

## **Integrated Communication and IT Infrastructure (ICITI) for the Socio-Economic Development of Auroville bioregion**

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### **Abstract**

Recent developments in Information and Communication Technology (ICT) changed the way we live and work. However, humanity is facing serious issues such as global warming, conflicts, violence, terrorism.... At the core of these escalating issues is the growing divisiveness. We need new paradigms of inclusive socio-economic development to usher an era of fraternity, peace, prosperity and harmony. Auroville is the world's first and only internationally endorsed experiment in human unity. Auroville, a place of 'unending education', has been engaged in practical research into the future cultural, environmental, social and spiritual growth of mankind and has decades of field experience in inclusive and participatory rural development of the Kaliveli tank bioregion (referred to as bioregion in the rest of the paper). ICITI, a new proposed project, aims to set up the world's first 'Green' community converged infrastructure to serve as an experimental research platform to explore the use of ICT in areas of sustainable development, consensus building, participative governance and human unity. ICITI is planned to be extended to the bioregion as an ICT for Development (ICT4D) platform and leverage it as a "soft delivery vehicle" for sustainable development of the bioregion. Such development can leap-frog the poor 'hard- infrastructure' and has the potential to reverse the migration to urban areas. This paper briefly presents the rationale behind ICITI, the vision, mission, goals and approach to use ICT for the social transformation of Auroville and the bioregion into a sustainable, prosperous knowledge society. It is hoped that this project would pave the way for ICT for Human Unity (ICT4HU) as a new interdisciplinary field.

**Keywords:** Education, Employment, Healthcare, Infrastructure, Socio-economic development, Sustainable Development, Green ICT, Human Unity, ICITI, Green Mobile Communications, Electromagnetic Pollution, ICT4D, ICT4HU, Knowledge Management Systems.

## **Introduction**

Information and Communication Technology (ICT) has made unimaginable strides in the recent past and found application in almost every field of human endeavour. ICT is changing the work ethos through tele-commuting and tele-presence. Mobile communications and computing have created space-time independence, leading to more flexibility in working and living. Social networking and social computing tools have already become part of our life and interactive multi-media services are just waiting to happen. At the same time, humanity is facing challenges in conflicts, terrorism, global warming and health issues. These challenges are threatening the fabric of fraternity and even the very existence of our planet. In the last 100 years, human beings have killed more than 100 million human beings in conflicts. In The documentary “The Eleventh Hour: Global Warming” by Leonardo D’Capiro, David Suzuki states that “Some years ago, it was estimated that it would cost 35 trillion dollars a year to do what nature is doing for us. To put this in perspective, all the economies of the world in that year added to \$ 18 trillion dollars”. In the spiralling indifference to ecological degradation, mistrust and violence, we have almost forgotten that love is our essential nature and that Earth, the only known blue planet in the universe, is our Home. This paper suggests a new role that Information and Communication Technology (ICT) could play for consciousness centric, inclusive socio-economic development to transcend the divisive barriers, leading to human unity.

## **About Auroville**

[Auroville](#) is located in Villupuram district of Tamil Nadu, India. [Tamil Nadu](#) is one of the foremost states in India in terms of overall development - with high literacy and a large number of higher educational institutions. Villupuram district with a population of more than 300,000 is a relatively backward district in Tamil Nadu. Sri Aurobindo's collaborator, the Mother, founded Auroville in 1968 to usher in a new world of Knowledge, Peace and Unity. This unique, emerging integrated township now has a population of 2,250 residents from 46 countries. Auroville is an autonomous higher education institution under the supervision of Ministry of HRD by the [Foundation Act of the Parliament](#), 1988. The innovative educational methods and sustainable development modes adopted by Auroville and their positive impact on the bioregion have generated an enormous amount of support for Auroville within India and abroad. [UNESCO has endorsed](#) the goals, plans and the direction of Auroville on several occasions. The

Government of India, Ministry of HRD, approved the Master Plan of the Future City for a population of 50,000.

The guiding spirit of Auroville is its four point Charter:

- Auroville belongs to nobody in particular. Auroville belongs to humanity as a whole. But to live in Auroville, one must be a willing servitor of the Divine Consciousness.
- Auroville will be the place of an unending education, of constant progress, and a youth that never ages.
- Auroville wants to be the bridge between the past and the future. Taking advantage of all discoveries from without and from within, Auroville will boldly spring towards future realisations.
- Auroville will be a site of material and spiritual researches for a living embodiment of an actual Human Unity.

### **The inclusive and integral development model of Auroville**

Being the world's first and only internationally endorsed experiment in human unity, Auroville has been engaged in practical research into the future cultural, environmental, social and spiritual growth of mankind. Inspired by the inclusive and integral development model envisioned by the Mother, Auroville has decades of on-going research and field experience in participatory, inclusive rural development in the core areas of Education [1], Employment [2], Infrastructure [3] and Healthcare [4]. The work done in these core areas is in close alignment with the [Millennium Development Goals](#) of the United Nations. Auroville has made a significant difference to this infertile, unindustrialized region and built core competencies and capabilities in integral development. The notable institutions include [Sri Aurobindo International Institute for Educational Research \(SAIIER\)](#) along with the [educational centres](#), [Centre for International Research in Human Unity](#) , [Auroville Village Action Trust \(AVAT\)](#), [Pitchandikulam Forest Consultants \(PRBC\)](#) and the work done spans diverse fields such as [ecological agriculture](#), [organic farming](#), [architecture](#), [environment and bioregion](#), [renewable energy](#), [alternative energy vehicles](#), [water management](#), [integrated urban planning for sustainable development](#), [art and culture](#) and non-polluting [industries](#) and [products](#). The success of the development programs is attributable to the inclusive model for integral development. It is inclusive because Auroville is part and parcel of the bioregion, allowing for the fusion of the developing and target communities into one community. The integral nature of development derives from its holistic approach to the sustainable development of the region as a whole. This model is different from

the more prevalent one wherein an organization is focused on some specific aspects of development and remotely manages the development program. Even when a whole village is 'adopted' with holistic development goals, the organization usually endeavours to develop the village with a few 'on site' resource persons. The inclusive model of Auroville fosters unity in a practical way.

## **Vision, Mission and Goals of ICITI**

### *Vision*

Harness the power of ICT for material and spiritual researches for a living embodiment of an actual Human Unity.

### *Mission*

Build a state-of-the-art experimental Integrated Communication and IT Infrastructure (ICITI) in Auroville and extend it to the bioregion as a means to pursue the Charter of Auroville.

### *Goals*

Provide high speed, converged, scalable and extensible infrastructure to positively impact quality of life and productivity.

Extend to the bioregion as an ICT4D platform for inclusive and integral development leading to self-reliance, prosperity and harmony.

Preserve the biodiversity by minimizing carbon footprint, electromagnetic radiation and electromagnetic pollution.

Create a practical research platform for applying ICT in collaboration, consensus building, participative and transparent governance, knowledge management and Human Unity.

## **Approach to ICT4D**

As per Maslow's hierarchy of needs (physiological, safety, social, esteem and self-actualization), it is necessary to provide the basic needs before fulfilling higher needs. Development plays an important role in bridging the 'divides' and realizing unity. Development offers the scope for self-actualization for some people in designing and delivering development programs to provide

the basic needs of others. ICT4D refers to the application of ICT within the field of socio-economic development. ICTs can be applied either in the direct sense for use by the disadvantaged population, or in the indirect sense, wherein the ICTs assist Auroville and the partners to improve the socio-economic conditions of the bioregion as a whole. International agencies like the [United Nations](#) and [World Bank](#) have recognized ICT4D as an important means for development work. ICT4D is particularly attractive for Auroville because it helps to leapfrog the poor state of “hard infrastructure” in program delivery, is more eco-friendly, is less capital intensive and is likely to pre-empt migration to urban areas.

To proactively manage the gaps in the skills needed in effective usage and maintenance of the infrastructure, it is suggested that ICITI be given a head-start and used for systematic improvement of ICT skills of all personnel involved in program development/delivery and infrastructure maintenance. This will improve the chances of success for ICT4D.

Auroville intends to transform the bioregion into a knowledge-based, sustainable, prosperous society by forging new partnerships to pool complementary strengths in the core areas of Education, Employment, Infrastructure and Healthcare. The strategies are outlined in succeeding paragraphs.

- **Education** Auroville together with [Anna University](#), [Pondicherry University](#) and [Tamil Nadu Agricultural University](#) could potentially collaborate to form an Innovation University as per [Ministry of HRD Concept Note](#). Auroville provides the practical (laboratory) component to the centres of academic excellence and pave the way for fusion of theoretical and practical research and innovation. ICITI could play a critical enabling role in the formation and functioning of such an Innovation University.
- **Employment** Good ICT infrastructure opens up new employment opportunities and could reverse the trend of migration to urban areas. [Mahatma Gandhi Institute of Rural Industrialization \(MGIRI\)](#) proposed the model of Rural Economic Zone (REZ) [5] to realize “Village Swaraj” vision of Mahatma Gandhi. It is proposed to experiment with ICT enabled REZ as an innovative approach to seed a new level of prosperity in the Auroville bioregion.
- **Infrastructure** ICITI is based on preference for indigenous equipment and Free Open Source Software; creating the possibility to evolve robust ICT solutions specifically tailored to suit the rural conditions of India. ICT based tools such as tele-conferencing, video conferencing, web conferencing are inherently more eco-friendly compared to travelling. Also, Auroville’s competencies in ecology, eco-friendly architecture and alternate energy could help the development of “Green Infrastructure” in the bioregion.

- **Healthcare** The work done by Auroville in [Complementary and Alternative Medicine](#) (CAM) reflects a holistic, global perspective that spans the oriental and occidental, preventive and curative, inner healing and ancient wellness practices. Auroville is one of the richest CAM communities and could develop sustainable health care management system in partnership with institutions in close proximity. ICT could play a key role in evolving such sustainable health management systems as well as in their delivery.

It is to be noted that the use of ICT does not negate the inclusive model but strengthens it by leveraging technology to bring in higher productivity levels, empower the bioregion with access to knowledge and pull in enabling resources and new partnerships.

### **ICT in Auroville**

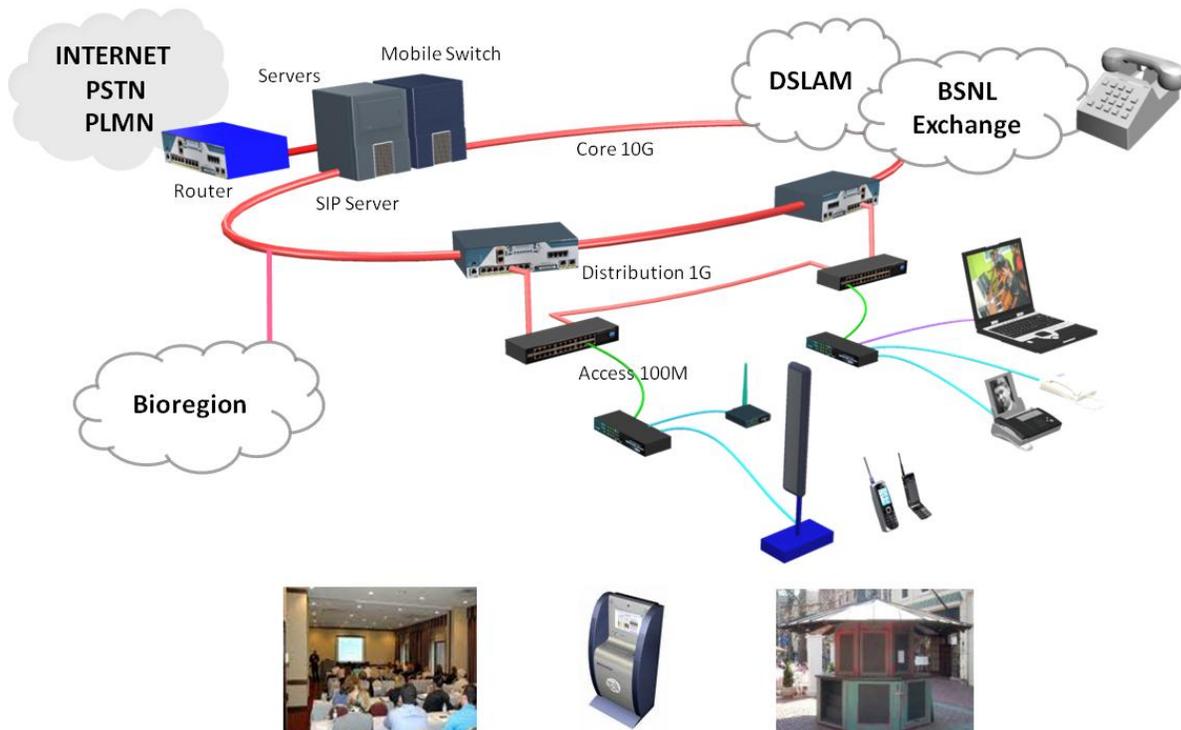
Today, Auroville is an area of high tele-density with high penetration of telephones (55%), mobile phones (90%), computers (41%) and broadband (28%). The [Intranet of Auroville](#) is the largest “community portal” in India, with rich features and functionality including Wiki, ecommerce, financial services, community radio and TV. The [Auroville website](#) captures the spirit of Auroville along with information related to ongoing projects and [research](#). In addition to the main website, several educational units, research projects, small-scale industries and developmental projects run their own websites, totalling more than a hundred websites. Unlike a normal campus, Auroville is currently dependent upon Plain Old Telephony System (POTS) and ADSL broadband services of a telecom service provider. This infrastructure is neither scalable to cost-effectively interconnect all the stakeholders for collaboration nor does it meet the ICT needs of new development proposals and projects [6, 7, 8].

Currently, mobile phone services are provided by base stations outside the perimeter of Auroville - an approach that increases the total electromagnetic (EM) pollution. The EM pollution is expected to increase as Auroville grows. There is an increasing concern about the deleterious effects of EM pollution [9, 10]. In May 2011, the [Council of Europe resolved](#) that the scientific basis for the present exposure standards be reconsidered and recommended that “as low as reasonably achievable” principles be applied. On 31 May 2011, [World Health Organization /International Agency for Research on Cancer](#) classified electromagnetic fields from mobile communications as possibly carcinogenic to humans (Group 2B). “Late Lessons from Early Warnings: Towards realism and precaution with EMF” [11] cautions against delay in taking steps to contain EM radiation and associated pollution. The report entitled “The potential dangers of electromagnetic fields and their effect on the environment” issued by the Committee on the Environment, Agriculture and Local and Regional Affairs of Parliamentary Assembly, Council

of Europe [12] emphasises the need to reduce the emissions to levels safe for humans and the environment.

The rest of the paper describes a project to build a ‘Green’ Integrated Communications and IT Infrastructure (ICITI) in Auroville and leverage it to realize an ICT for Development (ICT4D) platform for the integral development of the bioregion in pursuit of the goal of Human Unity.

### ICITI Architecture



The architecture of ICITI is shown in the above figure. The emphasis is on a green, integrated solution that enables the goals of ICITI. The salient aspects of the architecture are briefly explained below.

*Data Center* At the heart of ICITI would be a data centre with a private cloud to host “Open Source” communications software, community applications, collaboration and knowledge management tools. ICITI intends to share not only the software developed in this process but also the knowledge and wisdom. The cloud computing model allows for optimal utilization of computing resources and the mini data centre could be powered by cost-effective alternate energy sources.

*Network Fibre-to-the-premises architecture* is preferred for the network because it is future proof, flexible, non-radiating, low power and power efficient. The Data Centre connects to the Internet through an Integrated Services Router with redundant WAN links and a 10 Gbps Carrier Ethernet dual-ring, fibre-optic campus network. One Gbps fibre-to-the-premises rings provide a reliable and flexible distribution network to manage growth with ease. The SIP server makes converged communications possible. To protect the investment in customer premises equipment and seamlessly migrate to ICITI, it is proposed to integrate existing telephony and ADSL subscribers through suitable gateways.

*Green Mobile Communication (GMC)* GMC is a unique approach to minimize electromagnetic (EM) pollution, which is a function of the total radiated energy from all the base stations and mobile phones in the vicinity. GMC proposes to reduce the cell size and to delineate public-air and private-air. The public infrastructure caters to out-door coverage and (optional) indoor coverage would be provided through ultra low power repeaters/Femtocells/distributed antenna systems, where needed. This innovative approach enables the power density over the public-air to be reduced by 30 to 60 dB. The SIP server enables intelligent call control and routing to prefer wired communications to over-the-public-air radiation. The reduced call density over public-air and reduction in call durations reduce the radiated energy. Thus, the GMC framework could reduce the overall magnetic pollution from mobile phone system to less than a millionth of what is otherwise obtainable. The base stations would be transmitting at less than a watt of power and could be economically powered by alternate power sources. For the convenience of roaming subscribers, Femtocell booths would be installed to use mobiles without spilling radiation into the public-air.

*Community Information Centres and Kiosks* The overall cost, power consumption and e-waste on account ICT usage is directly proportional to the number of computers, peripherals and phones. ICITI proposes to reduce the cost, power consumption and e-waste by providing easily accessible public infrastructure, thereby eliminating the necessity to own hardware to avail the services provided by ICITI. Community Information Centres (CIC) would have a single networked computer connected to 5-10 monitors, a multifunction printer, a projector, phones and conferencing facilities. CIC would be powered by alternate energy. CICs enable remote participation in debates/decision making, interactive broadcast (with duplex back-channel facility to ask questions), tele-collaboration, tele-education, tele-medicine and tele-working. A variant of CIC is planned for public kiosks for free access to information to visitors and guests as well. This approach helps to reduce the need for travel and usage of paper, contributing to further reduction in carbon foot-print.

The concept and architecture of ICITI were presented at eIndia2010 Conference [13].

## **Interconnection and Integration with the Bioregion**

The architecture of ICITI permits direct fibre connection up to a distance of 10 Km and provides high speed, high bandwidth access to ICITI resources. This allows nearby villages to be interconnected to ICITI with relatively low recurring cost and modest capital cost. For farther regions, the approach depends upon economics and feasibility. New technologies like Broadband over Power Line offer potential alternative to interconnecting through the Internet. The integration requires ICT enabled village community/nodal/employment centres. These would be variants of the CIC/kiosks. Tools for collaboration, co-operation, e-Governance, e-Commerce, project management etc. could be shared over the integrated infrastructure.

Good multimedia communications hold the promise to bridge the spatial separation as demonstrated by tele-presence. Development programs are travel-intensive due to the need for close interaction. The effectiveness of ICT to reduce the travel depends upon making the tools easy-to-use and training. It is proposed to systematically train Aurovilians so that they could provide hands-on training to the teams involved in their projects. The initial emphasis will be on using voice/video conferencing to close the gap in space and reduce the need to travel. Such space independence finds ready applications in tele-education, tele-medicine and project management. Once this is in place, it could be used as a 'boot-strap' for other training programs on need basis.

Auroville has become a well known centre for workshops and seminars in diverse fields spanning culture, spirituality, philosophy, ecology, technology, education, sociology and industry. The widespread network of [Auroville International](#) attracts thousands of researchers and volunteers from all over the globe to Auroville. Currently, such volunteers and researchers need to be physically present in Auroville and their contribution diminishes almost to a vanishing point after they leave Auroville. ICITI enables participating and contributing in development programs without necessarily being physically present in Auroville or the bioregion. This space and time independence brings forth a multiplier effect in realizing a boundary-less development platform, paving the way to the realization of unity.

### **Implementation aspects**

ICITI is a joint project between Auroville and [International Institute of Information Technology, Bangalore](#) (IIIT-B). In addition, following institutions have expressed willingness to collaborate in this project

- Jawaharlal Institute of Postgraduate Medical Education & Research (JIPMER),

- Pondicherry Engineering College, University of Pondicherry
- Telecom Centres of Excellence, New Delhi

A comprehensive project report [14] has been prepared, was reviewed and endorsed by experts from India and abroad. Indigenous equipment vendors as well as potential systems integration partners have been identified. The project report [14] has been submitted to the Department of Information Technology, Government of India in April 2010 for funding. The report on “Green Mobile Communications GMC” [15] was submitted to Department of Telecommunications, Government of India in March 2011 for approval to set up the world’s first GMC Zone in Auroville.

The timeline for implementation of the project is estimated to be one year with a capital cost of Rs.5 crores (US \$ 1.2 million). The estimated net income in the first year of operations is Rs.0.28 crores and the cumulative surplus by the end of seven years of operation is Rs.2.28 crores. Without this project, the outflow in 2012 is estimated at Rs.2 crores. The reduction in recurring outflow and surplus generated make Auroville financially self-sustaining in ICT infrastructure, after the initial funding of Rs. 5 crores (US \$ 1.2 million).

To progress in a phased manner, it is intended to take up the work on ICT4D soon after ICITI is implemented.

The real potential of ICITI would be realized through software tools for cooperation, collaboration, decision making, transparent e-governance and community applications that are tailored to the specific and evolving needs of Auroville. The selection, customization, implementation, training and integration of such tools is a prerequisite for the success of ICITI. Auroville needs a well designed Knowledge Management System to support the creation, capture, storage and dissemination of knowledge. Given the diversity of activities and projects and the unique ongoing experiment in Human Unity, ICT could play a very significant role to make the documented base of facts, sources of information, and solutions available to the whole of humanity and expand the ‘knowledge catchment’ area beyond the geographical limits of the bioregion. The Knowledge Management System needs to define the strategies, dimensions, technologies and tools that are best suited to Auroville. It is anticipated that the implementation of the Knowledge Management System would pose special challenges.

## **What ICITI Needs**

- Funding of Rs 5 crore (US \$ 1.2 million) for the initial capital expenditure
- Approval to set up Green Mobile Communication Zone
- Cost-effective integration of POTS and ADSL subscribers connected to the network of the local telecom service provider (BSNL)
- Collaboration with organizations and individuals for realization of the vision, mission and goals

## **Alignment of ICITI with Auroville Charter**

ICITI is a means to pursue the Charter of Auroville as may be seen from the following

- ICITI enables better communications, connectivity and e-governance within Auroville. ICITI could connect Auroville to the whole world.
- ICITI provides an eco-friendly framework for education and research in Auroville, the bioregion and beyond.
- ICITI takes advantage of technologies from ‘without’ to spread knowledge ‘within Auroville’ to the bioregion and build a bridge for new paradigms in integral development of bioregions, heralding a Knowledge Society.
- ICITI aims to be a boundary-less platform for cooperation, collaboration, consensus and consciousness for an actual embodiment of Human Unity

## **Conclusion**

ICITI enables better communication, information exchange, collaboration and collective decision making for closer and more effective cooperation in pursuit of the Charter of Auroville and would help in making Auroville belong to the whole of humanity. It has the potential to be developed into an ICT4D platform to have a broader positive socio-economic impact on the bioregion. Once proven in Auroville, this model could be replicated across the rest of India for integral development and for ushering in a wider “Knowledge Society”. Ultimately, ICITI is a pathway to create a boundary-less platform for “material and spiritual researches for a living embodiment of an actual Human Unity”. It is hoped that ICITI would break new ground and pave the way for ICT for Human Unity (ICT4HU) as a new interdisciplinary field.

## References

- [1] [Sri Aurobindo International Institute for Educational Research \(SAIER\)](#), [Educational Centres](#), [Centre for International Research in Human Unity](#)
- [2] [Industries](#), [Products](#), [Auroville Village Action Trust \(AVAT\)](#), [Pitchandikulam Forest Consultants \(PRBC\)](#), [Ecological Agriculture](#), [Organic Farming](#)
- [3] [Architecture](#), [Environment and Bioregion](#), [Renewable Energy](#), [Alternative energy vehicles](#), [Water management](#), [Integrated urban planning for sustainable development](#)
- [4] [Health](#), [Quiet Healing Center](#), [Multi Purpose Health Centre](#), [Auroville integral health services](#), [Inner Health](#)
- [5] “REZ: Rural Economic Zone (Economy as if people and planet mattered)” by Dr. T. Karunakaran, MGIRI Publications 2010
- [6] Project Report “Total Rural Development (TRD)—A New Paradigm for Sustainability for a Target Population of about 200,000 People in the Auroville Bioregion” 1st December 2007
- [7] Integral Rural Development (IRD) - A Project of Auroville Village Action Trust (AVAT)
- [8] Towards Sustainable Rural Development in the bioregion – Special project under SGSY
- [9] Bees, Birds and Mankind Destroying Nature by ‘Electrosmog’ by Ulrich Warnke, A Brochure Series by the Competence Initiative for the Protection of Humanity, Environment and Democracy <http://broschuerenreihe.net/britannien-uk/brochure/bees-birds-and-mankind/index.html>
- [10] <http://www.emwatch.com/Cellmasts.htm>
- [11] “Late Lessons from Early Warnings: Towards realism and precaution with EMF?” David Gee, European Environment Agency [http://www.bioinitiative.org/report/docs/section\\_16.pdf](http://www.bioinitiative.org/report/docs/section_16.pdf)
- [12] “The potential dangers of electromagnetic fields and their effect on the environment” report by Parliamentary Assembly, Council of Europe, Committee on the Environment, Agriculture and Local and Regional Affairs, Doc. 12608. 6 May 2011 <http://assembly.coe.int/main.asp?Link=/documents/workingdocs/doc11/edoc12608.htm>
- [13] “Integrated Communication and IT Infrastructure – ICITI” JV Avadhanulu et.al. eIndia 2010 Conference, Hyderabad, India, August 2010

[14] “Integrated Communications and IT Infrastructure” A joint project proposal by Auroville and Indian Institute of Information Technology, Bangalore

[15] “Green Mobile Communications – GMC” Version 1.0 dated 05 March 2011

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### **About the Author**



Capt JV Avadhanulu VSM I.N (Retd.) held top R&D Management positions such as the Director of R&D of D-Link India, Joint CPE of CRISP at Indian Institute of Science, Vice President of Cirrus Logic India, GM (R&D) of BPL Telecom, and Head of Communications at Central Research Laboratory of Bharat Electronics. Earlier, he served in the Indian Navy for 21 years, mainly in Defence Research and Development Projects, and joined the Central Research Laboratory of Bharat Electronics in the rank of Captain. He received the Visisht Seva Medal from President of India for distinguished service and Jain Memorial Gold Medal from Chief of Naval Staff for innovative design. He holds a post graduate degree in Communications Engineering from Indian Institute of Technology, Kharagpur.

He quit his professional career in 2007 to explore alternate modes of living and chose Auroville to pursue his quest for meaning in life. He conceived the ICITI project in early 2008 and has been coordinating this project in a voluntary mode ever since.

He is a Visiting Faculty at Indian Institute of Management, Indore and conducts workshops in many institutes and organizations in the area of Personal Growth

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