Sa ley Sora

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Panel 11: Building a Space Ecosystem and Lessons Learnt in Bhutan

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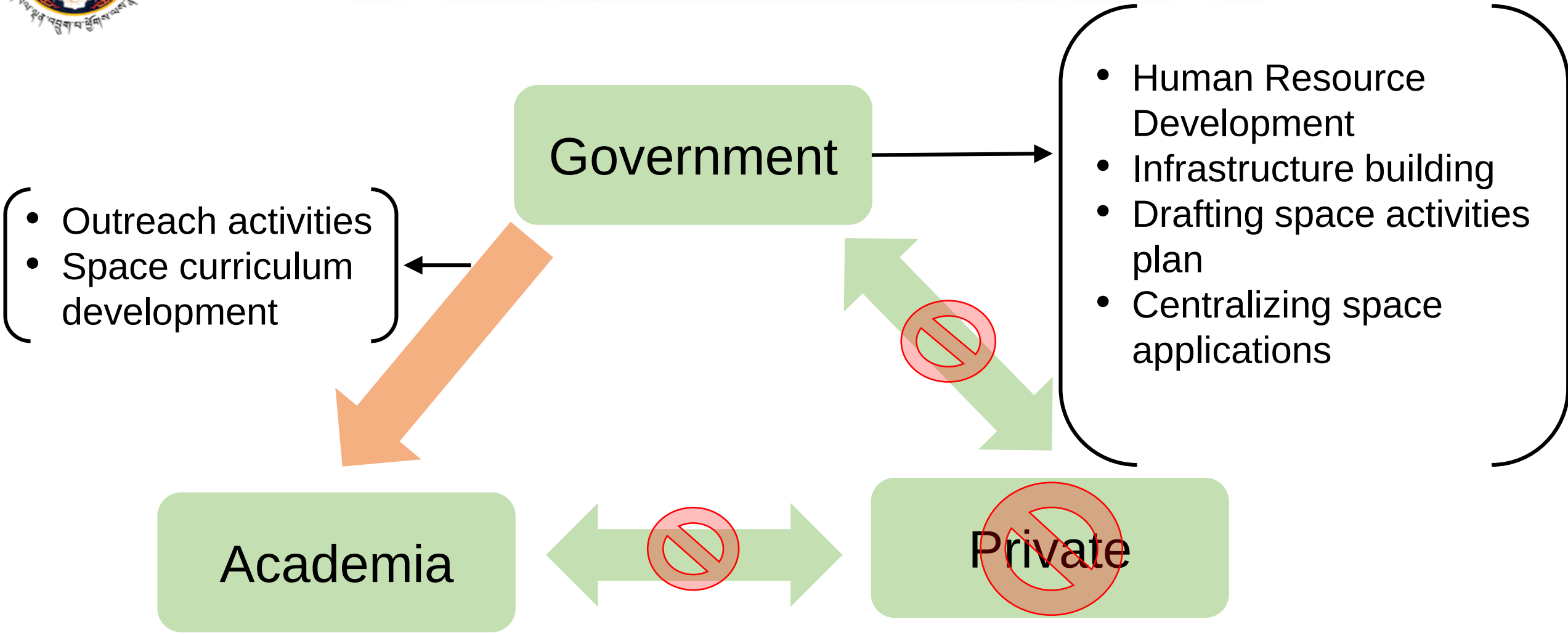
Bhutan's Space Journey

The space program of Bhutan began with the vision of His Majesty the King

" ***to raise awareness and generate interest in space science and technology in order to improve the lives of the Bhutanese people"***

Infant Space Ecosystem in Bhutan



Bhutan's Development Timeline and Space Activities

1961
First 5 year Plan

1999
Introduction of TV and Internet

Inauguration of Television in 1999
https://bhutantourisms.wordpress.com/

2003
Introduction of Cellular Mobile Services

October 2016
Bhutan started first satellite development through BIRDS-2 Project

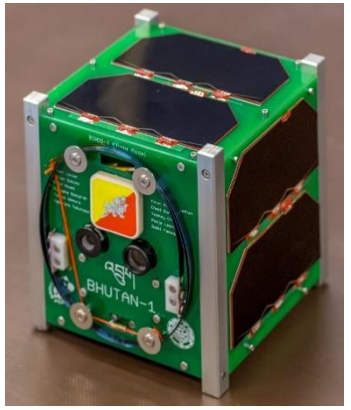
Space

Bhutan to launch its first satellite in 2018

Around USD 280,000 will be spent on the effort

Kuensel dated 21 October 2016

Aug, 2018
BHUTAN-1 deployed from ISS



Emerging Space Faring Nation

Nov, 2022
India-Bhutan Sat launched

Development of clean room facilities and lab for satellite development

Currently working on in country satellite project

Space Initiatives Undertaken by Government

Human Resource Development

1. Funded the masters degree on Space Engineering International Course of three (3) Bhutanese engineers in **Japan**
2. Developed the first satellite of Bhutan, BHUTAN-1 as part BIRDS-2 satellite project in **Kyutech, Japan**.
3. Formed the Satellite Working Group (SWG) and the Division of Telecom and Space (DoTS)
4. Recruited engineers for DoTS and continuous upgrading and upskilling of the engineers through trainings and workshops in various space related fields
5. Developed and Launched the second satellite, India-Bhutan Sat in collaboration with **India**

Lesson: Leveraging International Collaboration is Essential

: Prioritizing in Capacity Building

Space Initiatives Undertaken by Government

Infrastructure Building

1. Installed Amateur VHF and UHF ground station in the GovTech campus to support operations of amateur satellites
2. Installed S-band ground station to receive data from India-Bhutan Sat
3. Established clean room facility in the GovTech campus to facilitate in-country satellite development

Lesson: Starting small and scaling up gradually

Space Initiatives Undertaken by Government

Drafting space activities plan to progress forward

2023-2024

- In country satellite development
- Installation of S-band GS
- Acquisition of land for bigger space facility

2024-2025

- Satellite environment tests
- Survey and design for new facilities

2025-2026

- Launch and operation of satellite
- Construction of facilities.
- Indigenous satellite project consultation

2026-2027

- Commissioning of testing facilities (private sector involvement?)
- Design, development and fabrication of indigenous subsystems.

Lesson: Making long term goals is essential to ensure sustainability

Space Initiatives Undertaken by Government

Centralizing space applications

1. Remote Sensing Working Group formed with participants from different agencies to centralize remote sensing applications within the country
2. Development of a common repository of satellite imageries for country mapping and monitoring (agriculture, forestry, glacier and water resources)

Lesson: Earth Observation has immediate practical applications which can demonstrate tangible benefits of space technology

Space Activities: Government and Academia

Outreach Activities and Promotion of Space

1. National Space Challenge involving students from engineering colleges conducted annually to foster their interest in space related fields
2. Also installed VHF/UHF ground station in 5 different colleges to give 'hands-on' experience to the students
3. Design and Development of the secondary payload for the next satellite of Bhutan being conducted by students of engineering colleges
4. Providing components/resources to students and GovTech facility tours to demonstrate best practices and give practical experiences.

Lesson: Promoting Space activities in Academia to create future workforce

Space Activities: Government and Schools

- Space Science and Technology was introduced in the Physics subject for:
  - Grade 9: Moon and its exploration
  - Grade 10: Space Exploration
  - Grade 11: Space Technology in our Lives
  - Grade 12: Satellite
- Developed textbooks for Space Science and Technology for all grades by Ministry of Education in conjunction with GovTech

Lesson: Promoting fundamentals of Space Science, to capture students' interest, sense of wonder and pique curiosity

Challenges

1. Exodus to Australia (Brain Drain)
   - Bhutan's population is about 800,000 out of which around 65,000 left Bhutan for Australia post Covid.
   - 200,000 people expected to leave in next 5 years

2. Lack of Expertise and Trained Educators in Space who can effectively teach and mentor students in this domain.