GW CONSULTING

WATER MANAGEMENT

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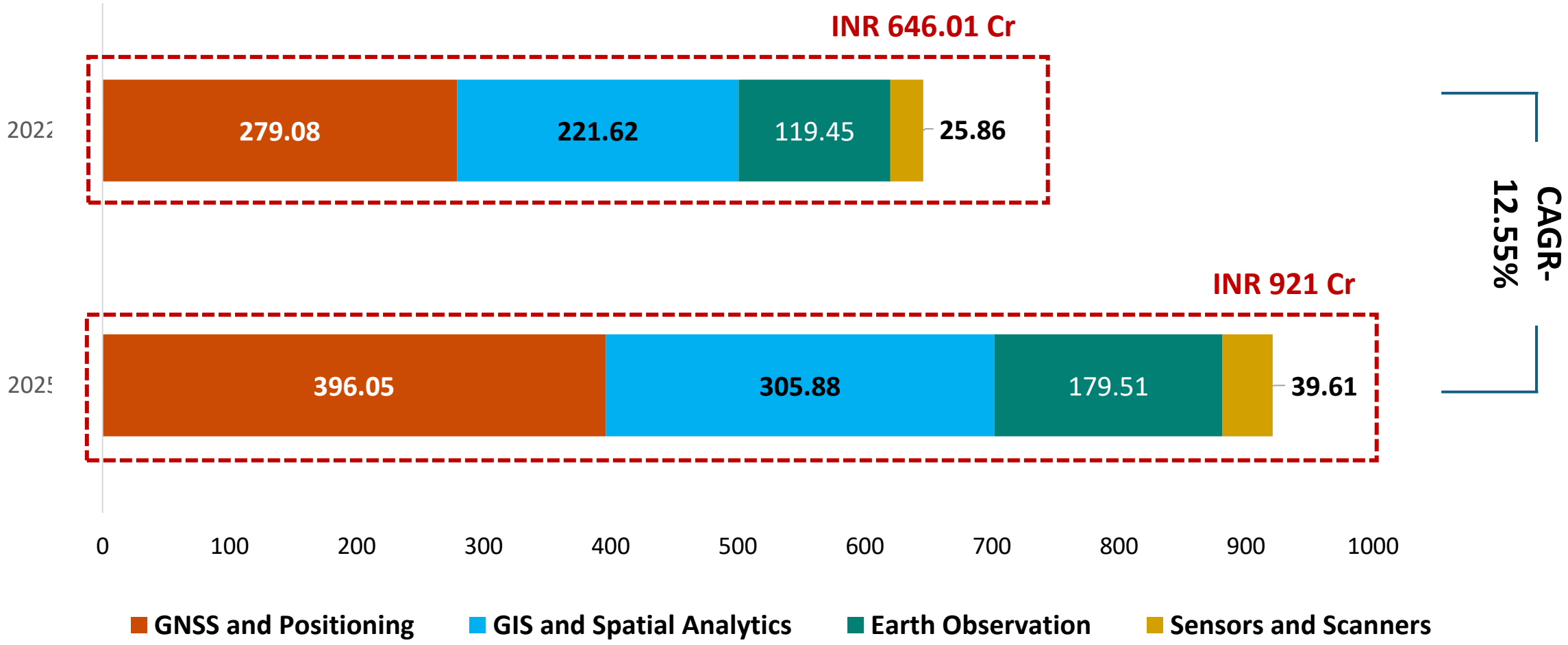
THEME

Digital Pathways for Water Sustainability: Rejuvenation, Resilience, and Smart Utilities

Functions of Water Resources Management

- Harnessing the benefits of water
- Sustaining healthy water-dependent ecosystems
- Protecting the aesthetic and spiritual values of lakes, rivers, and estuaries
- Managing water-related risks, including floods, drought, and contamination

Geospatial Market Size and Forecast: Water Resource Management (By technology Sub-segment)- 2022 and 2025F



Source : GW Consulting Analysis

Market Drivers Influencing Geospatial Technology Adoption and Growth

- Heightened Awareness Regarding Water-Related Issues
- Escalating Imperatives for Enhanced Water Infrastructure
- Proactive Government Measures and Policy Reinforcement
- The Impact of Climatic Fluctuations
- Harmonizing AI, ML, and IoT with Geospatial Information
- Advancements in Technology Becoming More Accessible
- Strengthened Partnerships Between Public and Private Sectors
- Enhanced Recognition of Geospatial Technology
- Surge in the Utilization of Data for Strategic Decision-Making

Key Government Initiatives – Water Management

Namami Gange Program

- Budget: Revised total outlay of **₹ 22,500 crore up to 2026**
- Focuses on sewage treatment, riverfront development, and biodiversity conservation.

Geospatial Technologies Used:

- GIS Mapping:
- Remote Sensing:
- Satellite Imagery

Atal Bhujal Yojana (ABHY)

- Budget: **₹6,000 crore** (launched in 2019) and **₹ 1,780 crore** for 2025 -2026.
- Aimed at sustainable groundwater management in water-stressed areas across seven states..

Geospatial Technologies Used

- GIS Mapping:
- Remote Sensing:
- Satellite Imagery

National Hydrology Project (NHP)

- Budget**: ₹3,640 crore** (World Bank-aided, launched in 2016), **₹ 661.20 crore** for 2024 – 2025 and **₹ 13 crore** for 2025-2026
- Develops a real-time hydrological information system for better water resource management.

Geospatial Technologies Used:

- GIS Mapping:
- Remote Sensing:
- IoT Sensors

Challenges and Solution

Current Scenario

- **70%** of India's surface water sources are polluted.
- Groundwater contamination by arsenic, fluoride, and nitrates affects over **12%** of India's districts.
- India generates over **72 billion** liters of wastewater daily, with only **30% being treated**.

Challenges

- Lack of adequate STP's and Inefficient operation and maintenance of existing plants.
- Limited real-time monitoring of water quality across surface and groundwater systems.
- Limited understanding of water conservation and treatment practices among local populations.
- Difficulty in identifying and penalizing polluters.

Solutions

- **Pollution Mapping and Monitoring:** Detecting turbidity, suspended sediments, and algal blooms using Remote Sensing.
- **GIS Integration:** Identifying pollution hotspots by overlaying land-use patterns with water quality data.
- **Hydrological Modeling:** Using geospatial hydrological models to understand pollutant transport and design mitigation strategies., Example: Modeling the impact of untreated effluents on the Yamuna River ecosystem.

Challenges and Solution

Current Scenario

- India has only **4% of the world's freshwater resources** but supports **17% of the global population.**
- Water management is fragmented, with separate agencies handling irrigation, drinking water, and industry needs.
- Interstate water-sharing agreements are under increasing scrutiny, often leading to disputes (e.g., Cauvery River dispute).

Challenges

- Lack of a unified framework for managing water resources at the basin level.
- Over-extraction of groundwater in various regions across India threatens long-term agricultural sustainability.
- Limited access to real-time hydrological and meteorological data hampers effective planning.
- Communities are often excluded from decision-making processes, leading to poorly implemented projects.

Solutions

- Use of **high-resolution DEMs (Digital Elevation Models)** to delineate watersheds and identify recharge zones.
- **GIS-Based Water Balance Models**: Analyze water inflow, consumption, and outflow in a region to determine optimal usage.
- **3D Visualization of Groundwater Resources**: Understand aquifer boundaries, recharge rates, and over-extraction hotspots.

Challenges and Solution

Current Scenario

- **Groundwater** accounts for **85% of rural water needs**, with alarming depletion in states like Punjab, Haryana, and Tamil Nadu.
- Private sector involvement has accelerated large-scale water projects, such as desalination plants, sewage treatment, and lake rejuvenation.
- CSR initiatives by companies like **Tata Steel** and **ITC** are actively contributing to water conservation and resource rejuvenation.

Challenges

- Fragmented policies and lack of unified implementation frameworks.
- Dependence on conventional, less effective methods for rejuvenation.
- Community-level awareness about water rejuvenation remains low.
- Weak enforcement of environmental norms and guidelines in industrial and urban areas.
- Delays in approval processes for PPP projects.

Solutions

- Use of **Remote sensing and GIS** to identify degraded water bodies requiring immediate attention.
- Deployment of **IoT-enabled sensors** integrated with GIS for real-time monitoring of pollution levels in lakes, rivers, and reservoirs.
- Targeted desilting campaigns in partnership with private players.
- Developing participatory **GIS platforms** where communities can report pollution, track project progress, and contribute to decision-making.

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