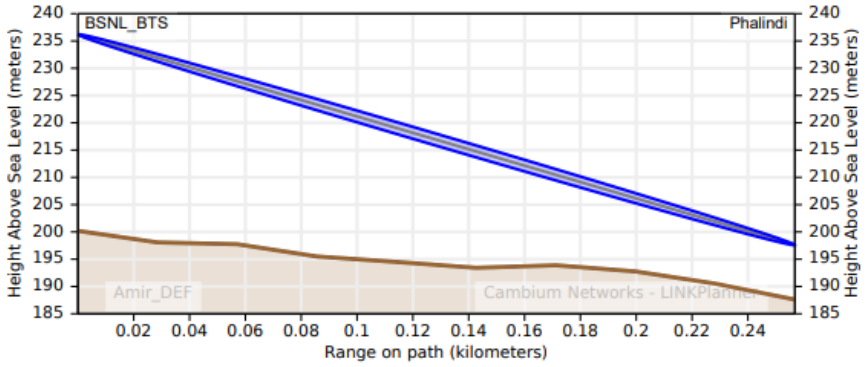
Graph 2:- Feasibility of Daulatpur, Bhaktiyarpur, Bihar

Summary	
Link Name	Mirdhachal to Mohamadmadpur
Profile Type	Line-of-Sight
Equipment Type	PTP670
Maximum Obstruction	0 meters
Link Distance	0.356 kilometers
Free Space Path Loss	98.72 dB
Excess Path Loss	0.00 dB
User IP Throughput Expectation Aggregate	Aggregate 452.23 Mbps assuming PTP-670 Series running the 670-03-12 software
RF Frequency Band	5.8 GHz (5725 to 5850 MHz)
RF Channel Bandwidth	45 MHz

Path Profile



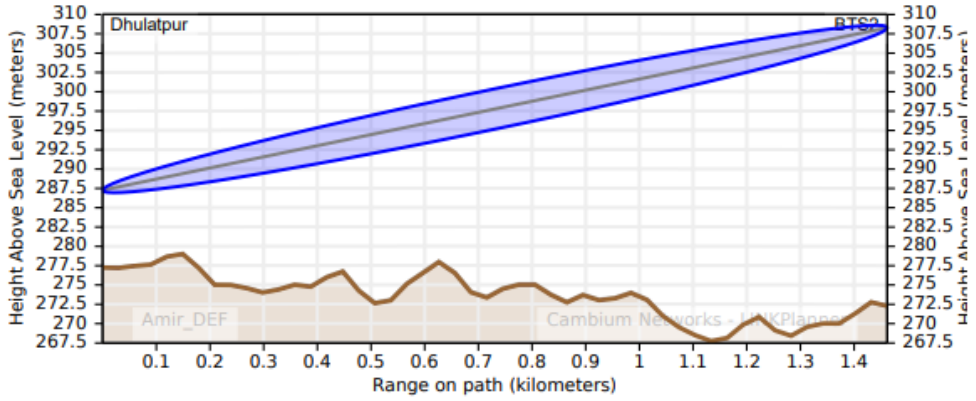
Graph 3:- Feasibility of Mridhachal, Bhaktiyarpur, Bihar



	Performance to BSNL_BTS	Performance to Phalindi
Mean IP	226.11 Mbps	226.11 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	0.257 km	System Gain	148.28 dB
Band	5.8 GHz	System Gain Margin	52.38 dB
Regulation	Argentina (Private)	Mean Aggregate Data Rate	452.23 Mbps
Modulation	Adaptive	Annual Link Availability	100.0000 %
Bandwidth	45 MHz	Annual Link Unavailability	1 secs/year
Total Path Loss	95.89 dB	Prediction Model	ITU-R P.530-17

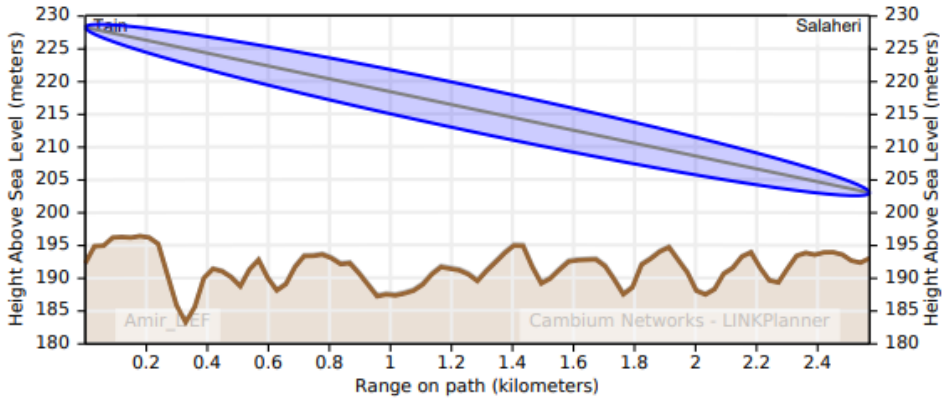
Graph 4:- Feasibility of Phalindi, Nuh, Haryana



	Performance to Dhulatpur	Performance to BTS2
Mean IP	226.11 Mbps	226.11 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	1.462 km	System Gain	161.28 dB
Band	5.8 GHz	System Gain Margin	50.27 dB
Regulation	Argentina (Private)	Mean Aggregate Data Rate	452.23 Mbps
Modulation	Adaptive	Annual Link Availability	100.0000 %
Bandwidth	45 MHz	Annual Link Unavailability	1 secs/year
Total Path Loss	111.01 dB	Prediction Model	ITU-R P.530-17

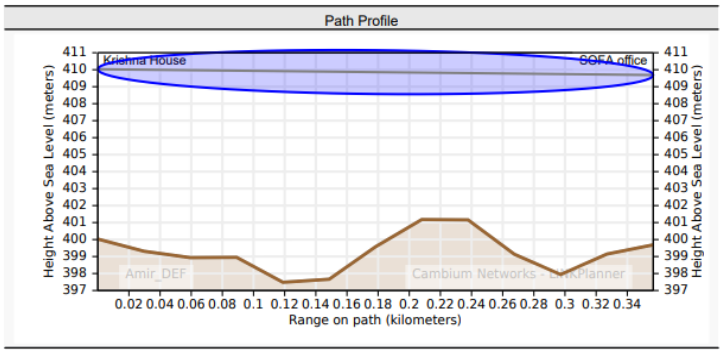
Graph 5:- Feasibility of Dhulatpur, Nun, Haryana



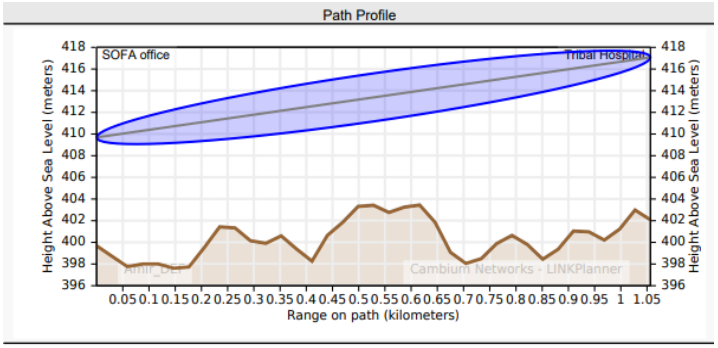
	Performance to Tain	Performance to Salaheri
Mean IP	225.60 Mbps	225.60 Mbps
IP Availability	100.0000 % for 1.0 Mbps	100.0000 % for 1.0 Mbps

Link Summary			
Link Length	2.570 km	System Gain	161.28 dB
Band	5.8 GHz	System Gain Margin	45.35 dB
Regulation	Argentina (Private)	Mean Aggregate Data Rate	451.20 Mbps
Modulation	Adaptive	Annual Link Availability	100.0000 %
Bandwidth	45 MHz	Annual Link Unavailability	1 secs/year
Total Path Loss	115.92 dB	Prediction Model	ITU-R P.530-17

Graph 6:- Feasibility of Salaheri, Nuh, Haryana



Link Configuration	
Precise Network Timing	Disabled
Bandwidth	45 MHz
E1/T1	None
Optimization	IP
Sync	Disabled
Symmetry	Adaptive
Dual Payload	Enabled
Highest Mod Mode	256QAM 0.81
Lowest Ethernet Mode	BPSK 0.63 Sngl
Master	Krishna House
Slave	SOFA office



Link Configuration	
Precise Network Timing	Disabled
Bandwidth	45 MHz
E1/T1	None
Optimization	IP
Sync	Disabled
Symmetry	Adaptive
Dual Payload	Enabled
Highest Mod Mode	256QAM 0.81
Lowest Ethernet Mode	BPSK 0.63 Sngl
Master	SOFA office
Slave	Tribal Hospital

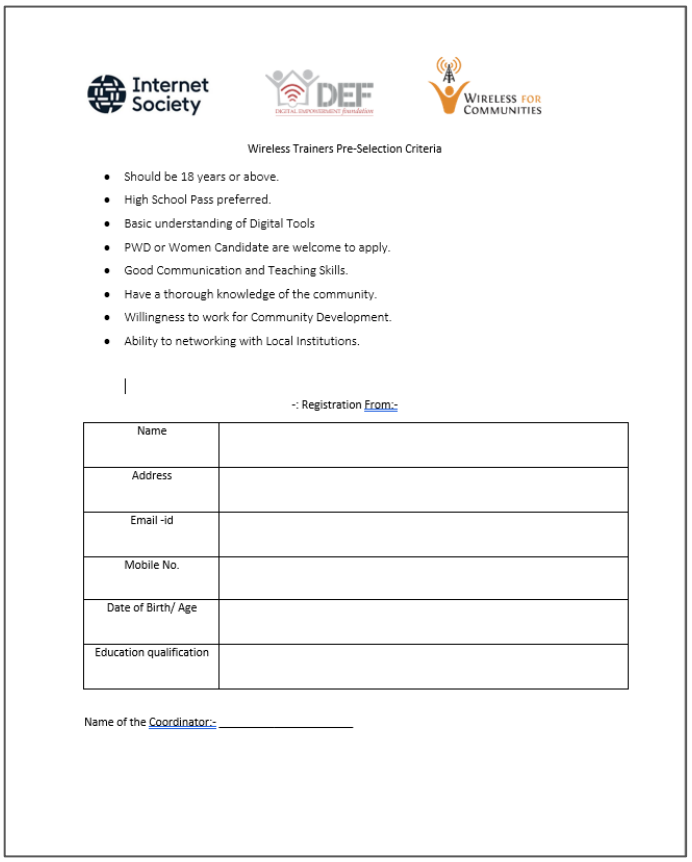
Graph 7& 8:- Feasibility of Sittlingi, Tamil Nadu

Identification of wireless trainers:

Youth wireless trainers from all caste, class, sex and ethnicity have been identified for the project.

Selection criteria for the Wireless trainers are as follows:

i. Technical capacity
ii. Willingness to work for the community and
iii. Commitment to be associated with the project/organisation for long term



Wireless Trainers Pre-Selection Criteria

- Should be 18 years or above.
- High School Pass preferred.
- Basic understanding of Digital Tools
- PWD or Women Candidate are welcome to apply.
- Good Communication and Teaching Skills.
- Have a thorough knowledge of the community.
- Willingness to work for Community Development.
- Ability to networking with Local Institutions.

-: Registration From:-

Name	
Address	
Email -id	
Mobile No.	
Date of Birth/ Age	
Education qualification	

Name of the Coordinator:- _____

Fig 2- Registration form for Wireless Trainers

List of selected Wireless Trainers:

S.N	District/State	Location	Wireless Trainers
1	Tamil Nadu	Sittilingi	Mani
2			Ram
3	Haryana	Tauru	Hannan
4			Jabbar
5		Nuh	Iklas
6			Aakil
7		Punhana	Yasir Arafat
8			Jahid
9	Bihar	Bhaktiyarpur	Bablu Kumar
10			Rajkumar

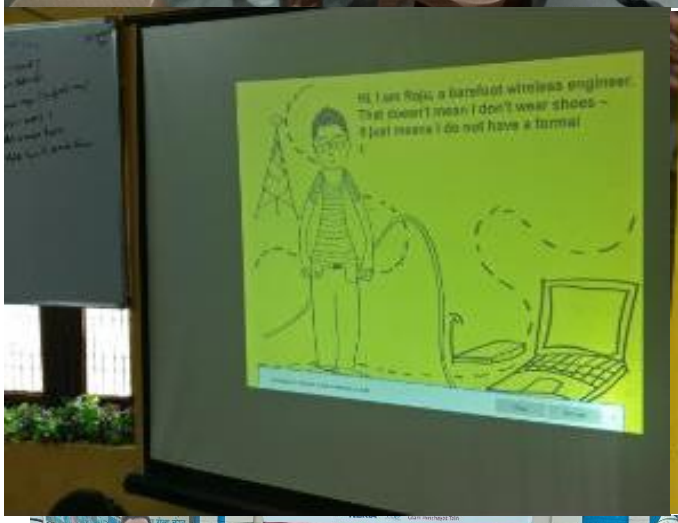
Capacity Building Training with Wireless Trainers

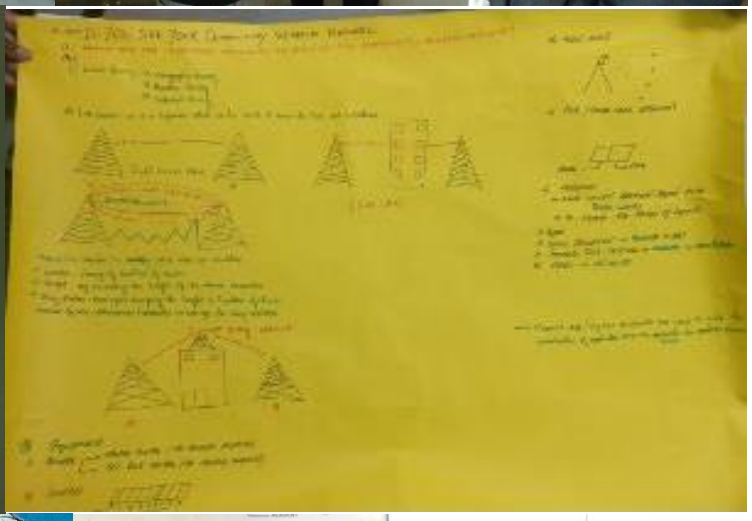
To enhance the capacity of the wireless trainers' various workshop was taken place at the identified location. The training was provided to the wireless trainers in Internet network management, wireless tech, content development and digital literacy and resourcing of information regarding government schemes/entitlements and citizen services.
One of the major objectives of the training was to create a network of rural wireless engineers/trainers for further management and operation of community networks across the location. The specific objective(s) of the training are as follows:

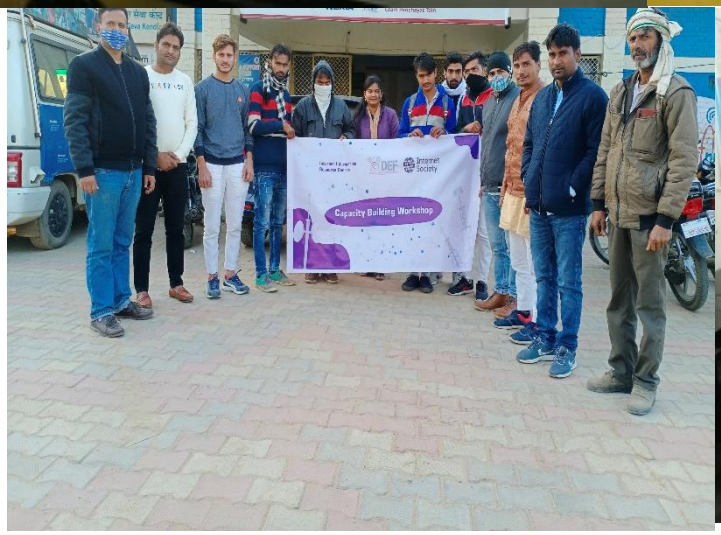
- Enabling trainers to understand the concept of internet and wireless networks
- Building confidence amongst participants in handling the wireless network through practical learning
- To understand the fundamentals of wireless networking
- To introduce the LMS and take them through the wireless course modules
- To be able to install the wireless network
- To be able to understand the nuances of troubleshooting and maintenance of the network

The self-designed course has been formulated in the form of videos and case stories - available in both offline and online version (on web and mobile). An open-source learning management system (LMS) has been developed for the same purpose. The course is available on lms.defindia.org. The self-learning material has been specially designed for barefoot wireless engineers with visual content and video stories.

Capacity Building of Wireless Trainers by Master Trainer Ms Fauzia at Punhana Internet Information Resource centre (Haryana)







Capacity Building & Training Workshop held at various locations, where Theoretical and Practical sessions conducted on concepts of wireless networks

Deployment of Community Networks

Following activities were conducted to deploy the wireless networks- installation of receivers, transmitter, server, Configuration of hardware, Router, and Device Testing. The installation was completed with the help of our trained Wireless Trainers.

Wireless trainers are engaged in network installation process in Sittlingi village, Tamil Nadu

Tower installed at Tauru Internet Information Resource centre, Haryana

Fig:- Wireless Connection Setup at Various identified Places

Community Awareness and Educational Activities

Workshops have been an integral part of the programme. These workshops were conducted with the people in the community, including women, elderly, youth, and the local authorities. These awareness-building workshops are necessary to sustain the centres within the community and encourage the people to use such services provided to them for their betterment.

The objectives of the awareness program were: -

- Encouraging the community to use the internet for their day-to-day activities.
- Motivating women and adolescents to access health-related information.
- Encouraging students to access the internet for education purpose, scholarship etc.
- Enabling the community to access opportunities regarding livelihood and education.
- Enabling the community to connect with district-level authorities, local grievance redressal, etc.
- Helping avail Entitlement benefits online.

"Whenever I see someone operating their phone, laptop to access anything, I use to think myself that this is a very difficult task, and I cannot do this on my own. But after the workshop, I never knew that all these things were so easy. whatever learnt by me through that workshop was easy and convenient to my use."

- A participant in Educational workshop

"I am Feeling very grateful to become a part of this initiative. I am very thankful to DEF and Internet Society, for letting me help the community in such way. I will continue to work and will always be available for the need of the community."

- Yasir Arafat, Wireless trainer, Nuh, Haryana

Setting up Internet Information Resource Centre

By adopting the approach of "Internet Information Resource Centre", under this project is to ensure the sustainability of the project in the identified location. Internet Information Resource Center (IIRC) is equipped with digital tools which is required to support the marginalized communities.

One of the major objectives of the programme is to connect people of the last mile with the benefits of government welfare schemes/entitlements, digital literacy, and citizen services. Therefore, by providing Internet access to the people, the established Internet Information Resource Centres is acting as an information access point for people living in the community.

Specific objectives that will be fulfilled through IIRC are: -

- To provide digital access to the people who do not have access to digital device.
- To provide basic digital literacy to illiterate/ Semi- literate people.
- To help facilitating government schemes and entitlement.
- To assist the community as a digital service point for various digital services like, printing, scanning, booking ticket, filling online forms, etc.

IIRC is equipped with an application called MeraApp, an Android-based app developed using cutting edge technology which provides rural India's vulnerable population with a catalogue of welfare schemes, with comprehensive information on entitlements, to empower them with access to rights and benefits under the core areas of Health, Education, Social security, Finance and Livelihood. Trainers will reach out to communities, create awareness regarding the various schemes and help the communities register for the schemes and entitlements using the MeraApp.

The wireless trainers liasion with the local bodies like School, Anganwadi, Panchayats, etc. to create a holistic approach to access information, opportunities and services online.

School will be connected through wi-fi to access digital education

Internet Information Resource Center at Nuh, Haryana

Awareness Building workshops with community members in Internet Information Resource Centres of identified target areas

Lessons Learnt

The main challenges and lessons learnt from the project are highlighted below: -

Key Challenges: -

· A resource person needs to be assigned regularly to assist wireless trainers beyond the project timeline.
· Low literacy level of community member to access the information and operate digital tools.
· Financial sustainability of IIRC after the project period.
· Restriction/ Partial Restriction during pandemic.

Key Lessons: -

- To identify the internet dark zones and equip them with sustainable Wireless Network.
- To conduct regular Awareness and Educational program to reach and connect every individual of the community.

Other Important lessons: -

Partnership: - This project showed how a project such as this implemented in partnership between various agencies like, local authorities, could draw on their different skills and resources and thereby achieve positive results. Such multi-disciplinary partnership was essential for the success of a project like this.

Training Outcomes: - Successful outcome of the training program is the trained wireless trainer, those are acting not only as a technical expert but also providing education and awareness to the community.

Long term Sustainability: - A physical/ virtual access point is important for the long-term sustainability of the project where all the stakeholders can gather and discuss the issues, activities, and action plan. For this project, Internet Information Resource Centre (IIRC) is playing a role of the access point.

Sittlingi Hub, Tamil Nadu - A Case Study

Sittlingi is a tribal community of Lambarda tribe in the Tamil Nadu region. With the population of 16000, this region is still living in an internet dark zone. Lambarda tribe mainly known for their handicrafts and simple lifestyle. These people lack access to basic rights and information due to non-availability of internet. With the help of "Wireless for Unconnected" an initiative, by Digital Empowerment Foundation in collaboration with Internet Society, Sittlingi installed its first ever wireless connection.

With the aim to improve the quality of life of the people, this network now provides them unlimited internet service to access digital services. Not having connectivity was one of the main concerns for this tribe, as people had to commute 4 hours daily just to get basic digital services done.

Our wireless trainers, Mani and Ram worked tirelessly in providing internet connection to the people of Sittlingi. Women of this tribe are now becoming self- reliant by getting internet access, they are now informed about various health related schemes and entitlement and are actively availing these too.

With Wireless connection, Sittlingi is connecting itself with the digital world.

Wireless for Unconnected in Sittlingi Village, Tamil Nadu

Video Link: -
https://www.youtube.com/watch?v=QyWjx98YgV0&feature=youtu.be