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Analysis of Current Infrastructure and Emerging Trends of Information and Communication Technology in the Indian Himalayan Region

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ABSTRACT

In this era of growing technologies, the internet and the information and communication technologies are not only the precursor of communication architecture but it is also the technology of production and social organisation, which has a pivot role in redesigning the social, economical, public and political aspects. Today, the term information technology incorporates many aspects of computing and technology like software applications, computer networks and information databases. When the computer and the communication are combined then it becomes the ICT. Presently, ICT infrastructure in the IHR is not in a good condition but nowadays, various new ICT technologies are emerging day by day through which ICT infrastructure could be upgraded in the remote areas of the IHR. ICT can play a significant role in development of the IHR and its peoples trough communication and internet technologies.

Keywords-- Internet, ICT, IHR, All India Radio, DTH, Doordarshan, Mobile

I. INTRODUCTION

ICT has a promising role in enhancing the capabilities of citizen of the Himalayan Region in India where there is low density population exist with poor communication infrastructure due to uneven terrains and adverse geo- physical environment. Connectivity and content are two pillars on which the entire structure of nationwide information technology movement rests. The term connectivity means the networking capabilities within information processing devices, to transmit data through internet, radio and television broadcasts. The great Himalayan rise in the Indo- Gangetic plains of Northern India. This serves as home to more than 50 million of people. The propagation of ICT in this region is cumbersome due to its peculiar demographic pattern. Technology advancement is necessary for every nook and corner of India and when talking about the Indian Himalayan Region there is a lot more to do. Himalayan region specificities require specific solutions for resilience edifice, which address the socioeconomic and environmental challenges in the mountain locale.

II. THE INDIAN HIMALAYAN REGION

Himalayans are high snow clad mountains with rich flora and fauna. The Indian Himalayan Region has 5.35 lakh sq km coverage and extends over 2500 Km in length between the Indus and Brahmaputra river system. The states of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh, Meghalaya, Nagaland, Manipur, Mizoram, Tripura and hill regions of two states Assam and West Bengal comprise the Indian Himalayan Region.

***Demography*:** The rugged terrains and the varied climate have affected the population distribution in IHR. There is an intermixture among the major cultural groups due to variation in cultural adaptation in order to make habitation possible. The lower terrains of Jammu and Kashmir, Himachal Pradesh, Uttarakhand and some of the states in north east are densely populated but the most of the high rise peaks are scarcely populated.

***Agriculture*:** Increasing male out-migration, land fragmentation and heightened exposure to environmental conditions have converted agriculture from livelihood to liability for the framers of IHR. But in contrast the poor scope of industrialisation in mountains, agriculture remains an important sector for livelihood. With the innovation of hill specific tools and dissemination of organic technologies the people here started adapting and there is a hike in production of off- season vegetables and fruits.

***Economy*:** The IHR is abound in economic resources. Forestry, trade, tourism and animal husbandry are the principal economic activities. Fruit farming, Tea plantation, Rice, wheat and maize farming are also practiced here. The Himalayas are rich in minerals like sapphires, alluvial gold and copper and iron ores. Hydroelectric generation is also a potential economic source with the production of about 1050 megawatt of power.

***Education*:** Literacy rate in IHR is low and is related to physical inaccessibility, unfavourable climate, political instability and low allocation of state funds. But at a contrast presently Tripura has highest literacy rate of

94.65 percent. This acknowledges the great variation of educational scenario in IHR.

III. EXISTING STATUS OF ICT IN THE IHR

To evaluate the existing applications of Information Communication Technology in Indian Himalayan Region we have to understand the basic information infrastructure of this region. The already available infrastructure constitutes devices, methods and networks to transmit information via broadcasting (like radio and DTH services), integrated service networks, cellular network, local area network (LAN), wide area network (WAN), electronic bulletin boards, modems and transmission media such as fibre optics. Telecommunication in India has greatly been supported by the INSAT systems of the country, which is one of the largest domestic satellite systems of the world. For information dissemination the basic broadcasting media in the IHR are radio, television and public telephone services. Also the internet services and mobile phone services are propagating at a pace in the IHR.

3.1. All India Radio in IHR

AIR, with its vast network of about 471 Radio Stations and 668 transmitter stations all over India broadcasts programmes related to current affairs, sports, agriculture, environment and family welfare. These programmes are broadcasted in different regional languages/ dialects of the country. In IHR there are approximately 162 radio stations and 202 transmitter stations with medium and short wave radio frequencies. The following table-1 depicts the number of AIR stations and population coverage in the IHR:

Table-1. All India Radio Stations in Indian Himalayan Regions

States	Total Stations	Total Transmitters	MW	SW	FM	Coverage			
						MW + FM		FM	
						Area	Population	Area	Population
Arunachal Pradesh	33	39	5	1	33	65%	80%	18%	18%
Himachal Pradesh	16	18	2	1	5	57%	92%	55%	90%
Jammu and Kashmir	25	39	14	3	22	51%	92%	15%	65%
Manipur	8	11	1	1	9	95%	98.50%	67%	75%
Meghalaya	8	11	4	1	6	97.50%	98.50%	48%	58%
Mizoram	9	13	2	1	10	59.50%	73.50%	50%	60%
Nagaland	10	11	3	1	7	85%	88%	50%	50%
Sikkim	16	19	1	1	17	72%	95.6%	75%	85%
Tripura	16	17	2	-	15	84.50%	89%	75%	86%
Uttarakhand	21	24	5	-	19	58%	83%	45%	60%

Abbreviations: MW: Medium Wave, SW: Short Wave, FM: Frequency Modulation

3.2. Doordarshan in IHR

The television is a dominant information medium in the rural as well as urban regions in India. According to a survey by Broadcast Audience Research council India in 2016 the number of television household is about 18% more in rural. Since from its establishment doordarshan has proved to be a dominant means of communication for maximum of population in India. It provides television, radio, online and mobile services throughout metropolitan and regional India. The extend of doordarshan in the IHR can be depicted from the following table-2:

Table-2. Doordarshan Studios and Transmitters in IHR

States	Studios	Transmitters			
		High power Transmitter	Low Power Transmitters	Very Low Power Transmitters	Transponders
Arunachal Pradesh	1	2	3	39	-
Himachal Pradesh	1	5	8	39	2
Jammu and Kashmir	4	20	13	66	1
Manipur	1	3	1	4	-
Meghalaya	2	4	3	2	-
Mizoram	1	3	2	2	-

Nagaland	1	3	3	6	2
Sikkim	1	2	-	4	1
Tripura	1	2	6	1	1
Uttarakhand	1	2	6	31	2

3.3. DTH Service in IHR

Direct to home television service is a method of receiving satellite television by means of signals transmitted from direct broadcast satellites. In November 2000 the government of India permitted the reception and distribution of satellite television signals. DTH does away with the need for the local cable operator and puts the broadcaster directly in touch with the consumer. The lack of cable network in difficult areas of IHR offers tremendous opportunities to the DTH service providing companies. In the past the population here was only exposed to a limited set of channels, large number of black outs and power cuts and no customer services. DTH is now affordable in the markets of IHR with higher transparency, better and upgraded quality of viewing. The top DTH service providers in India are: Airtel Digital TV, Dish TV, Reliance Digital TV, Tata Sky, Videocon D2H, Sun direct, DD Free Dish. Big TV of Reliance communications has become the biggest DTH service across Himachal Pradesh. In almost all other IHR states these seven DTH service providers have their coverage.

3.4. Mobile Service Coverage in IHR

The villages in Himalayan states like Jammu and Kashmir, Himachal Pradesh and Uttarakhand are not yet well connected for mobile services due to the rugged terrains of mountains. The government of India is making efforts to provide mobile phones access to villages in the Himalayan region under the flagship of Digital India programme. Indian government is working over the strategies for boosting the ICT infrastructure. The telephony segment is dominated mostly by the private sector. Most companies gained 2G, 3G and 4G licences and engaged in fixed line, mobile and internet business. The dominant companies are Vodaphone, Idea, Airtel, Jio. In relation to mobile telecommunication our country is divided into multiple zones called circles. Talking about IHR, it is divided into the states of Himachal Pradesh, Jammu and Kashmir and the north east circles. The circle wise landline and wireless subscribers in the IHR is as follows:

Table-3. Landline and Wireless telecom subscribers in IHR

Telecom Circle	Landline subscriber (Dec 2017)	Wireless subscriber (Dec 2017)	Teledencity (Sep 2014)
Assam	0.14	22.60	50.41
Himachal Pradesh	0.12	10.57	109.55
Jammu and Kashmir	0.11	13.12	69.98
North East	0.11	12.81	72.00
Uttarakhand and Uttar Pradesh	0.35	62.32	58.09 (combined)

3.5. Internet Service in IHR

There is a tremendous growth of internet subscribers in the IHR with the evolving internet access methods. The Bharat Sanchar Nigam Ltd (BSNL) has the largest proportion of optical fibre laid and lit across the IHR. In addition private telecom companies like Reliance, Tata and Bharti are also expanding their internet service penetration through IHR. The wire linked connections comprise of the telephone lines and secure leased line linked to telephone exchange. With the fact of limited telecom infrastructure in the IHR there is a lot of scope for radio frequency based wireless links for connectivity. Wireless network for internet service has far better prospects over the wired network in the IHR due to heavy capital investment of digging and laying the copper or optical fibre cable. There are four types of internet services available in various IHR states these are 4G/3G services, Wired line services, FTTH (Fibre to the Home) and EVDO (Evolution Data optimised). The various internet service providers available in the IHR are as follows:

Table.4. Internet service providers in IHR.

STATES	3G/4G
Arunachal Pradesh	Provided by : BSNL, Airtel, Vodafone, Reliance
Himachal Pradesh, Jammu and Kashmir, Meghalaya, Nagaland	BSNL, Airtel, Vodafone, Idea, Reliance.
Manipur	BSNL, Vodafone and Reliance
Mizoram, Tripura, Uttarakhand	BSNL, Airtel, Vodafone, Idea

Nagaland	BSNL, Airtel, Vodafone, Idea, Reliance
Sikkim	BSNL, Reliance

The *wired line service* in these states is provided by Sify Broadband and the *FTTH* service is provided by BSNL. Also the *EVDO* service is provided by BSNL. In two states Jammu and Kashmir and Uttarakhand this EVDO service is provided by BSNL and MTS.

IV. PRESENT SCENARIO OF ICT POLICIES IN IHR

The government of India recognises that the internet enables the citizens to interact with the governments, communicate, modify business, innovate and thereby improves the quality of life of various sections. The Digital India champagne launched by the prime minister of India has a vision to ensure that high speed internet should reaches to the gram panchayat level in India. This champagne is centred on three vision areas: digital infrastructure, governance and service on demand, and digital empowerment of citizens with the increased penetration of internet connectivity and the usage of smart phones provides tremendous opportunities for using mobile devices for public service delivery. The centrally initiated e-governance ongoing projects includes the following:

- Land records computerization at Tehsil level.
- Computerization of state or District level consumer forum.
- Right to information websites.
- AGMARKNET – Agriculture marketing information network, implemented by National Informatics Centre (NIC) to cater the needs of various stake holders like farmers, industry and policy makers.
- Aadhar card making and linkage by UIDAI which provide demographic and biometric information to facilitate hassle free people centric governance.

In the IHR region to streamline implementation of above ICT programmes, there are some more state wise ICT initiatives taken. These are as follows:

4.1. Lokmitra in Himachal Pradesh

It is an ICT initiative of the Himachal Pradesh state government to make people aware of government policies and programmes. A District wide *intranet* was created by setting a LokMitra Soochnalaya in the Deputy Commissioner office. There aftert the District administration identified 25 panchayats for setting Citizen Information Centre i.e LokMitra soochna Kendra. The LokMitra provides instant access to selected government information and offers the following services:

- E-Governance.
- Rural e-mail facility.
- Online public grievance.
- Information regarding land records
- Market rates of vegetables, fruits and other items.
- Online registration for Aadhar card.

4.2. Information Technology Development Agency (ITDA) in Uttarakhand

It is a World bank funded project for development and implementation of ICT initiatives in the state of Uttarakhand and is in action since 2004. The Uttarakhand government has developed a state portal (www.itda.uk.gov.in), application software for various departments and Community Service Centre to work in pace with the National eGovernance Plan (NeGp) and to develop State Wide Area Network (SWAN), Common Service Centre (CSC) and State Data Centre (SDC). There are number of ICT projects ongoing under this agency these are as follows:

- Capacity building
- National eGovernance Plan projects.
- UIDAI (Aadhar) registration.
- AEROSTAT (balloon technology): It is an aerial platform with a self contained Reallocated Wireless Communication System having connectivity up to or more than 10 kms. The main objective of this system is to facilitate communication in the situation of natural calamities. Chief Minister of Uttarakhand had launched the Aerostat Internet Balloon at ITDA, IT Park Dehradun on 8th June 2018.
- Cyber security training centre
- E- Gate pass: It is an initiative by the government of Uttarakhand to facilitate citizens to have a smooth and simple mechanism of making an appointment with a government officer. It is cloud based application software developed by ITDA with embedded security features. It assists in maintaining all the relevant information about the visitor.
- Digilocker: It is a digital wallet for the citizens to access their documents like PAN card, Aadhar, Driving licence, income certificates etc anytime and anywhere.

4.3. Community Information Centre in North East States

It is a joint initiative of Department of Information Technology, Ministry of Communication and Information Technology (MCIT) and the State Governments of eight North- Eastern states. The MCIT has set up 486 internets enabled CICs in block head quarters of these states. NIC initiated the CIC project in April 2000 in North-East states and later extended to Jammu and Kashmir in 2004-05. Local schools, colleges and government offices are used to set up the CIC centres. These CIC centres are linked to the internet through VSAT which provides as the lone option in

remote and unconnected regions of North-East states. Major activities of CICs are as follows:

- Basic internet services like internet access, E-mail etc for local population.
- eGovernance services for the citizens.
- To organise 'Computer Literacy Programme' conducted by IGNOU.
- To implement citizen centric services like issuance of Caste certificates, Birth and Death certificates, income certificates etc.
- For UIDAI (Aadhar card) registration.

4.4. UIDAI (Aadhar card) Registration in IHR

UIDAI or Aadhar card is a versatile card which can be used for all government related services like disbursing Provident fund, LPG subsidy, Jan Dhan Yojana, opening Bank account and acquisition of passport. It provides demographic and biometric information of the citizens and facilitates hassle free people centric governance. The government of India has accelerated the registration process in coordination with the state governments. In the IHR region the Aadhar registration is ongoing at par with rest of Indian states. The following table depicts the exact values of Aadhar registration in various IHR states:

Table-5. UIDAI registration in IHR (October 2018)

States	Number of Aadhar registrations	Aadhar by Age		
		< 5 Years	5 to 18 years	18 years
Arunachal Pradesh	1232017	4.91 %	27.65 %	69.83 %
Assam	3638214	0.24 %	11.38 %	88.4 %
Himachal Pradesh	7748287	5.88 %	20.02 %	74.1 %
Jammu and Kashmir	10442415	2.79 %	21.65 %	75.56 %
Manipur	2497564	5.09 %	24 %	70.91 %
Meghalaya	880956	0.22 %	19.47 %	80.31 %
Mizoram	1079031	5.65 %	24.94 %	69.41 %
Nagaland	1284550	0.21 %	22.69 %	77.11 %
Sikkim	614672	2.17 %	19.54 %	78.28 %
Tripura	378570	2.81 %	21.93 %	75.25 %
Uttarakhand	11135537	6.15 %	24.02 %	67.47 %

V. EMERGING TRENDS OF ICT IN IHR

The increased penetration of internet connectivity and the usage of smart phones, provide tremendous opportunities for using mobile devices for public service delivery. This would lead to cost effective technologies. Internet in North-East is set to get much needed fillip; in 2014 Indian government started the talks with government of Bangladesh to lease their unused bandwidth for India's seven North-Eastern states. The Bangladesh government has granted in- principle approval to India's proposal to connect Tripura with international internet gateway. After implementation this will help to improve internet services in Arunachal Pradesh, Meghalaya, Mizoram, Manipur, Nagaland and Tripura. With enhanced ICT infrastructure there are possibilities for new emerging trends to work out here in the IHR. Few of them may be as follows:

5.1. Vikaspedia

Ministry of electronics and information technology has developed as a part of ICT initiative, a multilingual, multisectoral online knowledge platform named as 'Vikaspedia'. It was launched on 18 February 2014 and is an e-knowledge and ICT based application for empowerment of underserved communities of rural and urban. Its web portal is www.vikaspedia.gov.in which has the following features:

- Act as information guide for providing knowledge of ICT based products and services of government of India.
- It hosts all available information in 22 languages of India.
- It hosts different contents forms like text, audio, video etc.
- Domains like eGovernance, Health, Education and agriculture are covered.
- Acknowledges ongoing government programmes through various ICT modes.

Vikaspedia can prove to be versatile awareness tool for the people of the IHR region. This will strengthen the eGovernance, E- learning, Health and Agriculture infrastructure in this region.

5.2. YOLO Health

It is a telemedicine network enabled with a custom website and mobile application for doctors and remote patient. It started from a lab at IIT Bombay with a motive to deliver affordable healthcare. In this a health

ATM is created which enable to do health checkups with automated devices and consult doctor over video conferencing. There are auto data capture and health screening integrated device facility that record pulse rate, oxygen saturation, blood pressure, glucometre, digital stethoscope, thermometer etc. In the IHR these Health ATMs may prove to be a boon as there already exists a huge gap between the demand and supply in the health sector.

5.3. MSakhi

It is an online application to enable front line health workers (ASHA workers), using a mobile phone for house hold surveys. With mSakhi the ASHA workers can use their smartphones to update the records and to communicate with their superiors. This will enhance speed and precision of work of these health workers.

5.4. Meri Sadak

This is a mobile application to enable users to give feedback about the quality of state roads in their locality to the National Rural Road Development Authority (NRRDA). This application may also act as a milestone for better connectivity of the IHR region, which faces the damage of roads time and again due to weather extremes.

5.5. My School on Wheels

An NGO named Pragya works in the high altitudes of Himalayas has bring the concept of 'My school on wheels' to provide basic minimum literacy to the people of remote and hilly regions of the Himalayas. It has designed Mobile Education Units (MEUs) which are equipped with digital equipment and other teaching aides. Two such 'My school on wheels' vans are operational in Kinnaur, Himachal Pradesh and Chamoli, Uttarakhand serving a total twelve migrant camps there. This concept may prove to be very beneficial to outreach the education needs in the IHR. With latest ICT tools like smart panels and skilled teachers these vans can be converted to 'Smart Education Vans' to bring the education of the remote hilly region people at same pace to the rest of India.

VI. CONCLUSION

ICT is about information and communication, and these are the two pillars of emerging hi-tech world. It has a promising role in enhancing the capacities of today's people. The ICT infrastructure is propagating very fast in the IHR region but at the same time locale specific extreme demands need fabrication of hardware and software devices according to the geo-physical environment of the Himalayas. Technology capacity is basically judge by performance, availability and user satisfaction. The growing usage of smart phones and availability of better internet services has boosted the ICT infrastructure in the IHR. People here getting relevant information in time and thereby getting more aware. With the availability of online web portals like Vikaspedia, ITDA, CIC etc. It has become possible to disperse knowledge and services to the towns and villages of IHR. People are now aware of government schemes and services like Jan Dhan Yojana, PM Awas Yojana, Suraksha Bima Yojana, Ayushman Bharat etc. Radio, Doordarshan, Television and DTH services has no less role in strengthening the ICT infrastructure in IHR. The need of the hour is to make a systematic approach and to raise the information literacy in the people of IHR. If people are acknowledged about the rewarding benefits of ICT then this will enhance their skills and capacity to lead a better living in the extremes of IHR.

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