



1st Abdul Kalam Conference

IIT Madras, Chennai, India
July 11-14, 2019

Sustainable Growth at Sustainable Cost

Conference Guide



Contents

1 Purpose	2
1.1 Program and Brochure	2
2 Introduction	5
3 Abstracts	8
3.1 Repositioning of Rural Development in India: From Mirage to Miracle.	8
3.2 Pre-Conference: Opportunities for Indian Rural Enterprise	9
3.3 Welcome	10
3.4 Looking Back	10
3.5 President Kalam’s Dream of PURA	11
3.6 Global Collaboration For Space Infrastructure:	11
3.7 Conference Purpose	12
3.8 Looking Forward	13
3.9 Understanding The EV Elephant	14
3.10 IUSSTF	14
3.11 Defence Research for Civilian Development	14
3.12 WG1 Panel: Roadmap to Rural Self-Sustainment	15
3.13 Reviving PURA: Providing Urban Amenities in Rural Areas: An Update	16
3.14 Biomethanation	16
3.15 Sustainable Development Goals	16
3.16 WG2 Panel: Renewing Mother Earth	17
3.17 Moon Base and Other Space Infrastructure	17
3.18 Tin-Foil Hat Technologies To Face the Grand Challenges	18
3.19 Flood Predictor: First Step	19
3.20 Hydrogen Village	20
3.21 Clean Air and Clean Water with Sustainable Clean Energy	20
3.22 Working Group 3: Reaching New Resources	21

3.23 Gas Turbine Combustion Technology	22
3.24 Innovation Nation: Role of Ancient Indian Traditions	22
3.25 Neoskilling for Digital Transformation	23
3.26 The Single Teacher Schools Programme	24
3.27 The Social Science Underpinnings of Rural Development and Reverse Migration	25
3.28 Rural Enterprise and Artificial Intelligence	25
3.29 India's creative dream fulfilled	25
3.30 Bridging Implementation and Capability	27
3.31 Role of Technology and Innovation in Rural Healthcare in India	28
3.32 Space Technology For The Nation	29
3.33 Working Group 4: Bridging Implementation And Capabiities	30
3.34 Poster Session	31
3.35 WG5 Panel: Global Alliance for Wellness and Healthcare	31

Sponsors



- NCCRD, IIT Madras
- India-US Science & Technology Forum
- SVRDS Single Teacher Schools
- India Awareness Foundation
- Takshashila Institute
- Global Indian Business Council
- Stratcepts.com
- STEM Academy

1

Purpose

Welcome to the conference and thanks for being such a vital part of this brave endeavor. Around the world, development has come at extreme ecological cost. You can see the effects in the news, and feel them, enough said. *Clearly and urgently, India must find a smarter route to development.*

We believe that at least one such route exists - and it is rooted in the traditions of India. The purpose of the conference is to start laying out that roadmap.

The theme draws on the work of the late President Dr. Abdul Kalam and the Technology Information, Forecasting and Assessment Council (TIFAC). This is a unique convergence of experts in technology, social sciences, administration, rural development and education, determined to chart out a roadmap for India's advancement.

1.1 Program and Brochure

Click here for the website of the [First Abdul Kalam Conference](#)

The conference host is Prof. Satyanarayana Chakravarty of the AE department. Smt. Usha Nagarajan of the Combustion R& Center is the coordinator.

The program is given below, but its latest update of the program is linked below. [Latest Draft Program](#)

Pre-recorded introductions:

- Why and How of Rural Prosperity: Jagdish Sheth, Emory U.
- Our Ancient Traditions of Rural Enterprise: Dhru Shah, GIBC

July 11: DEFINING PROBLEM & STRATEGY

- Plenary 1: Bhaskar Ramamurthi, Director, IITM
- Looking Back: S.V.E.L., Ponraj
- Abdul Kalam Foundation: APJMJ Sheikh Saleem
- Looking Forward: Prabhat Ranjan, VC, D.Y.Pati Int. U.
- Conference Purpose: Narayanan Komerath, G.I.T.
- Understanding the EV Elephant: Ashok Jhunjhunwala, IITM
- Global Collaboration in Space: Mark Hopkins, US N.S.S.
- Indo-US Science & Technology Forum
- Defense R&D for Civilian Use: Subhash Chandran, DRDL
- Rural School Project: D. Rajkumar, SVRDS/IDRF
- **WG1 Panel: Rural Self-Sustainability**
- BharataNatyam: Rashmi Ravishankar

July 12: SOLUTION PATHS

- DeInfrastructure: S. Chakravarthy
- Reviving PURA: SrijanPal Singh, Kalam Centre
- Sustainable Development Goals: Rahul Goswami
- Space Technology for the Nation: R.V. Perumal
- Village Development Experience: Team
- **WG2 Panel: Renewing Mother Earth**
- "Tin-Foil Hat" Advanced Concepts: Narayanan Komerath, GIT
- Project update: Flood Control, Nandu Gopan
- Hydrogen Village: Mahendra Sunkar, U. Louisville, and G.Myneni
- Thorium Cycle concept: Ganapati Myneni
- **WG3 Panel: Reaching New Resources**

July 13: GOING FORWARD

- Indian Traditions of Innovation: Rajeev Srinivasan, IIMB
- Neo-Skilling: L. Prasad, IIMB, S. Ramachandran, InfoSys
- Role of Social Sciences: Sarath Menon, U. Houston
- Rural Enterprise and AI: Krishnan Narayanan, ITHAASA
- Project STEM: Amitabh Sharma
- Evolving Role of Administration: Nivedita Haran
- **WG4 Panel: Bridging Research and Implementation**
- **WG5 Panel: Global Alliance for Healthcare**
- Poster Session



The 1st Abdul Kalam Conference will start a biennial tradition to generate practical and exemplary solutions to large societal challenges. India must find a route to achieve sustainable development and growth, at a sustainable cost to the environment. Five Working Groups will draw inspiration from the record of the past 30 years, and sharpen plans to tackle the massive challenges ahead. Working Groups:

- Rural Energy Self-Reliance
- Reaching Mother Earth
- Reaching New Resources
- Bridging Capability and Implementation
- Global Alliance For Wellness and Healthcare

The conference is hosted by the Indian Institute of Technology in Chennai, with the Takshashila Foundation as the US partner. The groups synergize researchers, practitioners, educators, planners, business leaders and administrators.

Contact:

Usha Nagarajan, NCCRD, IITM ushanccrd@gmail.com
Sayanarayanan Chakravarthy, IITM satyachakra@gmail.com
Rajeev Srinivasan, IIMB rajeev.srinivasan@gmail.com
Narayanan Komerath, Georgia Instt of Tech.
komerath@gatech.edu
Adarsh Deepak, Taksha.org adarsh.deepak@gmail.com

Participate on-site or via ZOOM

<http://www.stratcepts.com/1AKC2019>

A unique convergence of technology, social sciences, administration, rural development and education, determined to chart a roadmap for India's advancement.



1st Abdul Kalam Conference

“Sustainable Development At Sustainable Cost”

IITM, Chennai, India
July 11-14, 2019

*How Will We Achieve Sustainable Growth
Through A Distributed, Modern Rural Economy?*

A Conference With 5 Working Group Reports, Invited
Talks, Project Discussions and A Poster Session



First Abdul Kalam Conference, July 11-13, 2019. Program as of June 28, 2019			
11-Jul	Defining the Problem and Overall Strategy	12-Jul	13-Jul
	CLT	CLT	CLT
8:30	Registration, logistics & invocation		
9:00	Welcome & Plenary: Prof. Bhaskar Ramamurthi, Director, IITM	9AM	Rajeev Srinivasan: Role of Ancient Indian Traditions
9:30	Looking Back: V.Ponraj, former Scientific Advisor to Dr. Kalam	9:30	NeoSkilling: L. Prasad, IIMB & S. Ramachandran, InfoSys
10:00	Comments from Mr. APJMJ Sheikh Saleem, Abdul Kalam International Foundation	10:00	Social Science Role: Sarath Menon, U. Houston
10:30	Break	10:30	Break
11:00	Looking Forward: Prabhat Ranjan, VC, DYPatil I.U., Pune	11:00	AI and Rural Enterprise: Krishnan Narayanan, IITHAASA
11:30	Village Development Experience. Elangovan Ramasami and Gokul Devendran	11:30	Project STEM: Amitabh Sharma
Noon	Lunch	Noon	Lunch
1:00	Conference Purpose: Narayanan Komerath	1:00	Working Group2: Renewing Mother Earth
1:30	Understanding the EV Elephant: Ashok Jhunjhunwala:		Evolving Role of Administration: Nivedita Haran
2:30	Global Collaboration For Space Infrastructure: Mark Hopkins, NSS	2:00	Tin-Foil Hat? Advanced Concepts: Narayanan Komerath
3PM	IUSSTF	3:00	Project update: Flood Control. Nandu Gopan
3:30	Defence R&D for civilian advancement: Prof. P. Ravi Shankar, IITM	3:30	Hydrogen Village: Mahendra Sunkara and Ganapati Myneni
4:00	Break	4:00	Break
4:30	Rural School Project: D. Rajkumar: SVRDS/IDRF	4:30	Thorium Cycle concept: Ganapati Myneni
5:00	WG1 Panel: Rural Self-Sustainment	5:00	WG3 Panel: Reaching New Resources
6:00	BharataNatyam: Ms. Rashmi Ravishankar	6:00	End Day 2
		6:00	End Day 3
		6:00	End Day 3

2

Introduction

Namaste. This document is intended to assist the organizers and participants of the First Abdul Kalam Conference on July 11-14, 2019, at the [Indian Institute of Technology](#), Madras (IITM), in Chennai, India. The IIT campus is located on the Sardar Patel Road, midway between the Raj Bhavan and Adyar bus terminus and is around 12 km (but quite a long ride by road or metro rail) from Chennai Central Railway Station. Other landmarks include the Guindy Snake Park near the IIT main gate and the Central Leather Reasearch Institute (CLRI) campus opposite the IIT campus. [Directions to reach the IIT are given here.](#)

The Conference location is the Central Lecture Theatre, in the Humanities and Sciences Building which is next to the Administration Block. Meals and the Posters will be in the hall next to the CLT.

Click here for the website of the [First Abdul Kalam Conference](#)

Contacts:

- Ms. Usha Nagarajan, NCCRD, IITM ushanccrd@gmail.com
- Dr. Satyanarayana Chakravarthy, IITM satyachakra@gmail.com
- Mr. Rajeev Srinivasan, IIMB rajeev.srinivasan@gmail.com
- Dr. N. Komerath, Georgia Instt of Tech. komerath@gatech.edu
- Dr. Adarsh Deepak, Taksha.org adarsh.deepak@gmail.com

Electronic participation is via YouTube broadcast and ZOOM software connection. Participants may post comments/questions by text, which will be recorded and if possible answered. This is a new technology for us, we request your patience with

it. Registration for this option is \$100 for US and other foreign-based participants through the Taksha portal, and INR 1000 for Indian participants through the IIT registration portal.

Registrants will receive log-in instructions before the conference.

Student registration Full-time students and retirees may register for physical participation at the the full conference at the electronic participation rate. Please indicate your institutional affiliation and degree program, or select the retiree status at registration. Thank you.

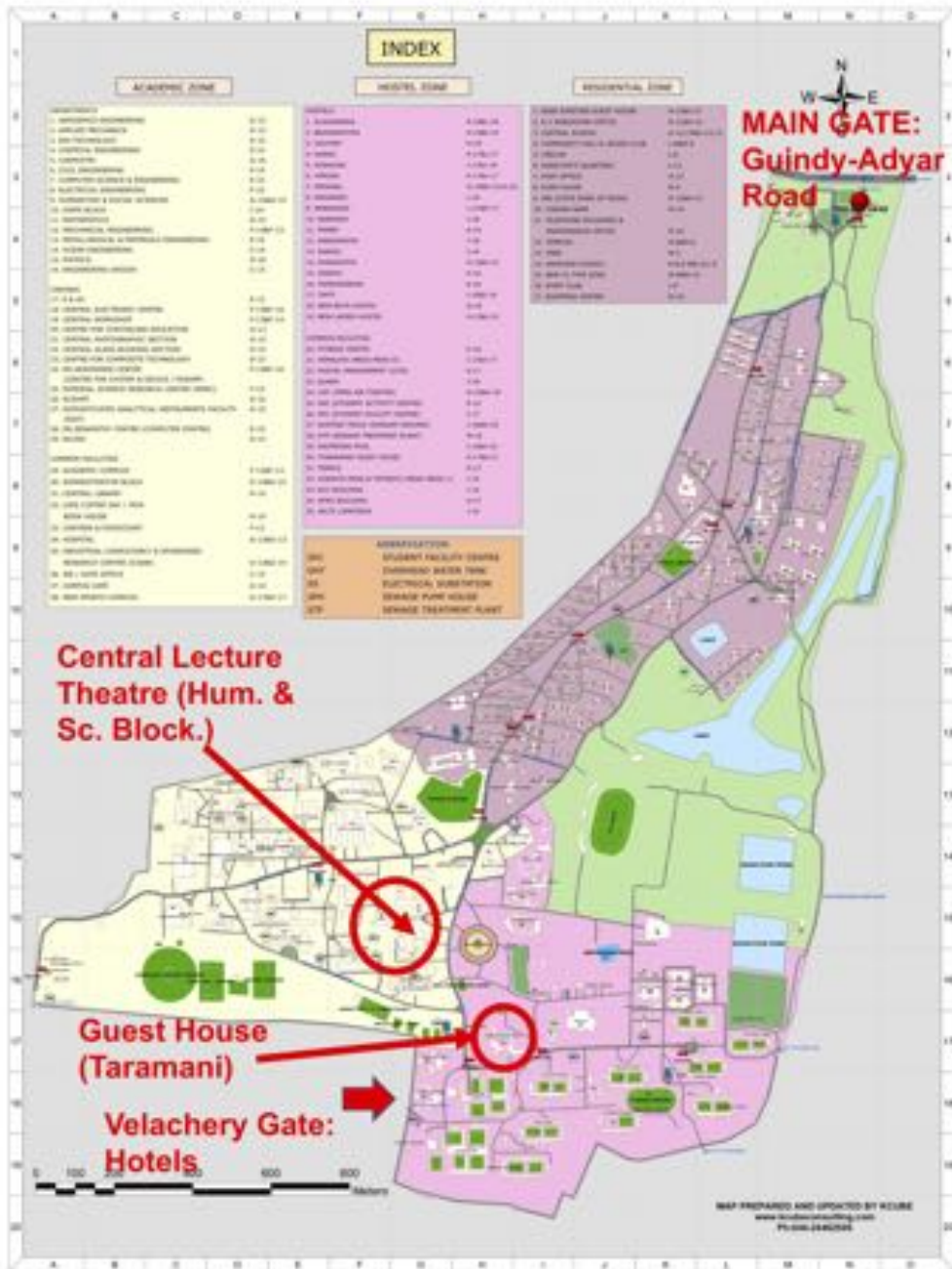


Figure 2.1: Map of the campus showing the Main Gate at top, the Velachery Gate and the Central Lecture Theatre

3

Abstracts

The standard disclaimer applies:

All opinions are those of individual authors, and are not to be construed as those of the organizers or sponsors.

3.1 Repositioning of Rural Development in India: From Mirage to Miracle.

Dr. Jagdish Sheth, Professor of Marketing, Emory University, Atlanta

Dr. Jagdish N. Sheth is the Charles H. Kellstadt Professor of Marketing in the Goizueta Business School at Emory University since 1991, after faculty positions at University of Southern California (USC), University of Illinois, Columbia University and MIT. He is the past President of the Association for Consumer Research (ACR) and Division 23 (Consumer Psychology) of American Psychological Association (APA). He is also a Fellow of APA. Professor Sheth is the recipient of all of the top four academic awards bestowed by the American Marketing Association (AMA). His academic publications include more than 300 hundred papers and several books, including *The Theory of Buyer Behavior* with John A. Howard; *Marketing Theory: Evolution and Evaluation* with David Gardner and Dennis Garrett; *Consumption Values and Prediction of Choice Behavior*; and *Customer Behavior* with Banwari Mittal and Bruce Newman. He has also published several professional books including, *The Rule of Three*, *Clients for Life*, *Self Destructive Habits of Good Companies*, *Chindia Rising*, and *Firms of Endearment*. All have been translated into multiple

3.2. *PRE-CONFERENCE: OPPORTUNITIES FOR INDIAN RURAL ENTERPRISE*⁹

languages. His latest publication is *The Sustainability Edge* (Rotman 2016).

Professor Sheth speaks to the core reasons for the conference, in a [pre-recorded 40-minute presentation on YouTube](#):

1. Why all of us should care about rural India's prosperity.
2. The urgency of reversing the degradation of the environment
3. Ways to induce growth of rural-based sustainable enterprise
4. That it is possible through technology to do the above today.

He then sets clear strategy and recommendations, with examples and case studies.

3.2 Pre-Conference: Opportunities for Indian Rural Enterprise

Dhirendra J. Shah, India Awareness Foundation

Shri Dhirendra Shah runs the India Awareness Foundation and is President-Elect of the Global Indian Business Council. Educated at the Maharaja Sayajirao University, Baroda, the London School of Economics and Harvard Business School, his career as a businessman spans experience in a major company in India in the 1960s, then in the Persian Gulf countries, then in America, starting an international trading company in Greenwich, CT. He is a long-time Atlanta resident where he runs Suraj International. He is the founder of the India Awareness Foundation, and a member of the Board of Directors of WAVES, the World Association for Vedic Education and Studies. His social activities include organizing lectures, seminars and discussion groups on wide ranging topics, writing and speaking on social /politics/ economics/history with particular reference to India and USA.

He will be recording a presentation for inclusion ahead of the conference. Shri Shah will provide a business-focused presentation:

1. The ancient tradition of rural-based enterprise
2. The importance of small business today
3. Improving ease of conducting small business due to the government's emphasis on reducing regulations, as well as global connectivity
4. Opportunities in connecting medicine, education and agriculture.

3.3 Welcome

Prof. Bhaskar Ramamurthi, Director, IITM, Chennai /indexBhaskar Ramamurthi

Dr. Bhaskar Ramamurthi is a Professor of Electrical Engineering at IITM, and the Director of the Institute. A B.Tech (Electronics) alumnus of IITM, he earned an MS and PhD from University of California, Santa Barbara, followed by 2 years at AT&T Bell Labs, before returning to IITMadrass. He served as Director of Planning at IITM before becoming Director in 2011. His research is on wireless communication networks. He is the principal architect of the corDECT wireless local loop system and Broadband corDECT Wireless DSL system, deployed in India and 15 other countries.

IITM is celebrating its 60th Anniversary this year, with a kickoff event on July 31 followed by an alumni event on September 6. The Institute has had an impact on the global economy and technology map, as well as those of India, far out of proportion to its relatively tiny number of alumni. Much of this came out of the undergraduate program, whose alumni went on to higher education and professional careers and entrepreneurship all over the world. Many graduates in the 1970s and later, went into the Computer Science/Information Technology fields, with tremendous impact on that industry worldwide and in India. All through the years, the graduate/research functions of the institutions, while remaining relatively low-key, have been crucial players in the nation's defense and other technological endeavors, with no lack of direct contact with the highest levels of India's government and industry.

Today IITM is building its graduate research and enterprise nurturing aspects. The Institute is in the middle of a fast infrastructure growth phase, with a large increase in the number of students, faculty and staff at all levels.

3.4 Looking Back

Dr. S.V.E.L. Ponraj

Dr. S.V.E.L. Ponraj served as Scientific Advisor to President Kalam. He is a public figure and writer, having formed in 2016 a political party named the Abdul Kalam Vision Party. The Party aims to turn Tamil Nadu into a developed state following the guidance of Dr. Kalam. He will speak from his perspective of having worked closely with Dr. Kalam in the later years.

3.5 President Kalam's Dream of PURA

Mr. A.P.J.M. Sheikh Saleem

Mr. Saleem is a grand-nephew of the late President Kalam, and is the managing director the Abdul Kalam International Foundation (AKIF). Their head office is in Rameswaram, Ramanathapuram District. AKIF has launched the 'One Crore Tree Plantation' project to increase green cover by planting 10 million well-grown saplings across all districts of Tamil Nadu by December 2020, with the help of school and college students. The saplings are being grown in nurseries in several districts. He will also speak of Dr. Kalam's passion for using technology to advance the rural areas of India, as well as to bring drinking water to the parched south-east coastal areas of India.

3.6 Global Collaboration For Space Infrastructure:

Mark Hopkins, President, US National Space Society

Mr. Mark Hopkins is Chairman of the Executive Committee Emeritus for the National Space Society (NSS). Earning a BS in economics from the California Institute of Technology, an MA in economics from Harvard University, he is a former Rand Corporation economist. His publications on space economics span most of the early economic studies of space settlements, including the economic study in the NASA publication: *Space Settlements: A Design Study*.

Studying social movements in the late 1960s and 70s, he coined the term *Space Movement*, to garner public support for the Space enterprise. He has been called the Father of the Space Movement. In 1972 he co-founded and later served as President of the Harvard-Radcliffe Committee for a Space Economy, dedicated to large scale economic development of space. This led to the L-5 Society to whose Board he was elected. He proposed the National Space Society (NSS), a result of the merger of the L-5 Society with the National Space Institute in 1987. He was the founding President of Spacecause and Spacepac. He is particularly concerned with developing an optimal strategy for the Space Movement and the question *What is the best way to drive humanity into space?*

Mr. Hopkins worked with President Abdul Kalam on global collaboration towards

Space Infrastructure, including Space Based Solar Power, for many years until 2015. A Joint Statement developed by Dr. Kala, and himself is linked here. He will speak about the international perspective of President Kalam's efforts.

3.7 Conference Purpose

Narayanan Komerath, Conference Chair

The fundamental question posed is how to achieve a large rise in the physical and mental living standards of a large population, while keeping resource consumption and ecological impact small. The premise is that at least one viable roadmap can be found, with India providing unique opportunities.

The strategy that is advanced here is to reverse urban migration, convincing people that living in their native villages is superior to migrating to crowded, quasi-dysfunctional, cities. This requires a large leap in the amenities available in rural areas to meet and exceed those available in urban areas. Such a leap cannot come from government programs alone, although the first step of basic amenities may need public funding. Most of the growth in rural amenities and wealth must be generated by rural-based enterprise, that is sustainable.

The question now distills to asking how to generate sustainable enterprise in rural areas. For this, energy and knowledge must be available, along with communication and transport. Rural residents (perhaps helped by those moving from cities) must be empowered to generate and grow their own enterprises, competing in the global economy while staying centered in the rural areas. A massively distributed and highly advanced entrepreneurial network is needed to accomplish this.

India is severely deficient in energy per capita. This is at the root of most obstacles to productivity, enterprise development and standard of living. We are refining a road map to grow a massively distributed, renewable, sustainable energy economy. With energy available in plenty, the rest of the roadmap becomes clearer. Environmental damage can be steadily rolled back through reforestation and re-greening, resilient agriculture, waste disposal with use of bio-methane, cleaning and conserving water resources and eliminating air pollution. Enlightened societal conduct and sure-footed business growth must be nurtured by an effective and swift justice system for a level playing field. Enter Technology and bold Concept Development.

Beyond energy, the other huge obstacle in rural India is access to wellness guidance

and healthcare. A global alliance is proposed. In each of the above, the role of culture and tradition is paramount. Current research is bringing out the rich heritage of distributed enterprise that used land and water to transport world-class merchandise “from Hanoi to Haifa” thousands of years ago. Technology enables revival of such rural enterprise.

The PURA (Provision of Urban Amenities to Rural Areas) was proposed in the 2010 era with two steps: a passive government-paid build basic infrastructure development, and an active second phase where enterprise development enables multiplication of the economy. The present roadmap draws heavily on their spirit. We aim to bring enterprise as soon as possible, through training energy system maintainers as a first step. Present Government initiatives have made startling impact (and run into problems of sustainability). They provide a launch framework into the entrepreneurial phase.

3.8 Looking Forward

Prof. Prabhat Ranjan

Dr. Prabhat Ranjan is the Vice-Chancellor of D.Y.Patil International University, Pune. From 2018 to 2018 he headed the Technology Information Forecasting and Assessment Council (TIFAC), India’s technology Think Tank. An alumnus of IIT Kharagpur, he holds a PhD from University of California, Berkeley in the area of Nuclear Fusion, doing his research at the Lawrence Berkeley Laboratory in 1983-86. He has worked at Saha Institute of Nuclear Physics and the Institute for Plasma Research, and as Professor at the Dhirubhai Ambani Institute for Information and Communication Technology. He was the Project Leader of the largest operation Indian Fusion Reactor, ADITYA at the Institute for Plasma Research from 1996-2002. Today his wide-ranging interests include applying wireless sensor networks to wildlife, planetary exploration, nuclear fusion, healthcare and agriculture.

He will speak about TIFAC’s role in the genesis of the “India 2020” reports and his projection of the route ahead for India.

3.9 Understanding The EV Elephant

Prof. Ashok Jhunjunwala

Dr. Ashok Jhunjunwala is a Professor of Electrical Engineering at IIT Madras, where he leads the Telecommunications and Computer Networks Group. He is a director on the Board of the State Bank of India, as well as several Telecom and IT companies. He was Governor of the International Council for Computer Communication Inc from 1999-2005. He received the JC Bose Fellowship (2010) and the Padma Shri Award in science and engineering from the President of India.

He is best known for his work on DC micro-grids, designed to alleviate the effects of the rolling blackouts that plague most of India due to the shortage of electric power. These systems have been installed in several cities in India. His group has also installed standalone solar photovoltaic systems with efficient batteries in several villages.

His recent work since 2016, is on Electric Vehicles. He nurtures several startups and groups to develop new batteries and EV models. His talk is on the tremendous potential of electric vehicles in India, and ways to tap into that potential.

3.10 IUSSTF

We are awaiting confirmation of the participants from the Indo-US Science and Technology Forum, sponsors of a large part of this conference. The IUSSTF presentation is expected to discuss the organization's aspirations to promote bilateral understanding and advancement by enabling dedicated researchers from both countries to meet and discuss critical issues.

3.11 Defence Research for Civilian Development

Dr. B.S. Subhash Chandran

Dr. Subhash Chandran is an alumnus of IITM, B.Tech AE 1979. he received an MSAE (1980) and PhD AE (1984) from Georgia Institute of Technology, specializing in Turbulent Combustion diagnostics and analysis. He was recruited to work on Dr. Abdul Kalam's team at the Defence Research and Development Laboratories since the early stages of the Integrated Guided Missile Development Program.

The Defence Research and Development Organisation was tasked with building the indigenous capability to defend India with modern weapons. In the 1960s and early 1970s, weapon imports strained the Indian economy, the need to meet external threats competing with the need to grow food and civilian industry. In the early 1980s Prime Minister Indira Gandhi set forth the Integrated Guided Missile Development Program to build a strategic and tactical deterrent to protect India. Dr. Abdul Kalam led this program. Today the capabilities developed by DRDO are ready for dissemination into many civilian applications.

3.12 WG1 Panel: Roadmap to Rural Self-Sustainment

Panel: SrijanPal Singh, S.V.E.L. Ponraj, D. Rajkumar, Rajeev Srinivasan, Subhash Chandran. Gokul Devendran , indexS.V.E.L. Ponraj

Goal: Rural Energy Self-Reliance, with sustainable enterprise. Reverse Urban Migration by making rural areas attractive.

The premise of this Working Group is that lack of access to energy is the single key or point of entry to solving many of the problems of rural India. A roadmap has been designed, to bring basic photovoltaic energy to village schools, and through that to develop the capability and understanding to expand renewable energy systems.

However, expansion requires sustainable enterprise in rural India, which is the second part of the challenge: the two must go hand in hand, the one reinforcing and amplifying the other.

Basic questions:

1. Is the Energy Self Reliance Roadmap appropriate? What corrections are needed?
2. Initiating Rural-based Enterprise and energy self-reliance: Tradition + Technology
3. How can Rural-based Enterprise be sustained in the modern marketplace?
4. Appropriate level and types of infrastructure

3.13 Reviving PURA: Providing Urban Amenities in Rural Areas: An Update

Dr. SrijanPal Singh

Dr. Srijan Pal Singh is an author, public speaker and social entrepreneur. He is an Electrical engineer from the Institute of Engineering and Technology, Lucknow and a graduate from the Indian Institute of Management Ahmedabad where he was President of the Student Union. He was an Officer-on-Special-Duty and advisor on technology and policy to President Kalam. He co-founded the Kalam Foundation with President Kalam and serves as its

Here he is expected to speak about the PURA (Providing Urban Amenities in Rural Areas) initiative started by President Kalam, and prospects for moving ahead along towards rural self-sustainment.

3.14 Biomethanation

Prof. Indumathi Nambi, Dept. of Civil and Environmental Engineering, IITM, Chennai

Dr. Indumathi Nambi heads the Environmental and Water Resources Engineering Division at IITM. She works on pollution control as well as biomethanation to solve the urban groundwater contamination and sewage disposal problems. For the last few years she has been managing a Carob Zero initiative sponsored by the US State Department / US Consulate in Chennai, where an innovation competition was conducted in the areas of renewable energy and sustainability. She has authored over 116 publications.

3.15 Sustainable Development Goals

Rahul Goswami

Rahul Goswami works on rural development and agro-ecological practices, sustainable development and intangible cultural heritage. He has worked with regional administrations and at government level (India) and with an intergovernmental system (UNESCO). His special interest is participation in and encouragement of multi-disciplinary study of contemporary livelihoods and sustainability issues. He

served as a Social Sector Consultant to the National Agricultural Innovation Project of the Ministry of Agriculture, Govt. of India (2009). He participated in consultations for India's 12th Five Year Plan (2012-2017) on agriculture, food and nutrition. He was an examiner for the 2003 UNESCO Convention of the Safeguarding of the Intangible Cultural Heritage (2011-13).

In this Conference Mr. Goswami will explain the Sustainable Development Goals and how our Working Groups deal with each of them, to make a roadmap for India's advancement.

3.16 WG2 Panel: Renewing Mother Earth

Panel: Indumathi Nambi, Rahul Goswami, Dileep Kumar, Nandu Gopan, Viva Kermani, Ravi Deepak This panel reports on the progress of Working Group 2. The group considers the immense challenge and opportunities in reversing pollution, adopting practical and sustainable solutions for Climate Change, and generally creating the physical environment to entice reversal of urban migration. The broad mandate of the Group includes opportunities in water conservation and interlinking, irrigation, reducing the weather dependence of agriculture, reforestation without economic loss, and breaking the curse of the flood-drought cycle.

Some Questions

1. Reforestation
2. Water Table replenishment
3. Controlled-environment agriculture
4. Pollution reversal
5. Model Villages vs. wider-distributed PURA
6. Role of Tradition

3.17 Moon Base and Other Space Infrastructure

John C. Mankins, President, ARTEMIS Innovation LLC

(Electronic presentation to be uploaded: Mr. Mankins will not be able to attend in person.)

John Mankins is a member of the Board of Directors of the US National Space Society. is an internationally recognized leader in space systems and technology innovation, with a record of effective management of large-scale technology research and development programs. Following a 25-year career at NASA and the Jet Propulsion Laboratory, where he was Chief Technologist for the Human Exploration and Development of Space. he now runs ARTEMIS, and Mankis Space Technology, with projects in the areas of Space Based Solar Power and Moon Base development. He will speak on the Moon Base plans that are being developed. He is Vice-President of the Board for the Moon Village Association, and a member of the Boards for the National Space Society and SPACE Canada. The Moon Village Association aims to be a permanent global informal forum for stakeholders including governments, industry, academia and the public interested in the development of the Moon Village. The MVA fosters cooperation for existing or planned global moon exploration programs. It comprises approximately 220 members from more than 39 countries and 25 Institutional members around the globe, representing a diverse array of technical, scientific, cultural and interdisciplinary fields.

3.18 Tin-Foil Hat Technologies To Face the Grand Challenges

Narayanan Komerath, Georgia Institute of Technology Dr. Narayanan M. Komerath is an alumnus of IITM, AE1978, followed by MSAE and PhD (turbulent combustion) at Georgia Institute of Technology. Since then his career as a research engineer and academic faculty member have been mostly in the areas of experimental aerodynamics, with an unbroken role in the Center of Excellence in Rotorcraft Technology since 1982. He has directed operations at the John J. Harper Wind Tunnel since 1990 with research at the interface of flow diagnostic techniques and fluid/aerodynamics. Since becoming a full professor in 1994 he has turned increasingly to cross-disciplinary endeavors, going into the Advanced Concepts parts of Space Infrastructure problems. He is a Fellow of the NASA Institute of Advanced Concepts, known for his work towards solving the problem of building large radiation-shielded habitats in deep Space. He has also published on the ways to implement Space Solar Power, arguing for advances in millimeter wave beamed power conversion to take advantage of an intensified thermal conversion architecture (INCA) to achieve high specific power and economic viability.

Professor Komerath's interest here is to show that there are feasible options to deal

with large problems, and exploit opportunities. Three interlinked areas are considered: (a) the idea of reflecting out sunlight from the edge of Space using aerodynamically and aerostatically supported, ultra-thin, ultralight sheets. Called the Glitter Belt for how it might be seen from Space, this concept is looking increasingly attractive as the technology is flight-demonstrated and objections overcome. An initial application may be in reversing the melting of sea-ice around Antarctica, in an effort to reverse sea level rise. India is an ideal launch site to test out and deploy the Glitter Belt initially. (b) A Roadmap towards Rural Energy Self-Reliance can be laid out, starting with getting buy-in from villagers through PV systems for their children in school, and going all the way to local production of hydrogen-oxygen for a clean, sustainable economy. (c) With hydrogen becoming available, India is again the ideal location to start supersonic airliner flight using the high efficiency and payload fraction achievable with hydrogen, while avoiding carbon emissions into the stratosphere entirely.

3.19 Flood Predictor: First Step

Nandu Gopan

Dr. Nandu Gopan is an Assistant Professor at Amrita University's Aerospace Engineering Department near Coimbatore, strategically placed near the Western Ghats. He specializes in computational fluid dynamics (CFD) but also works on a broad spectrum of problems with students. One current project is a tool based on geographic information systems, combined with CFD algorithms, to predict flooding probability in given areas based on rainfall and dam operations. This project is an informal collaboration with Narayanan Komerath's group at Georgia Institute of Technology, with the two teams working on complementary parts of the problem. Dr. Gopan will report on this project, which is also seen as the first step towards a micro-scale distributed strategy to beat the 'flood-drought curse' starting with the Western Ghats region separating Tamil Nadu and Kerala. The Ghats intercept the Southwest Monsoon's lower-level clouds causing intense rainfall and floods in Kerala to the west, while leaving Tamil Nadu on the eastern side dry, except for high-altitude clouds and thundershowers. It is argued that modern technology with pipelines and tunnels can achieve what was abandoned after surveys back in the 1820s: a linkage from the reservoirs on the western watershed, to the dry eastern slopes and beyond. This will also require reviving the ancient local water storage ponds and tanks in a well-managed network of local conservation and distribution, which is suitable to modern Big Data/ AI solutions.

3.20 Hydrogen Village

Mahendra Sunkara, U. Louisville, and Ganapati Myneni, US DOE

Dr. Mahendra K. Sunkara is a Professor of Chemical Engineering, University Scholar and the director for the Conn Center for Renewable Energy Research (Conn Center) at University of Louisville. He holds a B. Tech., M.S. and PhD in Chemical Engineering from Andhra, Clarkson and Case Western Reserve Universities respectively. He was a Project Engineer at Faraday Technology, Inc. in Dayton, OH from 1993-1996 in electrochemical technologies toward environmental remediation and corrosion sensing and mitigation. He has published over 100 refereed articles, four book chapters and was awarded ten U.S. patents with several others pending. He coauthored a book entitled *Inorganic Nanowires: Applications, Properties and Characterization*. He received the University of Louisville President's distinguished faculty award for research and United Phosphorus CDS Award from the Indian Institute of Chemical Engineers in December 2009.

Professor Sunkara and Dr. Myneni are collaborating on a project to develop a model hydrogen-powered village in Andhra Pradesh. This is seen as a leap-ahead test case in our roadmap towards rural energy self-reliance.

3.21 Clean Air and Clean Water with Sustainable Clean Energy

Ganapati Myneni

For the sustainability of the healthy and happy humanity clean air and clean water are essential elements that are only possible with clean energy. It is the moral duty of the peoples of the world, who are enjoying the benefits of clean air and clean water at the expense of the vast majority of the humanity, and the concerned Governments to come together and work collaboratively as a team and solve this issue for ever. International public private partnerships are the way to accomplish this immense humanitarian task. This complex problem can be broken up into two parts 1) villages and remote villages and 2) townships and cities. The solutions for these distinct groups can be different and can be addressed in a concerted way. Generally, most of the villages have a body of water close by. Photo voltaic solar panels could be installed over these water bodies not only to minimize water evaporation but also to generate electricity. The generated electricity will help to provide pumping of

water to the agricultural fields, offer controlled climate comforts as well as help in reducing the wastage of food. Additionally, hydrogen can be generated and usher up the hydrogen economy in the villages offering employment opportunities by creating village industries. The well established IC engine technology which can burn hydrogen will provide the necessary transportation needs of the village folks. Ultra safe, super clean and highly economical proton energy, sub-critical molten salt reactor (MSR) power plants are the answer to meet the needs of the townships and cities. These new types of power plants that operate at ambient pressures do not require costly and complex containment domes that take years to build. Additionally, these new low cost power plants are smart and can follow the electricity grids and enable renewable energy sources unlike to conventional base load nuclear plants that are operated as base load power plants. Plentiful thorium is the clean and cheap fuel for these new power plants and natural uranium will be the start up fuel for these new energy sources.

3.22 Working Group 3: Reaching New Resources

Panel: Mark Hopkins, Ganapati Myneni, Narayanan Komerath, Sathyanarayanan Chakravarthy, R.P. Shankar

The field of Advanced Concept Development is epitomized by organizations such as the NASA Institute of Advanced Concepts that existed from 1998 to 2006. Concept developers are part dreamers who think up solutions to grand and so-called ‘insoluble’ problems, but then follow up their dreams by thinking through implementation at increasing levels of detail. One motivation of this conference is to bring such people face to face with the real issues in the grand challenge posed here - and to let others see why they believe that solutions are possible, and are much closer to implementation than anyone may have realized. While the ‘pre-occupation’ with everyday reality leaves little time for most people to look beyond, this field looks at what is possible, imagines us reaching there, and asks how we got there. At minimum, this exercise identifies the real short-term and long-term technological obstacles requiring further research and development. Sometimes it leads to people seeing that there are no real obstacles, and opens doors to reach new resources far beyond what we can see today.

Some Questions:

1. How to tie Advanced Concepts to Systems Engineering for implementation

2. Role of AI/Big Data/ML as threats and opportunities for rural distributed wealth generation
3. Thorium cycle opportunities; desalination
4. Hydrogen Economy: leap-frog vs. gradual transition

3.23 Gas Turbine Combustion Technology

Prof. Satyanarayanan Chakravarthy

Dr. Chakravarthy, educated at IIT and at Georgia Institute of Technology, heads the National Center for Combustion Research and Development, out of the Department of Aerospace Engineering at IIT Madras. He is the host of this conference.

In this talk he will discuss the role of gas turbine technology in power as well as combined heat and power generation using gases available in rural areas, such as biogas and ammonia. He will also consider the possibilities of building large numbers of gas turbines using distributed enterprise across rural India.

3.24 Innovation Nation: Role of Ancient Indian Traditions

Rajeev Srinivasan

Rajeev Srinivasan is an Electronics Engineering graduate from IITM, with graduate degrees from Syracuse U. and an MBA from Stanford. His career spans technical experience with Bell Labs and Sun Microsystems, followed by management positions at the TechnoPark at TiruAnanthapuram, Kerala, the Maker Village at Kalamassery, and a faculty position at IIM, Bengaluru where he teaches in the area of Strategic Marketing and Innovation. Mr. Srinivasan is also an internationally known writer on strategic affairs and history.

Here he examines the role of ancient Indian traditions in inspiring entrepreneurship in rural India. He points to specific traits in tradition including that of self-defined limits on expansion and wealth, that value sustainability and balance, with respect for Nature and others, over the unlimited pursuit of wealth.

3.25 Neoskilling for Digital Transformation

Neoskilling for Digital Transformation - Inter-organizational dynamics in the e-age Prof L Prasad, IIM Bangalore, S Ramachandran, Principal Consultant, Infosys

The tides of Digital Transformation and Artificial Intelligence (AI) revolution we are witnessing today have the potential to deliver remarkable benefits, if managed adeptly, for large enterprises and the society. It brings with it new business models, revenue streams, adjacent markets and channels to reach out to them. If not handled properly, it can devastate industries, not just individual firms. According to Accenture's report *Fueling India's Skill Revolution* published in early 2019, we may have to forgo as much as \$2 trillion of GDP growth possible from investment in emerging technologies over the next decade, if we fail to bridge the skill gap. Skill development keeping the future in mind is neoskilling, in short.

Most of the implementation of this Digital Transformation will happen in inter-organizational networks, many spanning regional, national and continental boundaries. There is a pressing need to understand the dynamics of multiple entities getting together. If these interactions are managed properly, we have a *virtuous cycle*. If not, there is the *vicious cycle*, where things spin out of control.

Organizations must learn to *trustingly collaborate*, not *firmly compete* with each other all the time. Organizations fall into the vicious cycle when they stubbornly remain takers, emphasizing only substantive outcomes for themselves alone, even if this is at the expense of others. This aggravates the CAGE gap between them Cultural, Administrative, Geographic, Economic distances in the Ghemawat framework ((named after Pankaj Gheawat). Neoskilling offers a blue print to avoid the vicious cycle and to get into the virtuous cycle for keeping things under control and implementing a successful Digital Transformation, keeping the people aspect in mind.

It is important to clearly define ownership for neoskilling initiatives starting from their definition and design to execution and feedback. Mayer Zald proposed the political economy framework to study the relationship between the major political and economic factors in an organization, especially large ones. It is important to be aware of the political undercurrent to ensure that neoskilling initiatives are successful. Zald referred to the power system of the organization as Polity, the various actors who formally make and execute decisions. Polity consists of the power centers who sign-off on the training needs and budget.

From our study findings across more than 270 large enterprises in India, the primary

owners for reskilling appear to be the Polity, that is, CEOs and HR heads, across industry sectors. They may be unaware of the exact details and nitty-gritty of what training to offer, given the dynamics of the fast-changing areas in digital technologies.

It is important for the Economy to gradually take end-to-end ownership of the planning and implementation of neoskilling initiatives to ensure success. The Economy consists of niche roles such as Learning & Development heads (CLOs/CKOs), CIOs and even business and functional heads who will be specialists on what to train employees upon and be accountable for both the efforts and the planned business benefits expected out of them. It is important to harmonize between these two groups for a successful skill development program and not let the ownership rest with the polity. That will ensure that inter-organizational dynamics are taken care of for a successful and long lasting neoskilling initiative.

Reference: Prasad L, Ramachandran S, Neoskilling for Digital Transformation and the Artificial Intelligence revolution, Wiley India, Jan 2019

3.26 The Single Teacher Schools Programme

D. Rajkumar, Coordinator, SVRDS STS

The Swami Vivekananda Rural Development Society operates over 800 Single Teacher Schools in Tamil Nadu villages. These schools are usually the only way that children of the age to be in 1st to 7th grades in these villages can get an education, as they live too far from fully-staffed schools, and generally their parents cannot afford to send them to schools far away. The STS programme administers a holistic academic curriculum, and prepares students to enter mainstream schools by Grade 8. The schools also tries to hire back village residents who complete the 12th grade, as teachers to carry the program forward, a step that also serves as a social improvement in the villages as they retain educated villagers who provide a role model. STS has been working with grants from the Central and State Governments and Corporate Social Responsibility grants, to construct separate toilets for boys and girls at each school, and now to construct an adjoining bathroom in every village. In 2016-2018, STS trained local villagers to enable installation of 55 Photovoltaic systems in the village schools, that help the children carry on their education in the evening when the electric grid power supply is non-existent or intermittent - which was causing severe disruption of the children's education. They also installed a biogas cooking system at a teacher's residence as a pilot project. SVRDS which exemplifies a partnership

3.27. *THE SOCIAL SCIENCE UNDERPINNINGS OF RURAL DEVELOPMENT AND REVERSE M.*

between industrialists, public servants, administration experts and social workers, is a generous sponsor of this conference.

3.27 The Social Science Underpinnings of Rural Development and Reverse Migration

Prof. Sarath Menon, University of Houston

Professor Menon will speak to the social science theory and practical application, from his own formal background in the former. He was raised in Kerala, and is currently a member of the Board of the Indian History and Archaeology Research organization. His experience uniquely integrates the ancient traditions of southern India with the modern needs for sustainable rural development.

3.28 Rural Enterprise and Artificial Intelligence

Krishnan Narayanan, President itihaasa Research and Digital

Krishnan Narayanan is an alumnus of IIT Madras and Co-Chair of Sangam 2019, the flagship event of the IIT Madras Alumni Association. Over two decades, and primarily at Infosys, he has advised Global 1000 CXOs on digital transformation. He co-founded itihaasa (www.itihaasa.com) where he has chronicled the sixty years of history of Indian IT and studies the evolution of technology domains like AI and Brain sciences in India.

Here he considers the potential of IT, AI and Big Data. They pose large opportunities in distributed telecommuting employment for rural residents. Conversely, there are numerous opportunities to revolutionize agriculture, cottage industry, telemedicine, services and infrastructure using AI/ Big Data applications specifically tailored to Indian needs, as the predecessors of a generation of advanced products and services developed and tested from India.

3.29 India's creative dream fulfilled

Dr. Amitabh Sharma, STEM USA Paradox perennial: Over the past few decades, successive Presidents, Prime Ministers, Education Ministers, lawmakers,

educators, policy creators and enthusiasts across the world have endorsed STEM (Science, Technology, Engineering and Mathematics) education for creative uplift. Yet the gains have been far from satisfactory primarily due to the fact that the efforts to propagate STEM have been devoid of structure, context and true-to-life challenge experience. Hasten to add that the impetus on rural empowerment is all but missing. Sporadic efforts or simply resorting to toolkits-oriented experiments or even robotic gizmos et al have failed to create an effective STEM based educative environment. STEM Academy of USA is dedicated to filling this void and catapulting the STEM endeavor to its successful pinnacle through structured, contextual, challenge based, solution-oriented experiential learning.

Paradigm shift: STEM Academy of USA, a Georgia based premier organization has changed the learning paradigm in schools across the globe, especially India. We are committed to diligence, integrity and excellence. We offer a unique structured hands-on STEM (inter-disciplinary learning of Science and Math interspersed with application-oriented Engineering and Technology) curriculum for grades 1 thru 10 aligned with syllabi. Children experience immersive peer-to-peer collaborative learning while delving into real-life challenges, issues or problems and finding solutions thereof. This has proven to bolster critical out-of-the-box thinking triggering creativity. Our focus on rural empowerment emanates from firm belief that talent resides in youngsters across the geographical and economic spectrum. India's upsurge in research and innovation will accrue from villages where budding youngsters thrive in an environment of creative exploration. By virtue of our painstakingly crafted STEM modules we endeavor to augment the innovation index. Our mission is to transform conventional classrooms into Innovation labs through inquiry. We embody the vision of hand-holding the elementary, middle and high school child through a process of conceptual comprehension and mastery aided by authentic, applicable, and actionable student-centered and project-based learning challenges.

Tailored offerings: *STEM curriculum for grades 1 thru 10, regular updates and constant monitoring support. *Commensurate toolkits, teachers' manuals, student workbooks, Pre-post assessments (objective impact measurement learning outcomes): soon with virtual reality, video enhancements *Special STEM camps and STEM Olympiads *Comprehensive teacher training, certification center of Excellence *STEM program consultancy (customization).

3.30 Bridging Implementation and Capability

Dr. Nivedita Haran

Dr. Nivedita Haran retired after a career with the IAS, and now serves as a Senior Fellow at the Special Center for Disaster Response at the Jawarharlal Nehru University in New Delhi. She will speak on the need and opportunity to bridge the gap between research and implementation.

1. Coordination and good interaction forms the basis for good governance.
2. But in actual fact one finds a number of existing gaps in thought processes, actions and priorities; some of the widest gaps are: between academicians and administrators; between social and natural scientists; between researchers and technologists.
3. These gaps lead to deep chasms between thought processes that nullify the results on the ground.
4. Take for example the research being done on protection of public lands and the need to use modern technology to do the same. Why are digitised cadastral maps still a dream in India and what is done is more to spend budgetary funds and not to provide relief to the people? The policy makers struggle to find the right solution, fighting their way through a maze of hardware-selling corporates, cagey software designers and omnipresent land mafia with close political and bureaucratic links.
5. Or take the case of 'the bridge schools' meant to provide basic literacy to the school dropouts while providing them skill training. The schools have been hijacked by the local bigwigs for providing quality education to their children.
6. And then there is the example of cleaning up of our water bodies: the commercial houseboats and hotels release the night soil and pollutants into the Dal Lake with impunity in violation of all statutes and demand financial 'assistance' for not doing so.
7. Academicians rue the fact that no administrator even cares to read and get acquainted with the research dissertations, leave alone implement any of their suggestions. Administrators on their part struggle to find solutions to day-to-day issues and major administrative conundrums and draft major policy papers without having the benefit of the research base. Academicians and researchers struggle to find topics for research that would be relevant to society; while administrators find most research repetitive and often irrelevant. What a loss

it is for the entire community that the two never meet.

3.30.1 Solution Approach

1. If we are to take our country forward with better HDI and reduced inequality we need to bridge these gaps. We need to:
2. Bring together administrators and research scholars to generate a core group of experts with robust academic base and practical field-experience;
3. Set up a network of such experts to enable them to learn from each other and to supplement each other's knowledge and experience base;
4. Bring out occasional papers based on joint contribution and circulate these widely;
5. Hold workshops every year of select groups of scholars and administrators to expose them to innovative ideas in public service and to enable them to come up with innovative ideas on their own;
6. Develop this ever-enlarging group into a thinking and thought-provoking body led by a team of experts that would find novel ways to bring about interaction and cross-learning between administrators and academicians.

3.31 Role of Technology and Innovation in Rural Healthcare in India

Dr. Saurabh Khakharia

(Electronic presentation to be uploaded; Dr. Khakharia will not be able to attend in person)

Dr. Saurabh Khakharia is a specialist in Adult Reconstruction, Joint Replacement, Arthroscopy, Sports Medicine, Limb lengthening and Deformity Correction, practising in Atlanta, USA. Educated in India and the USA, he brings strong impetus to find ways of delivering top-notch medical care to all parts of India. In this effort he has researched the realities of rural India and the opportunities to bring access through telemedicine.

Life in villages is harder; citizens in villages are struggling for basic amenities like healthy food, clothes, sanitization, pure drinking water, toilets, basic education, electricity, transportation, medical facilities etc. The National Rural Health Mission

Report shows that the majority of deaths occur due to preventable diseases such as diarrhea, measles and typhoid. The report estimated that 66% of rural Indians do not have access to critical medicines, and 31% of the population has to travel more than 30 kilometers to seek healthcare in rural India. Rural Health centers are critically short of trained health and medical personnel, 8% of the primary health care centers do not have doctors, 39% do not have lab technicians, 18% do not have a pharmacist. On the other hand, the opportunities are huge. The Indian BoP healthcare market is estimated at around US \$27 at Purchasing Power Parity, which is around 4 times to 6 times that amount at today's conversion rates. Each rural sub-center and primary health center is expected to serve 6000 and 36,000 people per year respectively. Nearly 1.75 million beds will be needed to reach 2 beds per 1000 people, and 700,000 doctors to reach the goal of 1 doctor per 1000 people. These needs a capital investment of around \$80 billion. Currently the rural population spends 8 percent of its total expenditures on healthcare on average. Given that most have no access, or use very little, this means that those who must use significant healthcare assistance, are faced with unaffordable costs.

Dr. Khakharia surveys challenges and examples of solution paths through telemedicine, adopted in India. He uses several examples of telemedicine models, starting with the initial Apollo models, to more recent models such as Ex-GamVani, E-Point Health Services and Piramal E-Swasthaya. He concludes that Telemedicine has emerged as a sustainable business to cater to the needs of rural people. While it is extremely helpful in primary and secondary healthcare, it needs advancements to replicate the model for tertiary healthcare in rural areas. ICT has significantly reduced infrastructure and operating costs of healthcare delivery to rural areas. Telemedicine has been used as a market development tool by companies, creating a new market to get an expert doctor without meeting him in person. The emerging business models look promising but these are early days. Treatment of poor people at a cheap and affordable price is a huge social capital created by these business models. Some recommendations include increased public-private partnerships to improve the efficiency and viability of hospitals, along with government support to sustain reach to all areas and people.

3.32 Space Technology For The Nation

R. V. Perumal, Indian Space Research Organisation

Sri R.V. Perumal directed flight integration and launch operations of the first three

Polar Satellite Launch Vehicle (PSLV) flights. From 1996 to 2001, he was Project Director of the Geo-Synchronous Launch Vehicle Programme (GSLV). From May 2001 he has been the Associate Director (Projects), Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram. He was awarded the Padma Bhushan Award for Excellence in Science and Technology by Government of India in 2002.

Dr. Abdul Kalam started his career as an aerospace engineer at the Indian Space Research Organization. Today ISRO has sent successful missions to map the Moon (Chandrayaan1 and now Chandrayaan2), and to Mars (Mangalyaan). However, ISRO's primary effort is in the area of Remote Sensing, where India developed an early capability that has benefited many nations. Within the last 20 years, India has developed the capability to predict cyclonic storms accurately enough to allow accurately focused evacuation of large numbers of people. Monsoon prediction and crop prediction is assisted by spacecraft. News, entertainment and Internet/information delivery from Space brings the world to all corners of India. With President Abdul Kalam's impetus, ISRO has been working hard to bring top-notch educational resources to everyone in India. ISRO expects to lead technology delivery as India progresses.

3.33 Working Group 4: Bridging Implementation And Capabilities

Panel: Nivedita Haran, Amitabh Sharma, SrijanPal Singh, Sarath Menon, D. Rajkumar, S. Ramachandran , ,

This Panel starts with a report from Working Group 4 of the same name. India's development shows massive problems and massive achievements, the latter barely able to keep pace with the former. Modern technology, as well as determined leadership and implementation, can provide the breakthrough, and implement many solutions that have won consensus agreement. The Group brings experienced administrators together with NGO representatives and researchers in technology, finance and social sciences, to seek out solution paths.

Questions for WG4

1. Improving Justice, Healthcare and Governance through AI
2. Ending the Flood-Drought Curse; River interlinking and micro-water grid.
3. Urgency of seed/ demo projects.

4. Quality of Implementation

3.34 Poster Session

A Poster Session will feature presentations from various participants including students and active researchers.

3.35 WG5 Panel: Global Alliance for Wellness and Healthcare

Panel: Shine Mohan Talapully, Deepa M.R., Shivshankar Sastry, Khakharia, Mary Suresh

Educated in Bengaluru and Kerala, Dr. Shine Mohan Talapully is an Ayurvedic practitioner and well-known instructor whose current practice is in Kerala. Dr. Deepa M.R. is a doctor of Ayurvedic Medicine, who practises in suburban Thrissur, Kerala, and operates a clinic under the SNA Oushadhashala, along with a special Thyroid Clinic. Trained in the UK in the 1970s, Dr. Shivshankar Sastry is a cardiac surgeon and historian in Bengaluru, knowledgeable at the interface of 'modern' diagnostic and surgical medicine. Dr. Khakharia is a cardiologist in Atlanta, USA, interested in integrating telemedicine into rural healthcare in India. Smt. Mary Suresh operates a unique model of daycare centers in the Houston area, and is a member of the Indian History and Archaeology Research group.

Today the healthcare system is at once the leader of miracles, and a horror of bureaucratic excess. In rural India, the lack of access to medical care, and the inability to pay medical costs are described as the leading causes of sorrow, ruin and suicides. In principle, India has a massive public health system that offers free healthcare - if one can access it, and if it works. In reality, a large percentage of public health centers in rural areas have no or few qualified staff. In the USA, privatized healthcare offers access to the best of technological medicine and surgery but at ruinous cost. The health insurance system is similarly mired in controversy, except for a rate of cost growth that far outpaces inflation. In the United Kingdom and other nations with so-called government medicine, long waiting times for care are reality.

The stresses and comforts of urban life, particularly for those in knowledge professions

requiring sitting down and looking at screens for many hours a day, have brought chronic diseases in epidemic proportions. Hypertension, diabetes, eye disease and lung disease are growing rapidly.

India on the other hand offers the potential for a breakthrough. India's native Ayurvedic traditions are being revived with excellent education and scholarship. Modern Ayurvedic doctors have good training in the western brand of medicine. Although they are not certified to practice western medicine, they are empowered to diagnose and decide to refer to the Allopathic specialists where required. At the same time, their costs are low enough to enable them to be the accessible first point of contact for rural and urban residents. Their treatments are usually far more affordable, and gradual, than western remedies.

Holistic wellness care concepts developed in India are growing in scientific understanding. Vegetarian and vegan diets are now seen in increasing numbers of "anecdotal examples" to rapidly decrease diabetes and hypertension, with none of the side effects of allopathic drugs. The ancient Ayurvedic practice of Yoga is increasingly accepted worldwide, to an extent where Indians became extremely concerned about "cultural appropriation" and the government established the International Day of Yoga.

India has several brilliant examples where top-notch medical care is delivered at very low cost to large numbers of people. The Aravind Eye Care hospitals that deliver cataract operations to large numbers of people at very low or zero cost and the Narayana Hridayalaya Cardiac hospitals, are two examples where carefully constructed business plans work with dedicated medical care.

Telemedicine offers tremendous potential in India, obviously, where the frontline medical nursing professionals, the Ayurvedic physicians, the Allopathic doctors in the government hospitals, and the specialists worldwide can be brought into a dynamic alliance to bring top-quality access to wellness and healthcare for all.

Working Group 5 draws contributions from several other practitioner and end-user sources as well as the published literature. Wellness knowledge and healthcare issues are huge issues for rural India, even much more than for urban India. The examples of other nations shows that mere development of advanced medical science is not a solution to this problem. However, India is well-positioned with both the technology and the native traditions to integrate a holistic wellness and healthcare revolution.

The summary questions before the Panel are:

1. Current education and practice of Ayurveda: Ayurveda as first point of contact for healthcare.

3.35. *WG5 PANEL: GLOBAL ALLIANCE FOR WELLNESS AND HEALTHCARE*33

2. Telemedicine
3. Healthcare Economics