

India – Brazil – South Africa

A Few Commonalities in Challenges, Resources, Trends & Vision

- **Three large democracies with rich culture and history**
- **Rich in human and Natural Resources**
- **Fast Growing Economies**
- **Strong Friendship without Conflict of Interests**
- **Common Concerns in Health and Resource Management**
- **Issues in Catering to huge population with large scatter in economic and intellectual potentials**
- **Strong base in Science and Technology ; Poised for rapid industrial growth**

IBSA TRILATERAL CO-OPERATION

- **IBSA is a trilateral, developmental initiative between India, Brazil and South Africa to promote South-South Cooperation and exchange.**
- **In the aftermath of discussions between the Heads of State and/or Government of the IBSA countries at the G-8 meeting that took place in Evian in 2003, and the Foreign Ministers of the respective countries met in Brasilia on June 6, 2003. At this meeting between Ministers the launching of the IBSA Dialogue Forum was formalized through the adoption of the "Brasilia Declaration" .**

(www.ibsa.nic.in)

(www.ibsa-trilateral.org)



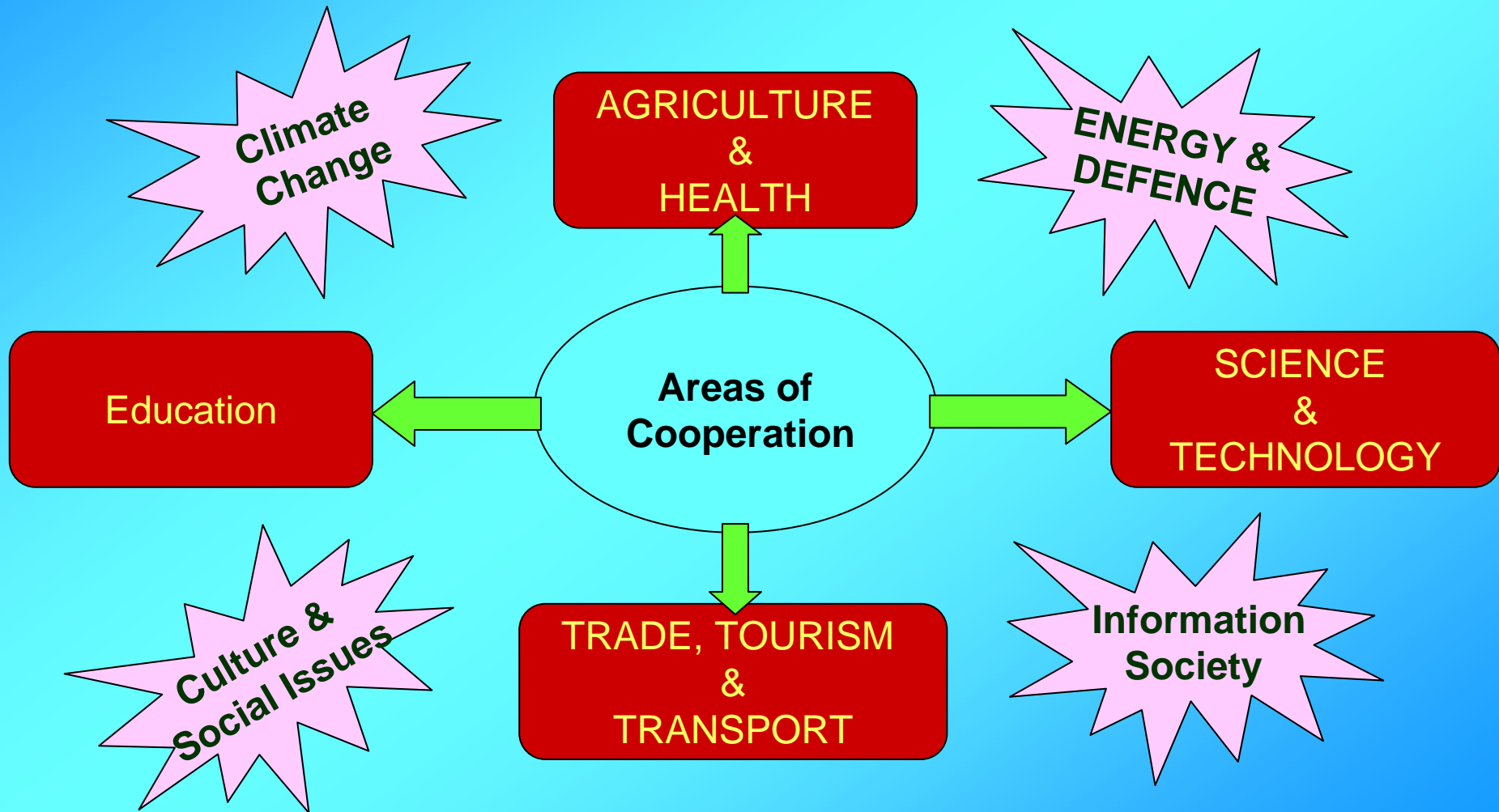
Objectives of IBSA Cooperation

The main objectives of the IBSA Dialogue Forum are:

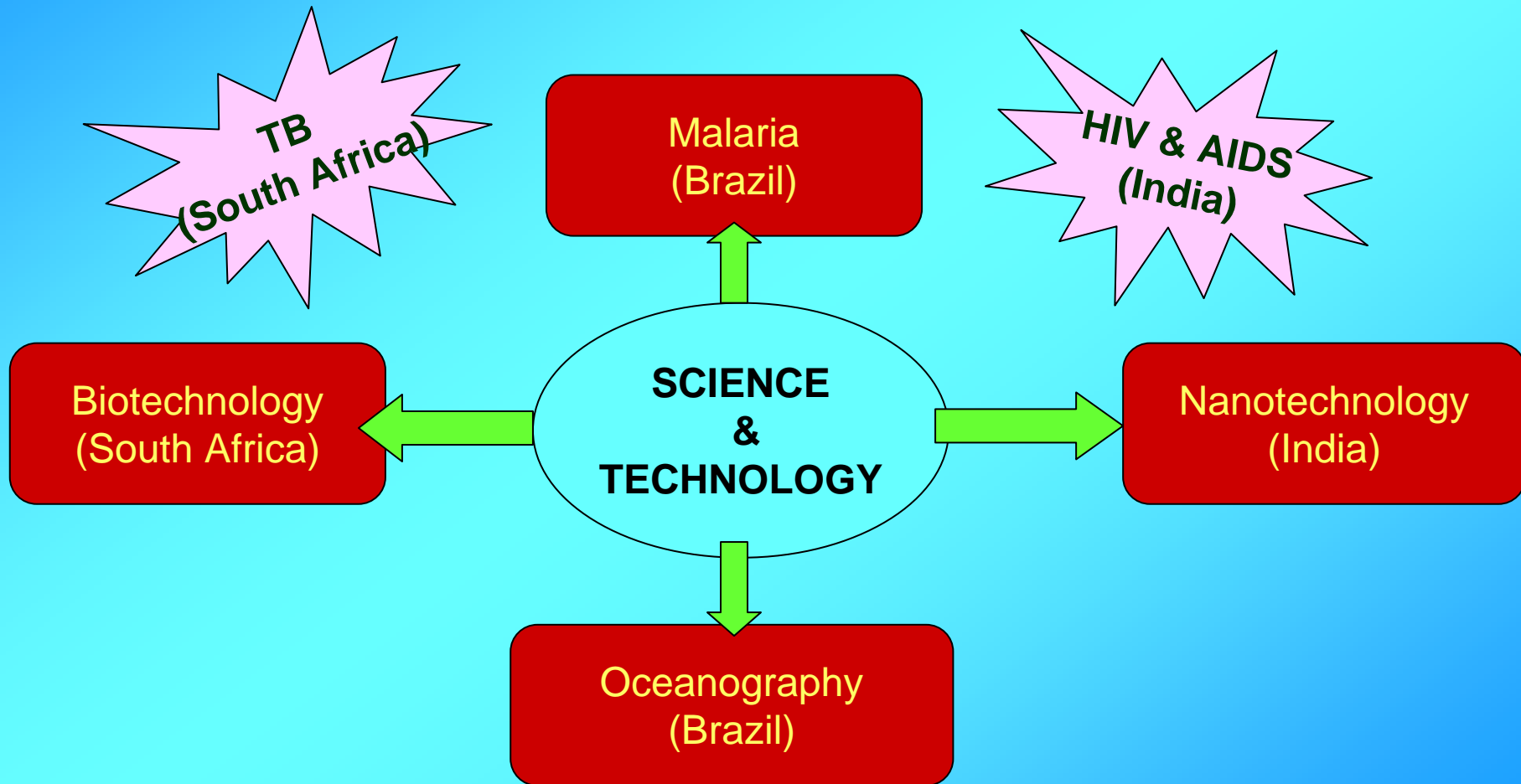
- ◆ **To promote South-South dialogue, cooperation and common positions on issues of international importance**
- ◆ **To promote trade and investment opportunities between the three regions of which they are part**
- ◆ **To promote international poverty alleviation and social development**
- ◆ **To promote the trilateral exchange of information, international best practices, technologies and skills, as well as to compliment each others competitive strengths into collective synergies**
- ◆ **To promote cooperation in a broad range of areas, namely agriculture, climate change, culture, defense, education, energy, health, information society, science and technology, social development, trade and investment, tourism and transport.**

The IBSA Dialogue Forum has regular consultations at Senior Official (Focal Point), Ministerial (Trilateral Joint Commission) and Heads of State and/or Government (Summit) levels, but also facilitates interaction amongst academics, business and other members of civil society.

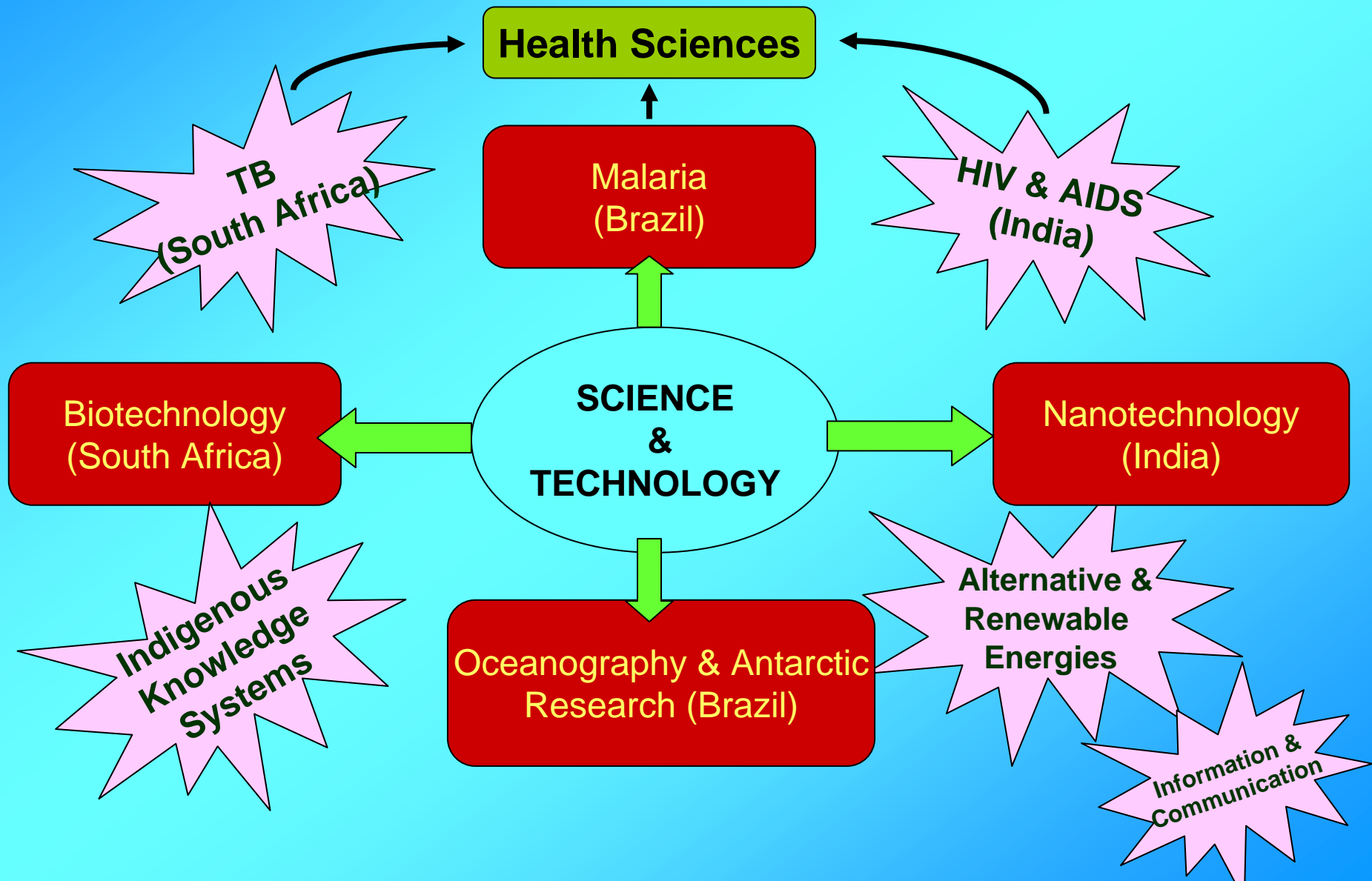
IBSA – Areas of Cooperation



IBSA – Science & Technology



IBSA – Science & Technology



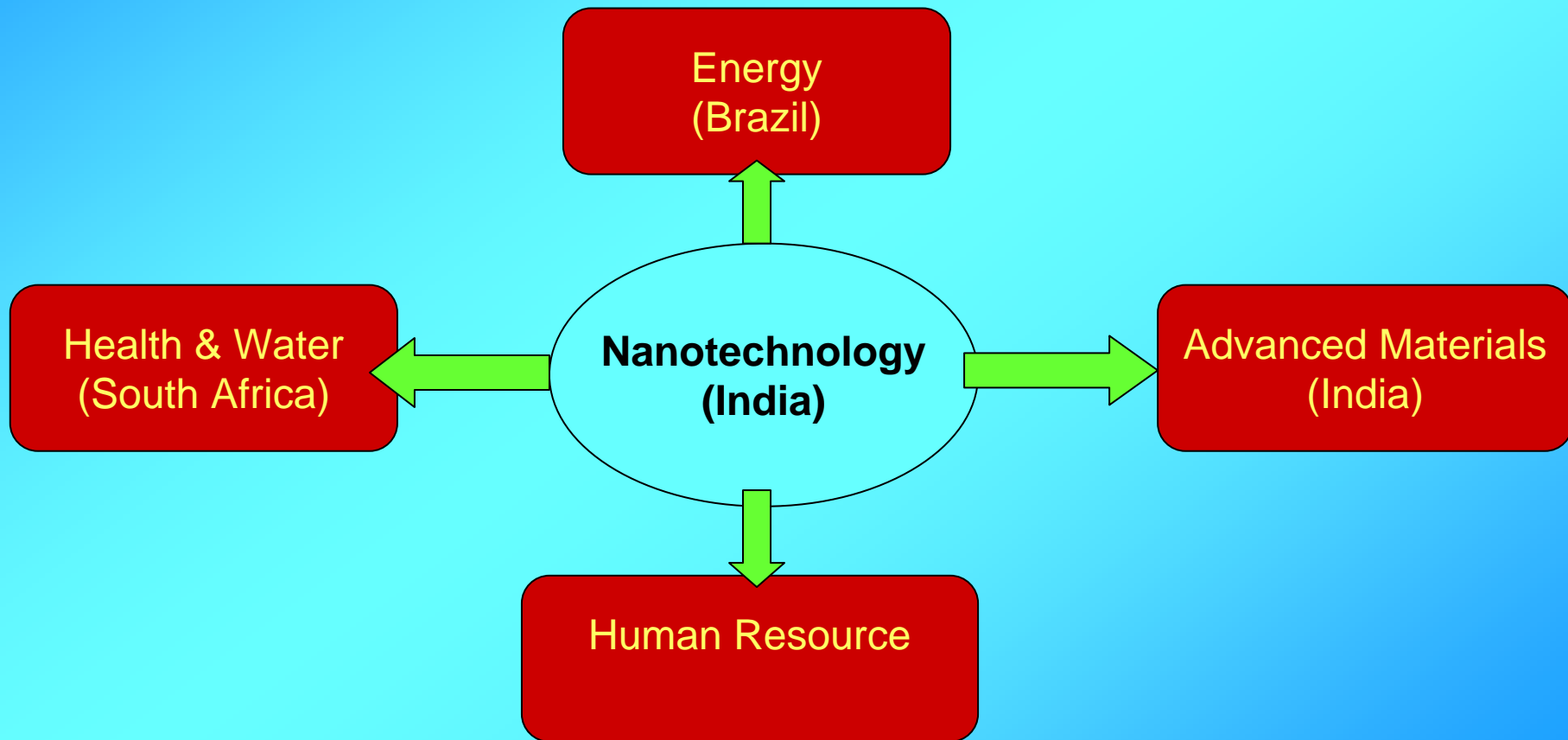
IBSA –Nanotechnology Initiative

1st visit

South Africa – Pretoria: 21st April 2005

- ◆ Indian delegation
- ◆ Dr. A. K. Tyagi (IGCAR, Kalpakkam)
- ◆ Prof. B.R. Mehta (IIT Delhi)
- ◆ Dr. Murali Sastry (NCL, Pune)
- ◆ The following areas were identified for collaboration:
 - Advanced Materials
 - Energy Systems
 - Health and Water
- ◆ Subject Area coordinators were also identified

IBSA – Nanotechnology Initiative



Action Plan

- It was decided to have three exchange visits, one in each country of one week duration, so that scientific delegations from two countries will visit important institutes / laboratories / nano centers to establish contact points among the scientists of three countries, identify available expertise and infrastructural capabilities in various scientific institutes of three countries, investigate areas of mutual interest and define the projects for scientific and technological cooperation.
- Awareness generation
- Familiarization with facilities
- Identify collaborating partners
- Brazil– 2006, India– 2007, South Africa - 2008

IBSA – Nanotechnology Initiative

2nd visit

Brazil: 6 - 10th November 2006

◆ **Indian delegation**

- **Prof. S.Ranganathan, IISc Bangalore**
- **Dr.A.K.Tyagi, IGCAR Kalpakkam**
- **Prof. B.R.Mehta. IIT Delhi**
- **Dr.P.K.Gupta, RRCAT Indore**
- **Prof. Indranil Manna, IIT Kharagpur**
- **Dr.V.K.Suri, BARC, Mumbai.**

◆ **Seven member delegation from South Africa**

◆ **Prof. J.A.Brum and others from Brazil**

◆ **Visits to labs / industries in Brazil**

◆ **IBSA – Nanotechnology working group meeting**

Brazil Visit : 6 – 10 Nov.2006

6 Member Indian Delegation and 7 member South African Delegation visited following labs / institutes / industries in Brazil

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- **Federal University of Rio Grande do Sul (UFRGS), Porto Alegre**
- **Brazilian Centre for Research in Physics (CBPF), Rio de Janeiro**
- **University of Rio, Rio de Janeiro.**
- **Petrobrass, Rio de Janeiro.**
- **The National Institute of Metrology, Standardization and Industrial Quality (INMETRO), Rio de Janeiro.**
- **Embrapa Agricultural Instrumentation, Sao Carlos.**
- **Federal University of Sao Carlos, Sao Carlos.**
- **State University of Campinas (UNICAMP). Campinas.**
- **Brazilian Synchrotron Light Laboratory (LNLS) Campinas**

**IBSA – Nanotechnology working group meeting @
LNLS Campinas 10th June, 2006**

IBSA –Nanotechnology Initiative

3rd visit

India: 2 - 6th April 2007

South Africa delegation	Brazil delagation
Dr Thembela Hillie (Co-ordinator) National Center for Nanosturctured Materials CSIR, Pretoria, South Africa	Prof. Dr. José Antônio Brum (Co-ordinator) Laboratório Nacional de Luz Síncrotron - LNLS Campinas, SP
Prof NEIL JOHN COVILLE University of Witwatersrand Johannesburg, South Africa	Prof. Ivo Alexandre Hummelgen Universidade Federal do Paraná - Upr Paraná, PR
Dr Rudzani Nematudi iThemba LABS, MRG , Somerset West, South Africa	Prof. Dr. Sílvia Guterres Universidade Federal do Rio Grande do Sul- UFRGS Porto Alegre, RS
Dr . Mbhuti Hlophe North West University, Mmabatho, South Africa	Prof. Dr. Martin Schmal COPPE Universidade Federal do Rio de Janeiro - UFRJ Rio de Janeiro, RJ
Mr Joseph J Molapisi Manager: Emerging Research Areas Department of Science and Technology, Pretoria, South Africa	Prof. Alberto Passos Guimarães Filho Centro Brasileiro de Pesquisas Físicas - CBPF Rio de Janeiro, RJ
Dr. Hulda Shaidi Swai Manufacturing and Materials Technology, CSIR, Pretoria, South Africa	Dr. Paulo Sérgio de Paula Herrmann Empresa Brasileira de Pesquisa Agropecuária - EMBRAPA São Carlos, São Paulo

India Visit : 2 – 6 April.2007

6 Member Brazil Delegation and 6 member South African Delegation visited following labs / institutes / industries in India

- P** ➤ Indian Institute of Technology (IIT), Delhi.
- L** ➤ Inter University Accelerator Centre (IUAC), Delhi
- A** ➤ Bhabha Atomic Research Centre (BARC), Mumbai
- C** ➤ Tata Institute of fundamental Research (TIFR) Mumbai
- E** ➤ Indian Institute of Science (IISc), Bangalore
- S** ➤ Indira Gandhi Centre for Atomic Research (IGCAR),
Kalpakkam

**IBSA – Nanotechnology working group meeting @
IGCAR, Kalpakkam 6th April, 2007**

India Visit : 2 – 6 April.2007

- **New Delhi :** *IIT Delhi , IUAC Delhi, IIT Roorkee, IIT Kanpur, IIT Kharagpur, JNU Delhi and NPL Delhi.*
- **Mumbai :** *BARC Mumbai, TIFR Mumbai, IIT Mumbai, RRCAT, Indore.*
- **Bangalore:** *IISc , JNCASR, NCBS, NIAS*
- **Kalpakkam:** *IGCAR Kalpakkam, IIT Madras, IIT Kharagpur, Madras University, Anna University, IMSC, Sathyabama University, UGC-DAE –CSR Indore, SNIP Kolkatta, PSG Coimbatore, VIT Vellore, PGIMER Chandigarh, ARCI Hyderabad.*

It was ensured that experts in nanotechnology from all parts of India participate in the discussions in at least one of the above mentioned destinations, to present and evolve their ideas for collaborative projects under this initiative.

It was emphasized that one of the major focus of the IBSA programme should be towards nurturing young talents and motivating them to pursue research and their profession in nanoscience and technology.

IBSA –Nanotechnology Initiative

4th visit

South Africa :19– 23 Nov, 2007

◆ **Indian delegation**

- ◆ Prof. S.Ranganathan, IISc., Bangalore
- ◆ Dr. A.K.Tyagi, IGCAR, Kalpakkam
- ◆ Prof. B.R. Mehta, IIT Delhi
- ◆ Dr. P.K. Gupta, RRCAT, Indore
- ◆ Prof I. Manna, IIT Kharagpur
- ◆ Dr. V.K. Suri, BARC, Mumbai
- ◆ Prof. G.K. Khuller, PGOMER, Chandigarh
- ◆ Dr. Pushan Ayyub, TIFR, Mumbai
- ◆ Prof. S.N.Sahu, Institute of Physics, Bhubaneswar
- ◆ Dr. P.K.Tewari, BARC, Mumbai
- ◆ Prof. V. Ramgopal Rao, IIT Mumbai
- ◆ Dr P.Shankar, IGCAR, Kalpakkam

◆ **Six member delegation from Brazil**

- ◆ **IBSA – Nanotechnology working group meeting**

South Africa Visit : 19 – 23 April 2007

12 member Indian Delegation and 6 Member Brazil Delegation visited following labs / institutes / industries in South Africa

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- iThemba Lab, Cape Town.
- Nano Innovation Centre at CSIR, Pretoria
- Nano Innovation Centre at Mintek, Pretoria.
- Nuclear Energy Centre - NECSA

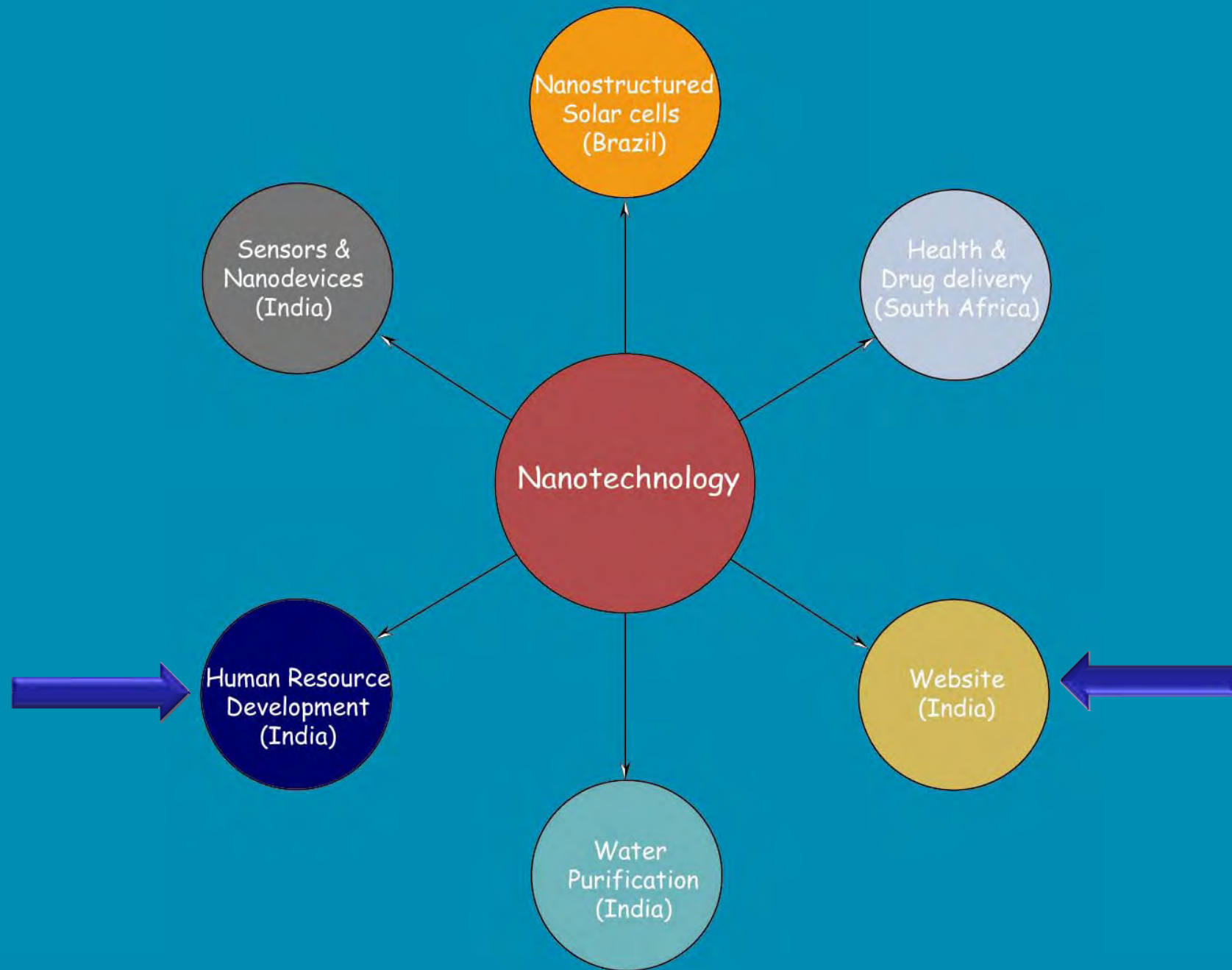
Inaugural of African Regional College on Science at Nanoscale @ iThemba Labs, Cape Town 19th April, 2007

IBSA – Nanotechnology workshop @ Pretoria Conference venue 20 – 22nd April, 2007

IBSA – Nanotechnology working group meeting @ Pretoria Conference venue 23rd April, 2007

IBSA – Nanotechnology working group meeting @ Pretoria 23rd April, 2007

- Proposals for flagship collaborative projects were presented by scientists of India, Brazil and South Africa
- Development of Sensors and nano-devices, Photovoltaics, Nano-drug delivery and water treatment were identified as areas of mutual interest for collaboration
- It was decided to start with only one flagship project in each identified area.
- Education and Human resource development were also identified as key areas for this collaboration
- It was agreed that a vibrant IBSA nanotechnology initiative website be hosted from India, with support from Brazil and South Africa
- Accordingly coordinators for Human resource development and website were identified



Technical Coordination

SUBJECT	INDIA	BRAZIL	SOUTH AFRICA
National Coordinator	Dr. Baldev Raj dir@igcar.gov.in	Prof. J.A. Brum brum@lnls.br	Dr. T. Hillie thillie@csir.co.za
Health and water	Dr. P.K.Gupta pkgupta@rrcat.gov.in	Prof. Silvia Guterres nanoc@farmacia.ufrgs.br	Dr. Ndumiso Cingo cingon@unisa.ac.za
Energy	Prof. B.R.Mehta brmehta@iitd.ac.in	Prof. Ivo A. Hummelgen iah@fisica.ufpr.br	Dr. Kenny Mathe KMathe@csir.co.za
Advanced materials	Dr.A.K. Tyagi akt@igcar.gov.in	Prof. Elson Longo liec@power.ufscar.br	Dr. Molefi Motuku molefim@mintek.co.za
Human Resource	Prof S.Ranganathan rangu2001@yahoo.com	Prof J.A. Brum brum@lnls.br	Prof Neil John Coville neil.coville@wits.ac.za
Web Site	Dr R.Ramaseshan seshan@igcar.gov.in	Dr Ana Flávia Nogueira anaflavia@iqm.unicamp.br	Dr. T. Hillie thillie@csir.co.za

IBSA –Nanotechnology Initiative

5th visit

South Africa : 11 - 13 June , 2008

Indian delegation

- ◆ Dr. Baldev Raj, IGCAR Kalpakkam
- ◆ Dr. Ashok Kumar Tyagi, IGCAR Kalpakkam
- ◆ Prof. Bodh Raj Mehta, IIT Delhi.
- ◆ Prof. Pushan Ayyub, TIFR Mumbai
- ◆ Dr. Shiv Kumar Gupta, BARC Mumbai
- ◆ Prof. Amlan J.Pal, IACS Kolkatta

◆ **Six member delegation from Brazil**

◆ **Nanotechnology workshop (11 – 12 June, 2008)**

◆ **IBSA – Nanotechnology working group meeting (13th)**

- ◆ Theme of the workshop was on Energy with a focus on Photovoltaics. The event was organized by Prof Neil Coville.

IBSA – Nanotechnology working group meeting @ Pilanesberg 13th June, 2008

- IBSA nanotechnology initiative – Proposal Presentation and discussion
- Finalization of IBSA Proposal
- Young researcher workshops
- Specialized workshops
- Thematic meetings
- IBSA calendar for next 1 year
- Plan for IBSA events for next 3 years
- Launching of website (www.nano-ibsa.com)

IBSA - Proposal

- Development of sensors and nano-devices
- Nanostructured organic– inorganic hybrid solar cells
- Nano-drug delivery system for antiretroviral and mycobacterium avium complex (MAC) drugs
- Water purification
- Human capacity development (including web-site)

Subject Area 1.0 Advanced Materials: Lead Country – India

Co-Ordinators

Dr. A. K. Tyagi
akt@igcar.gov.in

Dr. Monica Cotta
monica@ifi.unican.br

Dr. Molefi Motuku
molefim@mintex.co.za

Flagship Project 1.1: Development of Sensors and Nanodevices

PI

Dr. A. K. Tyagi
akt@igcar.gov.in

Dr. P. S. P. Herrmann
herrmann@cnpdia.enbrapa.br

Dr. Lucky M. Sikhwivhil
lsikhwivhilu@csir.co.za

Sensors based on Thin Films and Oxide Nanostructures

Co-PI

Prof. I. Manna

Prof. J. A. Brum

Dr. Sreejarani Pillai

Sensors based on Microcantilevers and Semiconductor Nanostructures

Co-PI

Prof. V. Ramgopal Rao

Prof. Monica Cotta

Dr. Rudzani Nemutudi

Subject Area 2.0 Energy : Lead Country – Brazil

Co-Ordinators	Prof. B.R.Mehta brmehta@physics.iitd.ernet.in	Prof.Ivo A.Hummelgen iah@fisica.ufpr.br	Dr. Mukulu Mathe kmathe@csir.co.za
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Flagship Project 2.1: Nanostructured Organic– Inorganic Hybrid Solar Cells

PI	Prof. B.R.Mehta brmehta@physics.iitd.ernet.in	Prof.Ivo A.Hummelgen iah@fisica.ufpr.br	Prof.Neil J. Coville neil.coville@wits.ac.za
Co-PI	Dr. P. Ayyub/ Prof.Amaln J.Pal	Prof.Ana F. Nogueira	Dr. Willem Van Otterlo

Subject Area 3.0: Health and Water: Lead Country – South Africa

Co-Ordinators	Dr. P. K. Gupta pkgupta@cat.ernet.in	Prof. S.S.Guterres nanoc@farmacia.ufrgs.br	Dr. N.Cingon cingon@tut.ac.za
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Flagship Project 3.1: Nanotechnology based drug delivery system (s) for antiretroviral and Mycobacterium avium complex (MAC) drugs : Lead Country – South Africa

PI	Dr.Sadhna Sharma Prof. G. K. Khuller gkkhuller@yahoo.co.in	Prof. S.S.Guterres nanoc@farmacia.ufrgs.br	Dr H. Swai hswai@csir.co.za

Flagship Project 3.2: Water Purification : Lead Country – India

PI	Dr. P.K. Tewari pktewari@barc.gov.in	Prof. Paulo Herrmann herrmann@cnpdia.	Dr B. Mamba bmamba@uj.ac.za
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Subject Area 4.0 Human Capacity Development: Lead Country – India

Co-Ordinators	Prof. S.Ranganathan rangu2001@yahoo.com	Prof. J.A.Brum brum@lnls.br	Prof.Neil J. Coville neil.coville@wits.ac.za
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Expected results

- The scientific knowledge will be shared among the three countries using several mechanisms such as joint-workshops, technical training, web-based tools
- The collaboration is expected to result in joint publications.
- The results may also have commercial values. The patents and any commercialization of product will be discussed under IBSA framework.
- Novel sensors for environment monitoring and agri instrumentation, solar cell devices with improved efficiency, nanodrug delivery system and water purification/treatment technologies are expected deliverables of this project.
- Another important contribution of collaboration will be Human Capacity development in the area of Nanotechnology.
- The cooperation would be of immense societal value dealing with core issues of materials, energy, health and safe drinking water.

IBSA –Nanotechnology Initiative : Other events

- ◆ **International Conference on Nanoscience and Nanotechnology (ICONSAT – 2008), Feb 27 – 29, 2008, Chennai, India.**
Participation of Scientists from
Brazil : Prof.Monica A Cotta,
South Africa: Prof.Neil J Coville and Dr. Suprakas Sinha Ray
- ◆ **International Conference on Nanostructured Materials (Nano – 2008), 4 - 6 June, Rio de Janeiro, Brazil**
- ◆ **Participation of scientists from India:**
Prof. S. Ranganathan, Prof.Pushan Ayyub
- ◆ **International Conference on Nanoscience and Nanotechnology (NanoAfrica – 2009), Feb 1 – 4, 2009, Pretoria, South Africa.**
- ◆ **Participation of scientists from**
India: Dr.A.K.Tyagi, Prof.B.S.Murty, Prof. Ramgopal Rao and
Dr.Vikram Kumar
Brazil: Prof.Monica A Cotta
- ◆ **IBSA nanotechnology initiative meeting Feb 5th 2009, Pretoria, DST, South Africa**

IBSA – Science and Technology: 13 – 14th Oct, 08

- ◆ IBSA Science and Technology working group meeting at DST Delhi on 13th October 2008
 - ◆ Dr.Baldev Raj and Dr.A.K. Tyagi for Nanotechnology Initiative, Other IBSA-S&T Co-ordinators from India, Dr.Rajeev Sharma and Dr.Y.P. Kumar from DST India and DST officials from Brazil and South Africa
 - ◆ Dr.Baldev Raj described activities of IBSA – Nanotechnology Initiative over past 3 years and presented the proposal for next 3 years discussion
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- ◆ Meeting with Science and Technology Ministers of India, Brazil and South Africa on 14th October, 2008 at Delhi
 - ◆ Dr.Baldev Raj made a presentation on IBSA- Nanotechnology Initiative
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- ◆ IBSA Nanotechnology Initiative proposal was **ACCEPTED**
 - ◆ To increase participation from current level of 75 to about 200
 - ◆ To float 15 IBSA fellowships
 - ◆ To constitute an IBSA Scientific Council

IBSA- Nanotechnology Initiative: Status

Calander for the year 2009-10

- ◆ Organization of 3 Nano Schools, of 1 week duration each
 - 13-19 Sept.2009 – Brazil – Energy systems: Photovoltaics
 - 23-27 Nov.2009 – South Africa–Health & Water: Nano drug delivery & Water Purification
 - 22-26 Feb. 2010 – India – Advanced Materials: Sensors and Nano Devices