REACHING THE UNREACHED:

The challenge of making Nuclear Technologies Acceptable, Accessible and Affordable

V.S.Ramamurthy
Chairman
Standing Advisory Group on Nuclear Applications
International Atomic Energy Agency
1400 Vienna
AUSTRIA
&
DAE Homi Bhabha Chair Professor
Inter-University Accelerator Centre
New Delhi 110067
INDIA

NUCLEAR TECHNOLOGIES FOR DEVELOPMENT

- **It is more than five decades since the first demonstration of the power of the atom and the production of commercial electricity from nuclear energy**
- **The decades have also seen the development of several nuclear technologies in non-power applications such as in medical diagnosis, therapy, agriculture, industry, water resource management etc.**
- **The emergence of these technologies as friendly neighborhood choices has been slow and often irregular**
- **The three A's of friendly neighborhood technologies-Acceptability, Accessibility and Affordability**

ACCEPTABILITY

- **Public acceptance of nuclear technologies for development is at best moderate**
- **General fear psychosis in public mind following the early explosions and the demonization of anything nuclear- recall the rechristening of Nuclear Magnetic Resonance Imaging (NMRI) as simply Magnetic Resonance Imaging (MRI)**
- **After several decades of successful demonstration of the beneficial use of irradiation of food and agricultural products , there still exist skeptics and the public acceptance is not uniform across countries**
- **Slowing down of the nuclear energy programs following concerns on health hazards of ionizing radiations, problems associated with disposal of long-lived radioactive wastes, possibility of major reactor accidents etc.**
- **Compare and contrast cell phone penetration in spite of occasional concerns on the health hazards associated with the electromagnetic fields**

ACCESSIBILITY

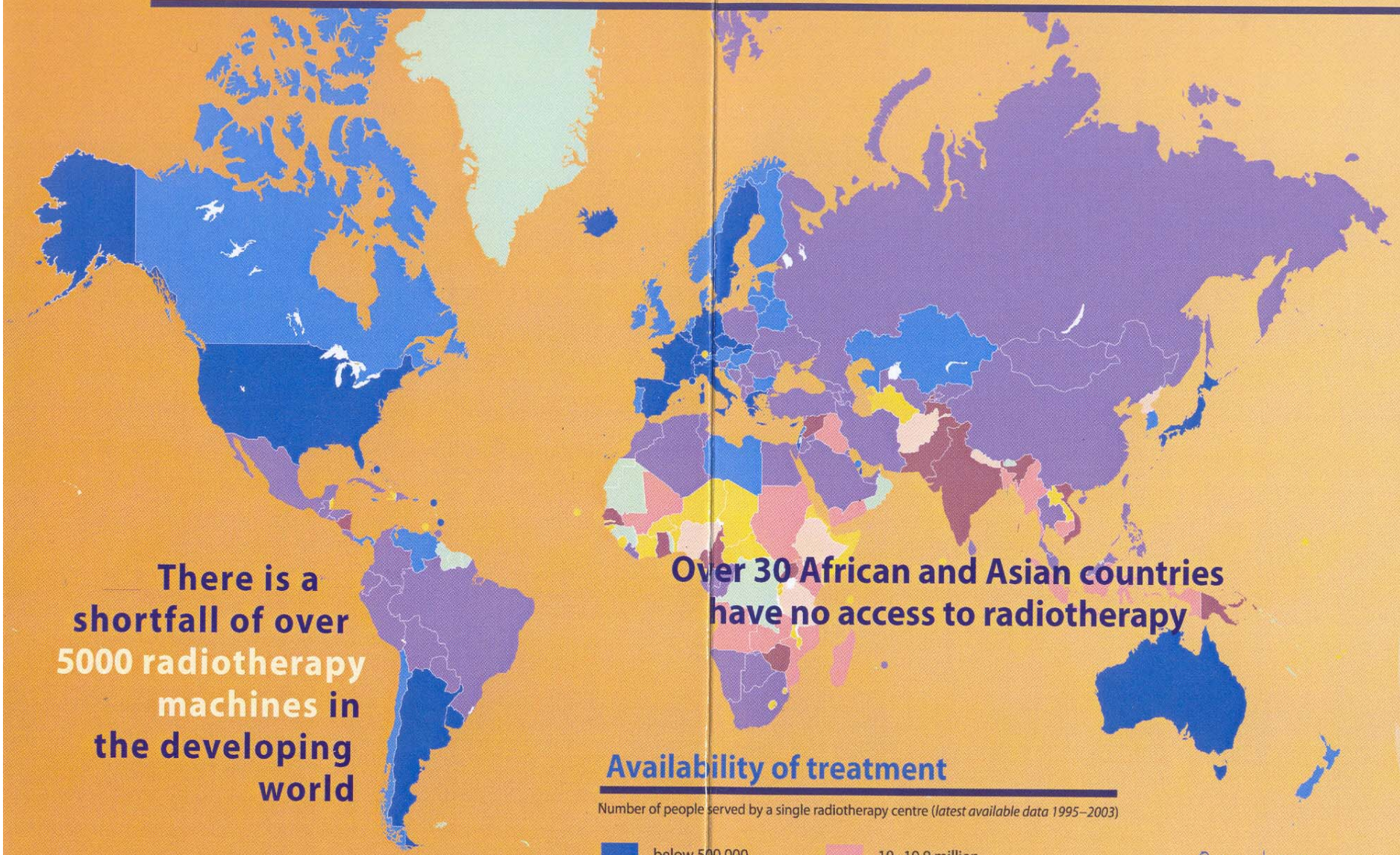
- **High capital costs of nuclear equipments**
- **Lack of trained human resource leads to higher maintenance costs and poorer utilization of the equipments**
- **International restrictions on transfer of nuclear knowledge and materials due to concerns on nuclear proliferation and terrorism further restrict accessibility**

AFFORDABILITY

- **Poorer accessibility leads to poorer affordability**
- **No cost adjustments to local purchasing powers**

NET RESULT?

ACCESS TO RADIOTHERAPY: Radiotherapy is an essential part of the treatment of cancer



There is a shortfall of over 5000 radiotherapy machines in the developing world

Over 30 African and Asian countries have no access to radiotherapy

Availability of treatment

Number of people served by a single radiotherapy centre (*latest available data 1995–2003*)

- below 500 000
- 500 000–999 999
- 1–4.9 million
- 5–9.9 million
- 10–19.9 million
- 20 million and above
- no centre
- no data

IAEA | Programme of Action for Cancer Therapy PACT

IAEA'S MANDATE TOWARDS NUCLEAR TECHNOLOGIES FOR DEVELOPMENT

- **Article III of the IAEA Statute authorizes the IAEA to encourage and assist research on, and development and practical application of, atomic energy for peaceful purposes throughout the world and to foster the exchange of scientific and technical information, as well as the exchange of scientists in the field of peaceful uses of atomic energy**

TOWARDS BETTER ACCEPTABILITY OF NUCLEAR TECHNOLOGIES FOR DEVELOPMENT

- **Increase public awareness through extensive and imaginative outreach programs**
- **catch them young**
- **Share success stories**
- **Innovative models to reach out in local languages**
- **Expectations from the Agency’s communication cell are indeed large**

TOWARDS BETTER ACCESSIBILITY OF NUCLEAR TECHNOLOGIES FOR DEVELOPMENT

- **Reasons for poor accessibility: high capital costs of equipments, poor infrastructure to support the facilities, poor technical expertise to maintain and use the facilities**
- **The unique role of the Agency to develop scientific and technical competencies in the Member States**
- **The Co-ordinated Research Programs (CRP's) and the Technical Co-operation (TC) programs are the vehicles through which this mandate of the Agency is currently being implemented**
- **Do not underestimate the importance of human resource development and capacity building through CRP's**
- **Do not underestimate the importance of Technical co-operation Programs**

Human Resource Development and capacity building

- **Recall Bhabha's letter to the Tata Trust in 1944- "when nuclear energy has been successfully applied for power production, in say a couple of decades from now, India will not have to look abroad for its experts but will find them ready at home"-full one year before the world came to know the power of the atom, full three years before India became free from colonial rule, full ten years before the production of commercial electricity from nuclear energy.**
- **Nuclear Science and Technology education is important for both states with nuclear power programs/ambitions and states with no nuclear power ambitions**

Is Nuclear Education in the 21st century different from what it was in the 20th century?

- **Yes**
- **Nuclear Science is mature and therefore lacks glamour and fails to attract promising young students**
- **Nuclear Technology is mature and therefore resists disruptive changes**
- **Nuclear workforce is aging and therefore calls for innovative knowledge management strategies**
- **The education pipeline is seriously disrupted due to confusing public perceptions of safety and security issues associated with the industry.**

CHALLENGE OF NUCLEAR EDUCATION

- **Need for good teachers across the globe**
- **First generation teachers can come from international partnerships**
- **Teaching material is scarce, text books are expensive**
- **Nuclear Laboratories are capital intensive and therefore expensive**
- **Strong regulatory environment**
- **Indian experience in bringing text books and laboratory equipments at affordable costs**
- **Emerging role of the Agency in Nuclear Science and Technology Education and Knowledge Management**

TECHNICAL COOPERATION

- **Technical Cooperation between unequal partners is often seen as a philanthropic activity, some kind of social responsibility of the have's towards the have-not's**
- **NOT ALWAYS**
- **Technical cooperation can be an effective technology demonstrator in new environments**

ILLUSTRATIVE EXAMPLE-SATELLITE INSTRUCTIONAL TELEVISION EXPERIMENT(SITE)-1975

- An Indo-US initiative in Technical co-operation
- NASA Applications Technology Satellite F (ATS F) relocated over India for the experiment
- Technology Demonstrator for carrying education and information to Rural India using Satellites
- Enabled Policy Options for India long before India entered the Satellite Era

NEW MODELS OF TECHNICAL CO-OPERATION

- **The IAEA/PACT: a unique model in public-private partnership**
- **Full technical support from the Agency**
- **Financial contributions of the Agency to be only catalytic**
- **Any other examples or models?**

TOWARDS BETTER AFFORDABILITY OF NUCLEAR TECHNOLOGIES FOR DEVELOPMENT

- **Reduction of capital costs through indigenous manufacture and maintenance**
- **The make/buy jugalbandhi (Duet) for better cost/benefits**
- **Recall the Indian developments of tele-therapy machine (Bhabhatron), the brachi-therapy machine, linear accelerator for cancer therapy etc.**

IN SUMMARY-WHERE DO WE GO?

- **The coming decades clearly see an expanding role for nuclear technologies in improving the quality of life of every human being across the globe**
- **The Agency has a unique role in our realizing the full potential of nuclear technologies but has to go beyond its model of functioning today**
- **Development and safety/security are two sides of the same coin**

- **Resource constraints are “real”. There is no free lunch. The Agency will need additional and assured resources in fulfilling its mandate and therefore will need the full support of the Member States (contribute liberally and demand aggressively)**
- **Our congratulations to the Commission of Eminent Persons for their report on the Future of the Agency emphasizing the new roles of the Agency in making nuclear technologies acceptable, accessible and affordable**