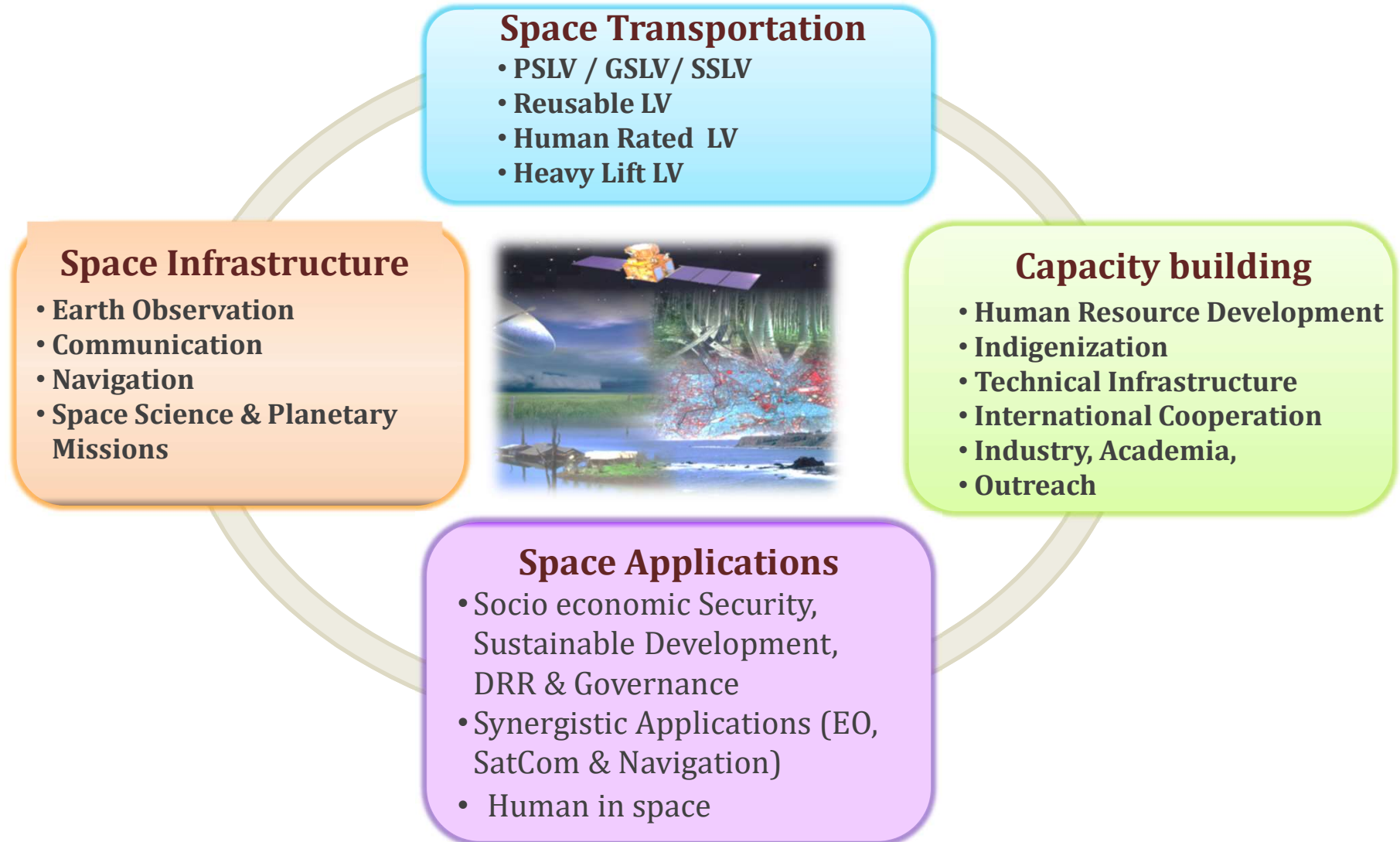**Government of India**
Department of Space

Capacity building activities in the field of Space in India –

An update

Indian Space Research Organisation (ISRO)
Antariksh Bhavan, New BEL Road,
Bengaluru – 560094,
India.

Indian Space Programme: Dimensions

Vision: Harness space technology for national development, while pursuing space science research and planetary exploration

Space Transportation
- PSLV / GSLV/ SSLV
- Reusable LV
- Human Rated LV
- Heavy Lift LV

Space Infrastructure
- Earth Observation
- Communication
- Navigation
- Space Science & Planetary Missions

Capacity building
- Human Resource Development
- Indigenization
- Technical Infrastructure
- International Cooperation
- Industry, Academia,
- Outreach

Space Applications
- Socio economic Security, Sustainable Development, DRR & Governance
- Synergistic Applications (EO, SatCom & Navigation)
- Human in space

AREAS OF CAPACITY BUILDING

01 Academia Research Collaborations

02 Infrastructure Building

03 Industry Promotion

04 International Co-operation

05 Human Resource Development

06 Student Engagement

ACADEMIA RESEARCH
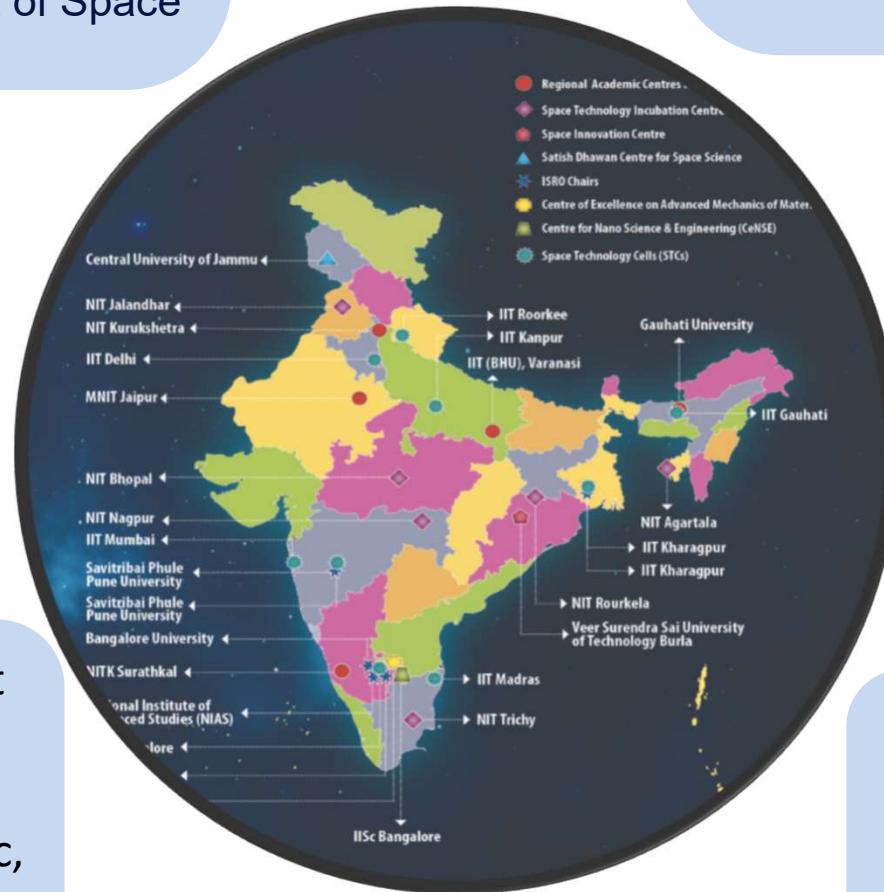
Indian Institute of Space Science and Technology
A dedicated autonomous institute under Department of Space

Collaboration with National / international Departments & laboratories for Gaganyaan Programme

Sponsored Research through more than 180 academic institutions carrying out live 250 research projects

Indigenization of Materials & electronic components and devises, composites, additive manufacturing

30 nos. of ISRO cells at premier technical institutions of the country such as IITs, IISc, Central Universities /NITs

Announcement of opportunities for collaborative Advanced Research in disruptive technologies

- Regional Academic Centres
- Space Technology Incubation Centre
- Space Innovation Centre
- Satish Dhawan Centre for Space Science
- ISRO Chairs
- Centre of Excellence on Advanced Mechanics of Mater.
- Centre for Nano Science & Engineering (CeNSE)
- Space Technology Cells (STCs)

Central University of Jammu

NIT Jalandhar
NIT Kurukshetra

IIT Delhi

MNIT Jaipur

NIT Bhopal

NIT Nagpur
IIT Mumbai

Savitribai Phule Pune University
Savitribai Phule Pune University

Bangalore University

NITK Surathkal
National Institute of Advanced Studies (NIAS)
Bangalore

IIT Roorkee
IIT Kanpur
IIT (BHU), Varanasi

Gauhati University

IIT Gauhati

NIT Agartala
IIT Kharagpur
IIT Kharagpur

NIT Rourkela
Veer Surendra Sai University of Technology Burla

IIT Madras

NIT Trichy

IISc Bangalore

ACADEMIA RESEARCH

Academia Outreach

- **Sponsored Research of 250 projects with 180 Premier Institutes**
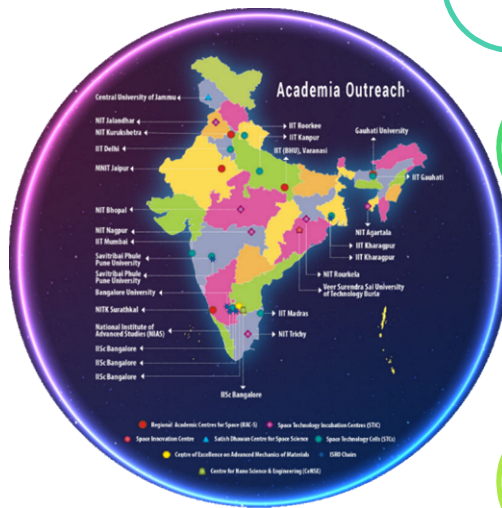- Regional Academic Centres for Space (RAC-S) (6 Nos.)
- Space Technology Cells (STC) (8 Nos.)
- Space Technology Innovation Centre (S-TIC) (6 Nos.)
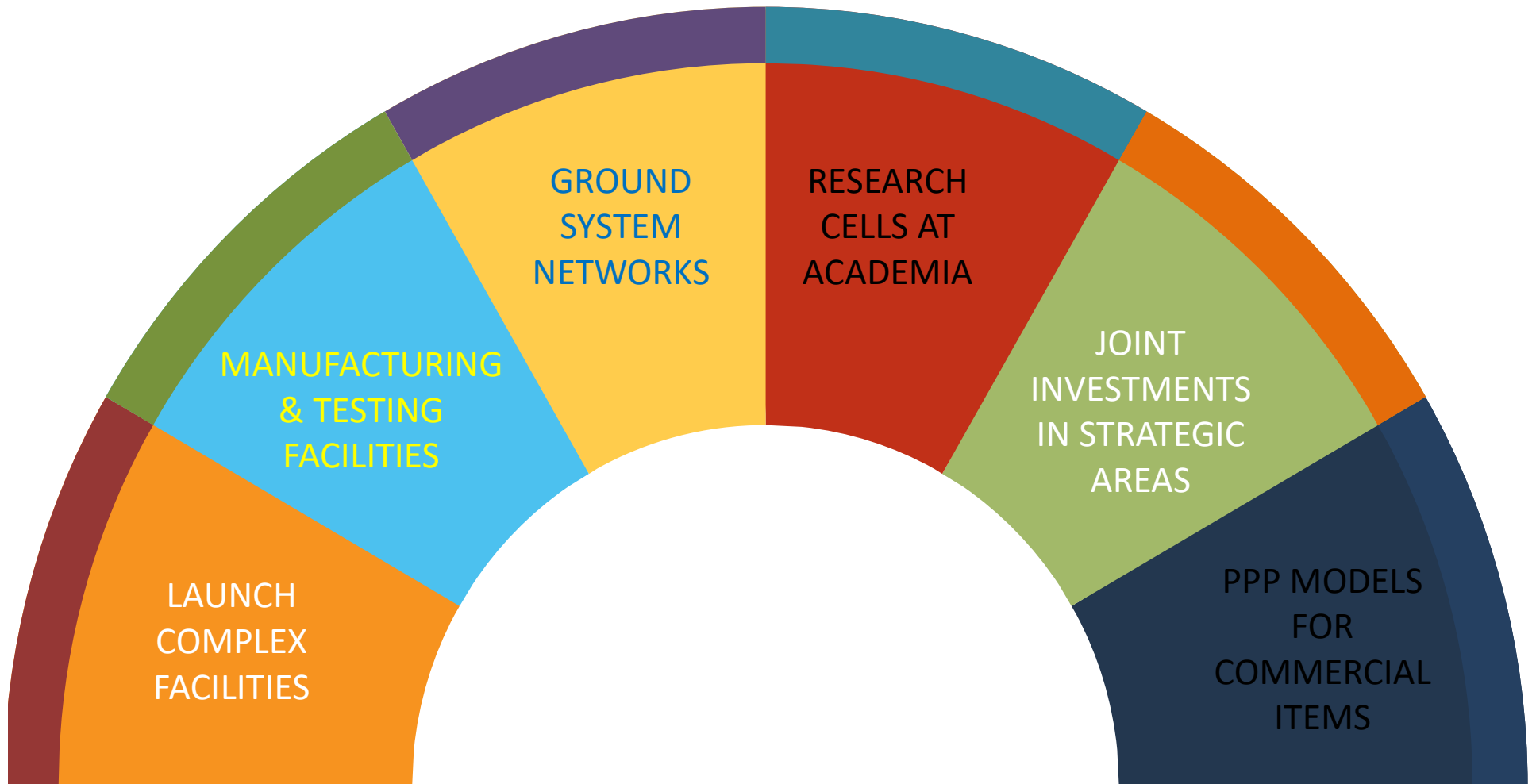- Centre of Excellences in Nano sciences
- Faculty & Student Exchange Programme (Nos.)
- ISRO Chairs (Nos.)

INFRASTRUCTURE BUILDING

ISRO is responsible for building critical, long lead time and capital intensive infrastructure and enable NGE to use them on sharing basis as per the need.

GROUND SYSTEM NETWORKS

RESEARCH CELLS AT ACADEMIA

MANUFACTURING & TESTING FACILITIES

JOINT INVESTMENTS IN STRATEGIC AREAS

LAUNCH COMPLEX FACILITIES

PPP MODELS FOR COMMERCIAL ITEMS

Disruptive* & Futuristic Technologies

*Technologies that breakthrough the conventional technologies and provide a basis for a new competitive paradigm

Quantum Technologies

Unconditional data security against eavesdroppers.

- **Satellite Based Quantum Communication**
- **Quantum Radar**

Sustainable Space

Minimise addition, and clearing of debris; protecting the space assets.

- **Self-Eating Rocket**
- **Self-Destructing Materials**
- **Self-Healing Materials**
- **Space Robotic Arm**

Energy Security

Solution to meet the growing energy demand; enabling energy storage; operation at sub-zero temp.

- **Space Based Solar Power**
- **Low Temp. Lithium-ion cells**
- **Roll-Out Solar Array**

Artificial Intelligence & Robotics

Intelligent systems for water security, weather prediction, space-systems health monitoring and space-robotics

- **In-Orbit Integrated Spacecraft Health Management**
- **Humanoid Robots**
- **Ground Water Level Prediction with Remote Sensing**
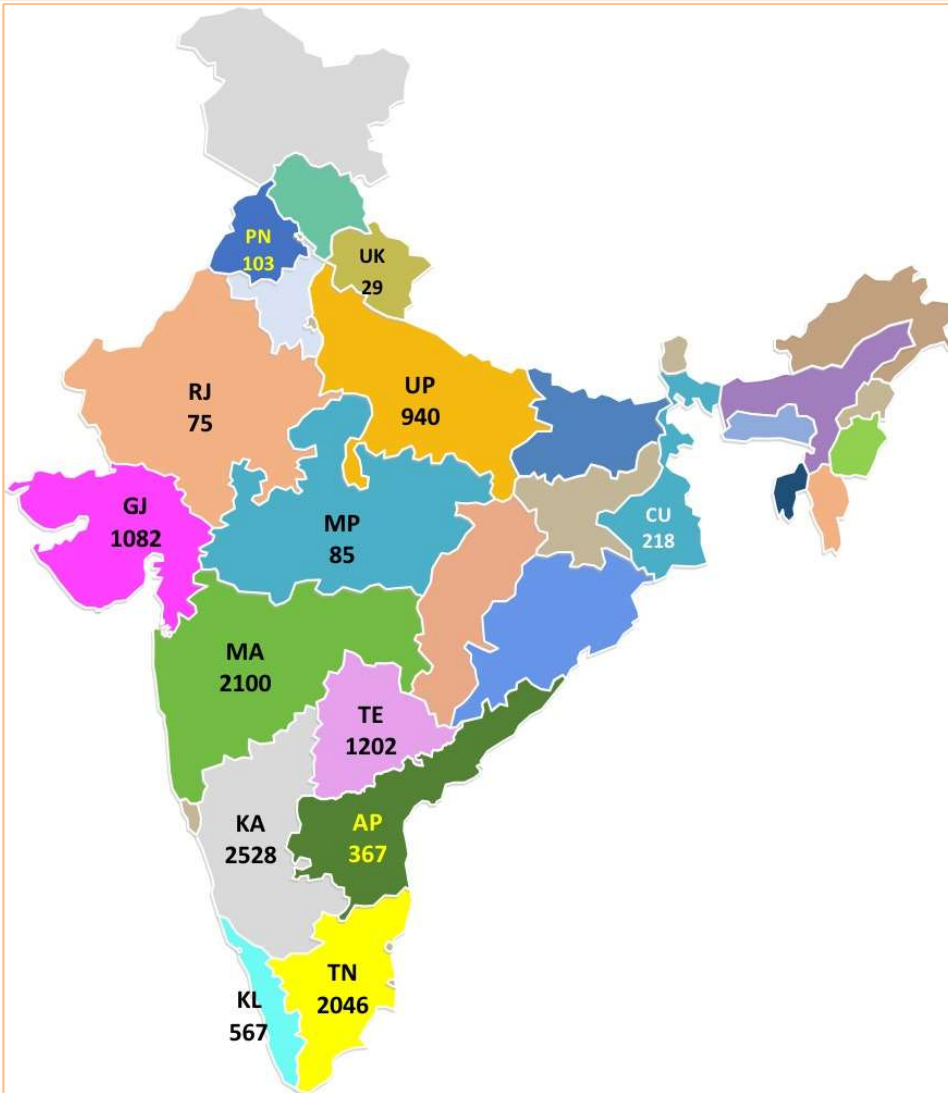- **AI-based Weather Prediction**

Solar System Exploration

Enabling planetary and interplanetary missions, extending human reach to Moon, Mars and beyond.

- **In-Situ Propellant Production at Moon and Mars**
- **Reconfigurable Rover**
- **Lunar Environmental Simulation Test Facility**

INDUSTRY PARTICIPATION & PROMOTION

Country wise spread of Industry (11342)

- Sourcing through Industry: 90% of launch vehicles & 55% in spacecraft subsystems.
- 500+ Tier-1 & 2 Indian industries contributing to space industry
- Transfer 363 technologies to more than 250 industries.

- Unlocking of space sector to Non-Government entities.
- PSLV productionisation through Industry
- Micro satellite bus through industry
- Startup encouragement & Mentorship
- Industry involvement for infra development and end-to-end space activities.
- Policies to ease out business through IN-SPACe mechanism

International Cooperation

International MoUs / Agreements signed	252
Cooperating Countries	59
Total number of international students trained in space science and technologies	2975
No. of countries trained in small satellite development in UN coordinated programme	60

Collaborations

- Joint R&D with academia in activities in Data sharing, propulsion systems, HSP, SSA, quantum communication; AI & ML; Big data analysis, Space Solar Power

- Widening ISRO's ground station networks (for quicker data access; enhanced navigation signals; enhanced TTC support; redundancy; global coverage)

- Creating platforms for inflow of international expertise in newer areas and industry-to-industry collaborations for products and services.

- Startup encouragement and ease of doing business and investments.

Diplomatic Relations

- Strategic 'Space' in bilateral/ regional/ multilateral relations
- Sharing data; Opportunity in orbital platform; Establishing Application centres; Training and capacity building building & launching of satellites
- Long-term sustainability of outer space activities; non-proliferation of dual use technologies; space resource utilization…

Human Resource Development

Inhouse Competency Development

- Domain Training through Induction and structure training
- Functional Training – Skill Development trainings
- Behavioral Competency development though Management Development Programs

External Skill Development

- Identifying the skill development councils in Aerospace
- Imparting training to qualified youth on niche domains
- Collaborating with training agencies and academia to train the qualified in their regions.

Organization level Frame Work

- Identifying potential areas of space applications
- Announcing challenges and hackathons.
- Collaborating with talented for building the technologies

Challenges and Hackathons

- Organizing and supporting the conferences on advanced technologies.
- Conducting theme based seminars and works shops for disseminating the technologies

Conferences, Seminars & workshops

Student Engagement

01 Student Satellite Programme

02 Space Challenge Competitions

03 Young Scientist Programme

04 Student Online Competitions

05 Science Fairs & Exhibitions

06 Technical Facility Visits
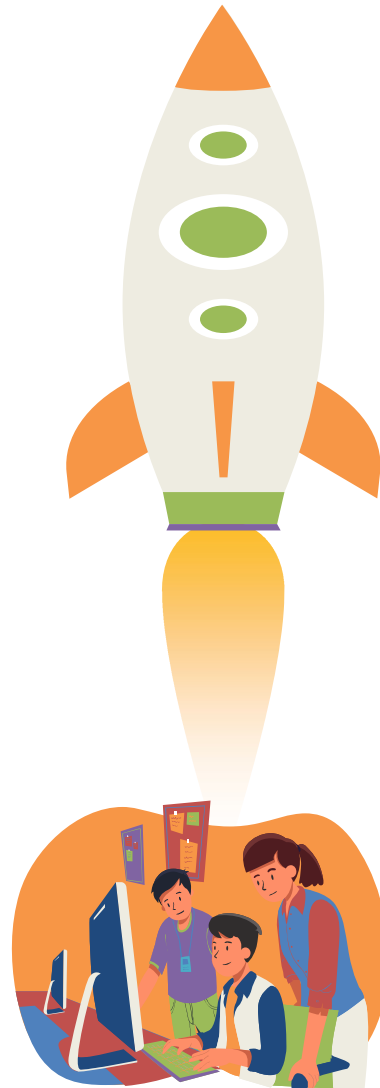
07 Tinkering Labs

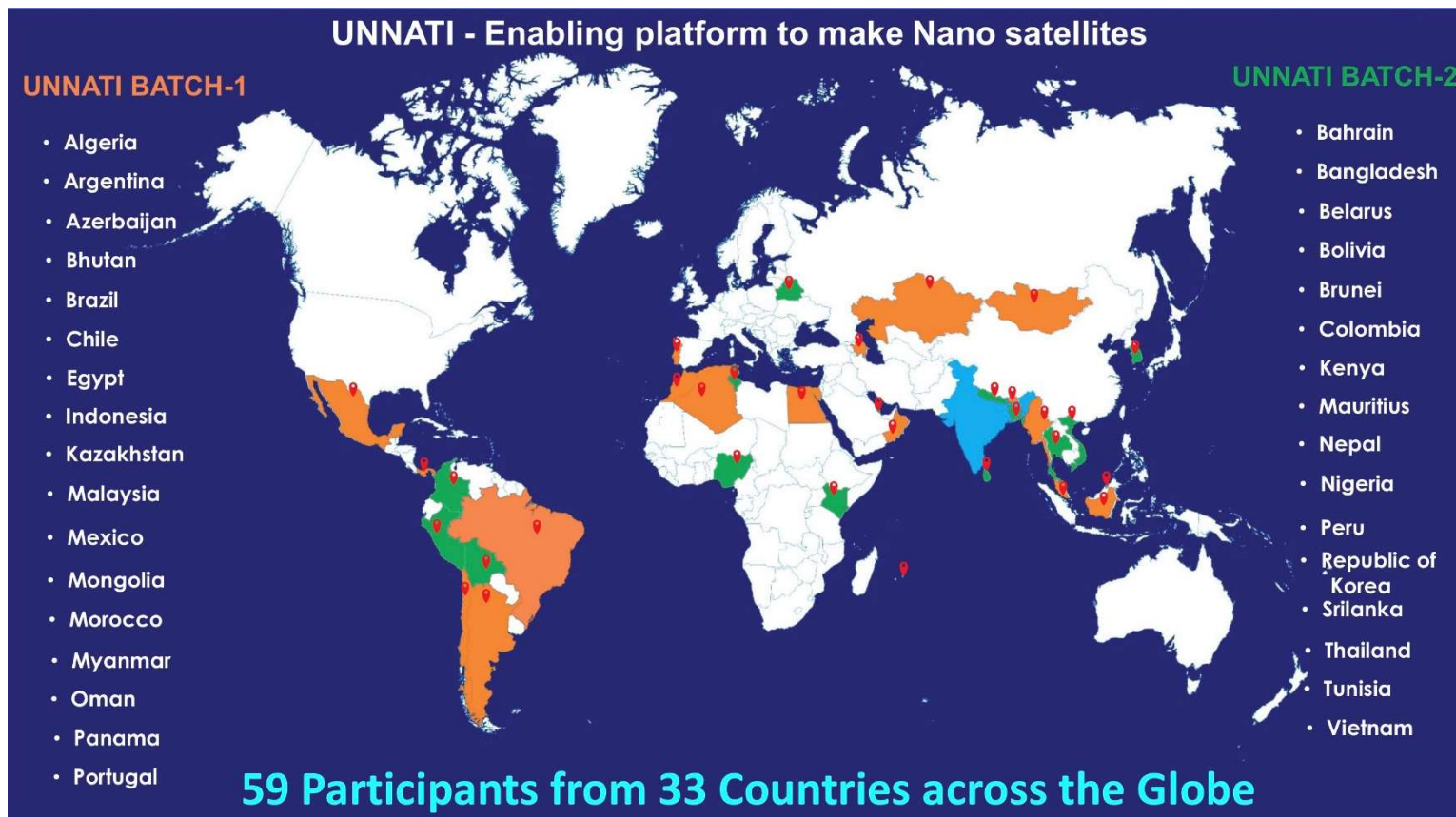**08** Student Projects

09 Internship Trainings

10 World Space Week Celebrations

UNNATI (UNispace Nanosatellite Assembly & Testing by ISRO)

At UNISPACE + 50 (June 2018: Vienna) India announced a capacity building Programme on Nanosatellite development

UNNATI - Enabling platform to make Nano satellites

UNNATI BATCH-1

- Algeria
- Argentina
- Azerbaijan
- Bhutan
- Brazil
- Chile
- Egypt
- Indonesia
- Kazakhstan
- Malaysia
- Mexico
- Mongolia
- Morocco
- Myanmar
- Oman
- Panama
- Portugal

UNNATI BATCH-2

- Bahrain
- Bangladesh
- Belarus
- Bolivia
- Brunei
- Colombia
- Kenya
- Mauritius
- Nepal
- Nigeria
- Peru
- Republic of Korea
- Srilanka
- Thailand
- Tunisia
- Vietnam

59 Participants from 33 Countries across the Globe

YUVIKA
(Young Scientist Programme for Schools)

Residential training programme for 10th standard students. 150 students across the trained every year in space science, technology and applications

CSSTEAP
Centre For Space Science And Technology Education In Asia And The Pacific

In response to the UN General Assembly Resolution (45/72 of 11th December, 1990) endorsing the recommendations of UNISPACE-82, established in 1996.

Exhibitions, Competitions, Talks & Space on Wheels

THANK YOU