KGS IAS

Science & Technology

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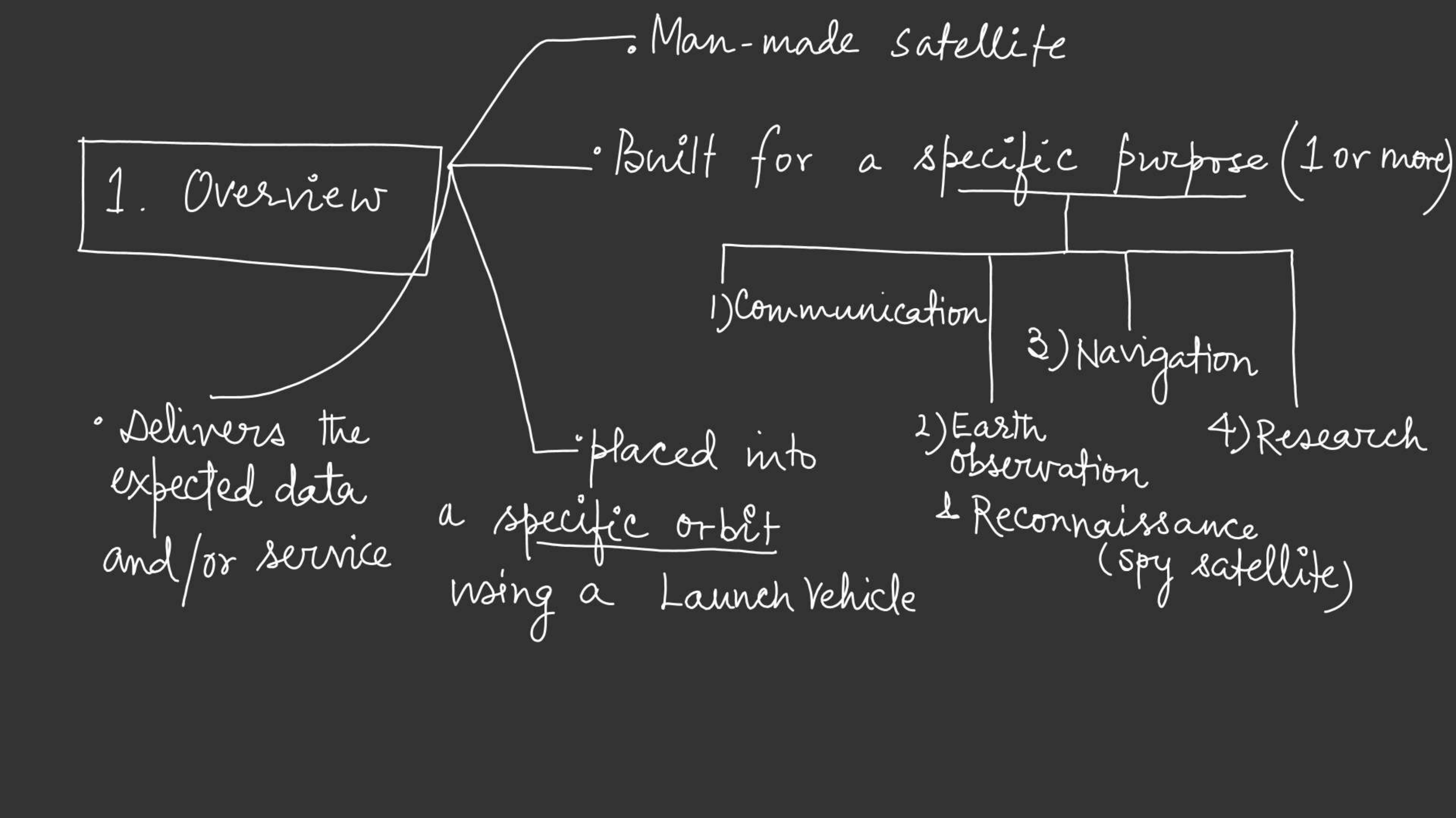
Application Areas of Satellite Technology

1. Artificial Satellite Overview

2. Satellite Communication

3. Satellite Based Earth Observation
(Remote Sensing by Satellites)

4. Sat-Nav
(Satellite based Navigation)


1. Overview
• Man-made satellite
• Built for a specific purpose (1 or more)
1) Communication
2) Earth Observation
& Reconnaissance (spy satellite)
3) Navigation
4) Research
• placed into a specific orbit using a Launch Vehicle
• Delivers the expected data and/or service

2 main parts

(1) Payload

carries the instruments or tech. to fulfil mission objectives

Bus

has the support-system

- power
- propulsion
- Communication
- Solar panels

etc.

Satellites & Orbits

	Comm.	E.O.	NAV.	Research
Global Norm	GEO or LEO for small nations	LEO SSPO	MEO	LEO
India	GEO (rarely, GSO)	SSPO (rarely GSO)	GSO GEO	LEO

(2) Satellite Communication (SatCom)

→ Communication signal transmission from one point to another using satellite receivers & transmitters

→ wireless communication

↳ radio waves

↳ travel at the velocity of light

→ 3×10^8 m/s

Mode

(1) Ground station trasmits the signal to the satellite

(2) The satellite changes the freq. and amplifies the signal

(3) Transmits the signal to ground receivers

(4) Ground receiver captures signal through antenna


- long wavelength
- low freq.
- larger antenna.


- short wavelength
- high frequency
- small antenna

Applications

(1) Telephony

(2) Wireless - satellite based internet

(3) Live broadcasts

(4) Dedicated Services
- Military Comm.
- Air Traffic Control & Tracking
- Banking & ATM
- Stock markets
- many others ...

(5) Remote Communications

- e-Panchayats
- Tele-medicine
- Search and rescue
- Remote education

etc.

Bands of SatCom in India

Band	Frequency	Main use cases in India
C	3 - 4 GHz	Rural Connectivity
Extended C	4 - 8 GHz	- Urban Connectivity - Telecom
Ku	12 - 18 GHz	- DTH High Definition Broadcast

India's Comm. Satellites

- Started in 1983 with INSAT-1B
- Many launches
- New Series → GSAT
- Presently in operation → 9 Satellites
- All in GEO

Based on which,
earth related specific information
can be gathered.

(1) Cartographic Information

(2) Land utilisation patterns

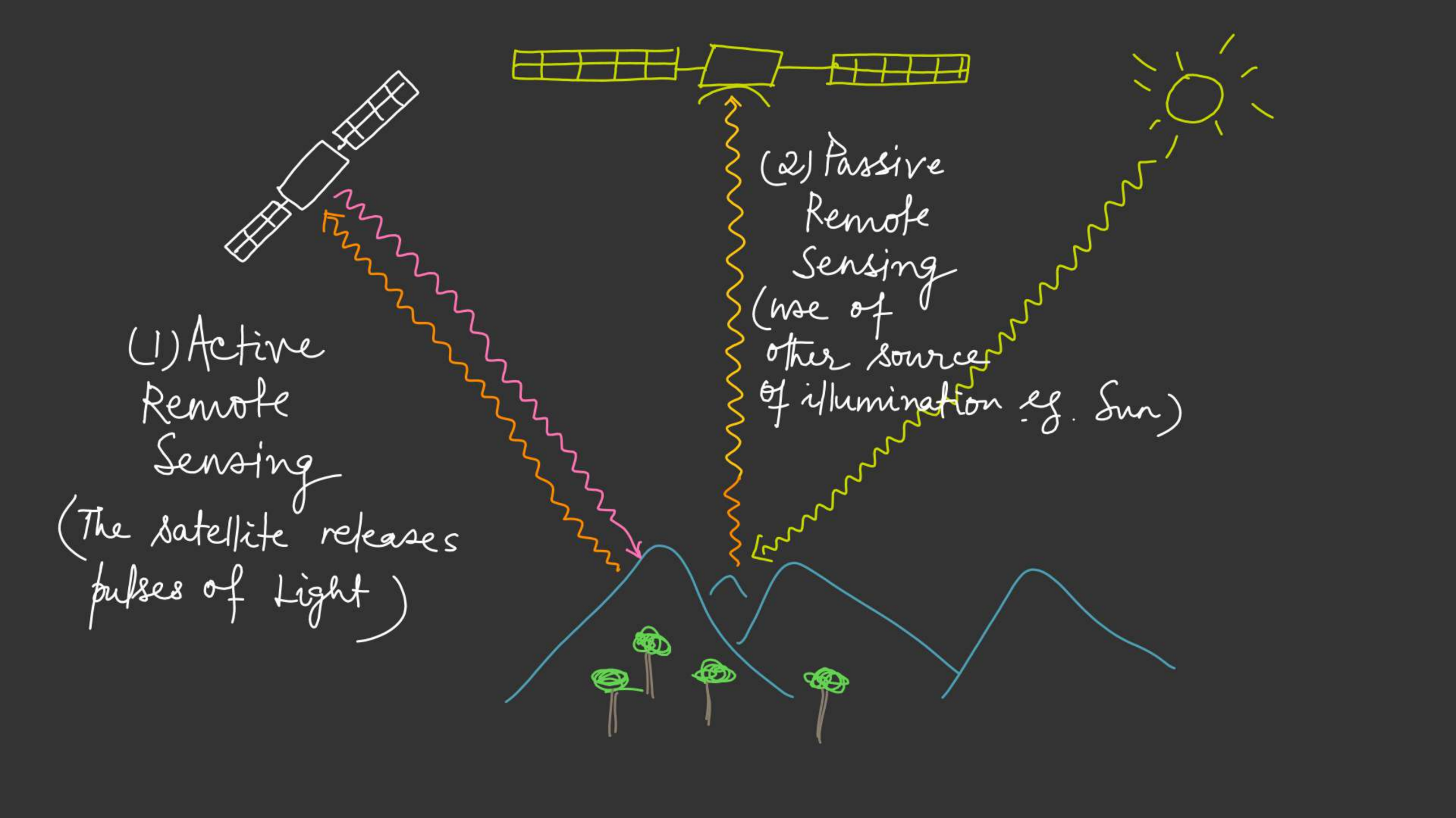
(3) Forest cover mapping

(4) Crops land utilisation

(5) Surface water resources

(6) Weather assessment

(7) Wildlife movement


(1) Active Remote Sensing
(The satellite releases pulses of Light)
(2) Passive Remote Sensing
(use of other source of illumination eg. Sun)

↓

(2) Data converted into radio signals of a specific freq.

↓

(3) Transmission to the ground station

↓

(4) Analysis of spectral data

↓

(5) Interpretation

↓

(6) Data storage & Communication

- Officially started in 1988 with launch of **IRS-1A**
- ISRO maintains one of the largest constellations of RS Satellites
  - **Presently 23 in operation**
    - serve India
    - overseas customers (nations)

4. SatNav