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WGIC POLICY REPORT: 2019-01

# Geospatial Outlook for User Industries



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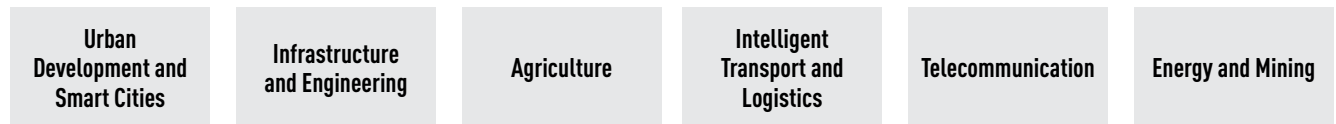
## Message from the Committee Chair – Partnerships & Industry Engagement

**VALRIE GRANT**

Founder & Managing Director  
GeoTechVision

### Dear WGIC members and members of respective industries,

In the background of major transitions and innovations that are fostering innovations in the ever-connected ecosystems of the industries, WGIC was envisioned with a mission to build inter & intra industry collaborations for knowledge exchange and value creation by setting up common agendas for meaningful engagements. The board members resolved to undertake proactive engagement as a priority with trade bodies, professional associations and forums with the following user industries:



In view of these aspects, on behalf of the Partnerships & Industry Engagement committee, I am delighted to present to you this report that brings 'geospatial outlook for these priority sectors of the world economy' and gives you a panoramic view of strategic initiatives, opportunities and potential programs with key industry associations for 2019.

### A few highlights of year so far have been:

- Monthly issue of Industry Watch that brings a snapshot of significant stories among identified priority industries
- Signing an MoU with buildingSmart International to enhance utility and value of geospatial and BIM standards in civil infrastructure projects
- Progressive conversations with more than 15 User Industry associations and exchange of concept notes on major themes and areas for reciprocal value propositions between the respective industry and geospatial

The year holds the promise for high-level executive seminars, roundtables, signing of letter of intents, publication of position papers and WGIC representation at several key global events of the industries, post presentations and dialogues with key officials of the several forums that include - World Federation of Engineering Organization – Paris, International Transport Forum – Paris, World Water Council – Marseille, World Railway Organization (UIC) – Paris, United Cities and Local Governments (UCLG) – Barcelona, International Road Transport Union (IRU) – Geneva, International Telecommunication Union (ITU) – Geneva, The International Federation of Consulting Engineers (FIDIC) – Geneva, Confederation of International Contractors' Association – Paris, World Farmers' Organization – Rome, World Mining Congress – Katowice, International Energy Agency – Paris, World Energy Council – London, buildingSmart International – UK, International Road Transport Union (UITP) – Brussels

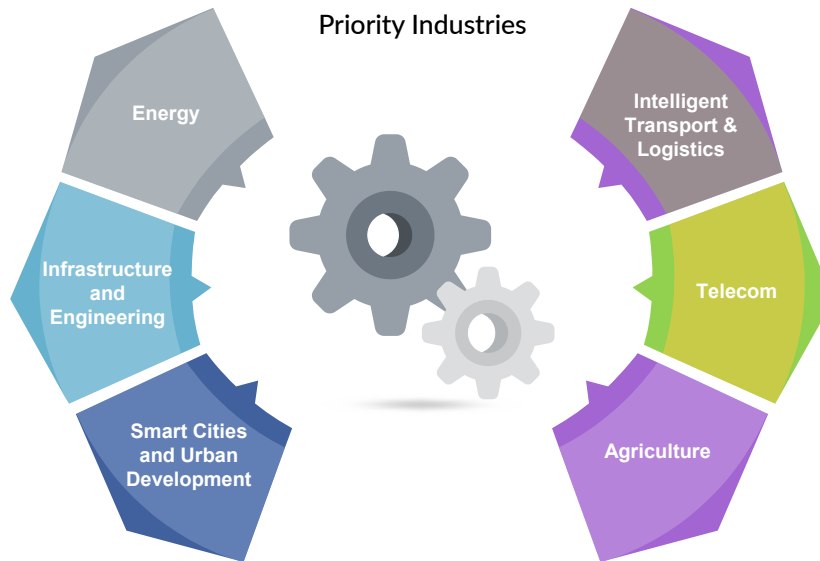
I must thank the hard working committed members of the Council and industry groups for your time, talent, and expertise.

We look forward to your active participation and guidance as we continue this journey to make a significant difference in society, economy and environment – at all times ensuring that sustainability is the mission for us as geospatial champions.

**Best wishes!**

## Executive Summary

The complexity of the ever-evolving geospatial technology landscape is a well-acknowledged phenomena. This report on Geospatial Outlook for User Industries presents an overview about geospatial industry ecosystem and the role it plays as an integral component in transforming and digitalizing prominent sectors of the world economy.



A major knowledge gap exists among the key decision makers in public sectors, businesses and governance about far-reaching geospatial applications across broad spectrum of processes and workflows. It is an indispensable technology for establishing seamlessness across the value chain of an industry and in facilitating intra-industry cross linkages for positive changes in social-economic and environmental aspects.

The role of geospatial technologies and its potential for the positive impact varies and depends on the specific user industry. Similarly, the gap between the existing and desired level of adoption varies from industry to industry, as well as country to country. Its successful implementation is also reliant on various other supporting factors such as availability of data, ICT facilities, skilled manpower, policy frameworks, regulator environment etc.

By analysing data from several secondary sources such as company annual reports, industry reports, news articles, web posts, webinars, conference materials, published interviews, etc., this report sheds light on the potential for geospatial disruption within the value chain of each of the focused user industries.

It also analyses emerging trends and directions, future opportunities and challenges for geospatial adoption in select key sectors of the world economy. Additionally, it presents - Industry landscape & dynamics that are changing the status quo of the industries, future pathways for development and for achievement of sustainable development goals.

**Tanuja Vashistha**  
**Executive Director – Partnerships & Industry Engagement**

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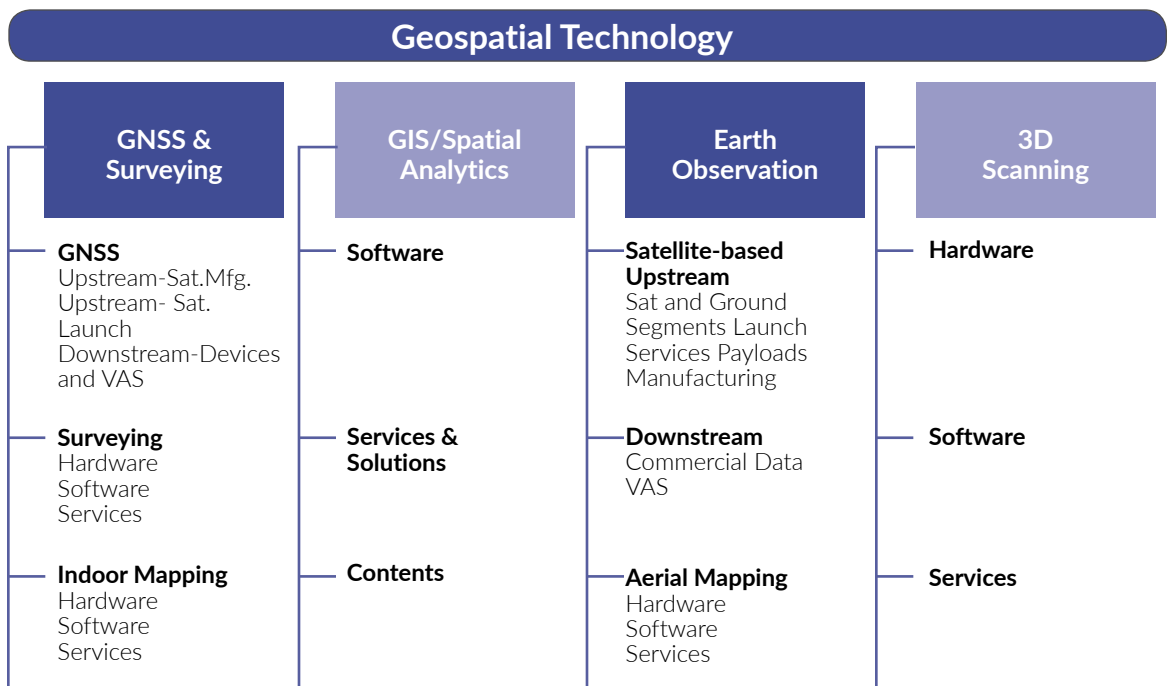
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# 1. Geospatial industry Overview & Composition

The geospatial technology ecosystem has evolved over time, specially through a great churning in the last decade, offering several modern tools that enable geographical mapping and analysis of the earth in the socio, economic and environmental contexts, a country or POI (points of interest) to discern crucial insights for new processes, business models and pathbreaking innovations.

Geospatial technologies can be classified in four categories: GNSS and Surveying, GIS and Spatial Analytics, Earth Observation and 3D Scanning. Encompassing various other technologies, these four segments are the key components of the geospatial technology ecosystem.



Source: GeoBuiz Report 2018

For the mankind, its relationship with maps dates back to cave paintings to age of exploration to narrate stories with simple drawings to visuals wherein cartographers created maps to define, explain and navigate through the world. Over several years, 'democratization' of maps is making it an integral part of everyone's life, bringing the realization that data on static tables may present facts and figures, and help us realize there is a problem, but it cannot tell us accurately 'where' the problem is? How does that impact an area and what can be done to influence the impact?

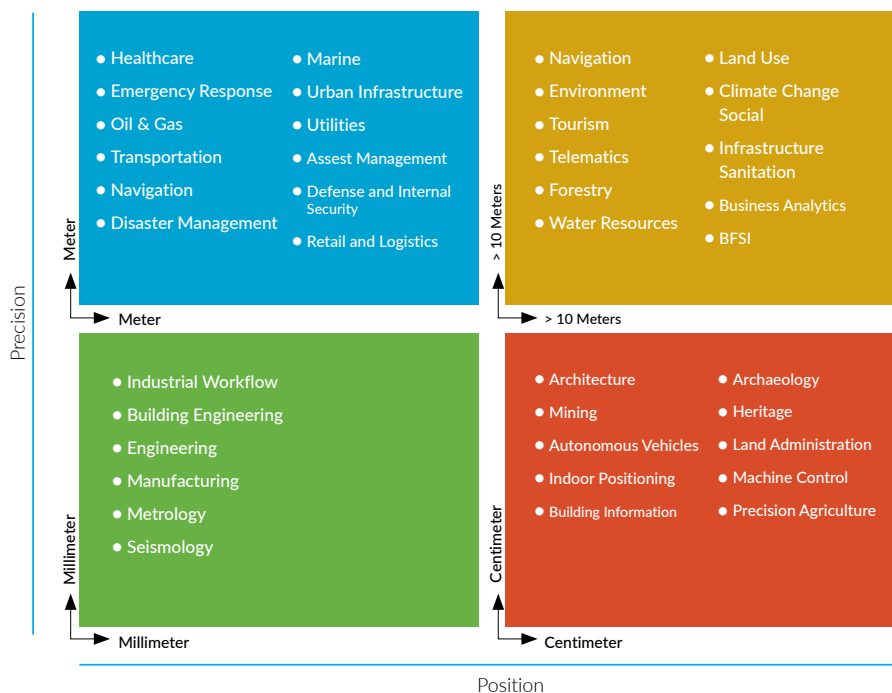
Geospatial industry has reached that existential moment where being *'niche'* is an old cliché and *'by-default'* 'mainstreaming' of geospatial data and technology is accepted as the *'new normal'*. The strategic use of maps speak volumes of information, defining the power of 'where' and unleashing true potential of geospatial industry, through universal relevance and utility in the world economy, society and environment.

## 2. Geospatial in the Digital Ecosystems

In this data driven industrial age, spatial data and location with interrelated technologies – Big Data, Augmented Reality, Machine Learning, Artificial Intelligence, IoT and 3D technologies are transforming the core of traditional business practices, rendering competitive advantage through visualization of data, analytics and digital insights - continuously accelerating need for real-time data, geospatial content and services for end customer applications as well as at the enterprise levels.

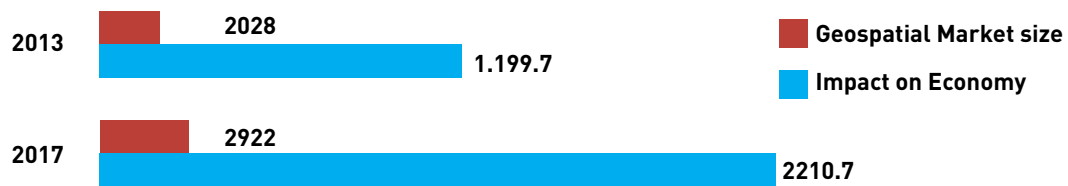
Going beyond archetypal sectors such as governance, urban planning, internal security and defense, spatial context continues to become an integral component and a core tool for workflow management, smart applications and a key lever of automation in manufacturing, telecom, architecture, engineering, intelligent transportation and many other areas. Location data may be required from position to precision accuracy of less than a meter (and in some cases millimeter accuracy).

**Figure 2.1 - Geospatial Industry Applications: Position to Precision**



Source: Geospatial Media Analysis

Various traditional and emerging geospatial applications are improving the efficiency and productivity through spatial insights for planning & analysis, operational readiness, better management of assets and improved customer services, however the true potential of geospatial technologies is not fully exploited to derive optimum economic gains and social impact



Source: Adapled from Indecon International Economic Consultants, ACIL Tasman, BCG, AlphaBeta, Oxera, Natural Resources Canada and Geospatial Media Analysis

Several reports signify the role of geospatial technologies with economic impact assessments that indicate a value of US\$ 2,210.7 Billion in 2017 with an estimated CAGR of 20.9% between 2013 and 2017 with unparalleled value through social impact.

## Scope of this report

The technological advancements and innovations are recasting legacy systems in major sectors of the world economy to help industries navigate through complex factors; and continue to create sustainable value.

This report on Geospatial Outlook for User Industries, captures a few signposts of evolving business environment in the backdrop of disruptions caused by digitization; gives a background to frame the right questions that will help in opening new frontiers and explore possibilities to thrive in a rapidly changing environment. The spotlight of this report is geospatial industry in the ecosystems of the following user industries:

- Urban Development and Smart Cities
- Engineering and Infrastructure,
- Agriculture
- Energy
- Telecommunications
- Intelligent Transport Systems and Logistics.

## Approach and methodology

The information presented in this report is primarily prepared on the basis of insights that are curated from secondary sources that include industry publications, news releases, newsletters, white papers, case studies and documentaries available in the public domain. Select references are also picked up from conference sessions and discussions with industry leaders.



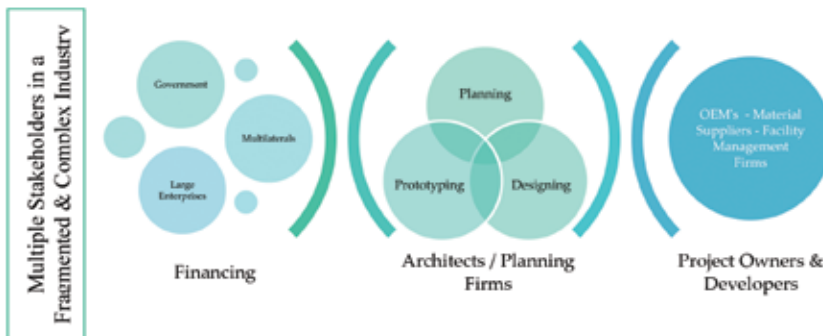
# Industry Focus: Engineering and Infrastructure

## 3.1 Overview

Engineering and infrastructure underpins every aspect of modern life. As a forefront industry that shapes the world we live in – engineering makes a significant contribution to the world economy, social well-being and also plays a critical role in social stability and environmental sustainability. With the fast growing urban population, infrastructure needs are at all time high - for housing, commercial spaces, transport, utility and other civic amenities.

To stay ahead of the curve, the industry has to consciously orchestrate transformations across entire value chain and for all built environments – outside as well as indoors. The shift from paper- based blueprints to CAD and then BIM are reshaping the way built environments are envisioned, designed and constructed, however these changes are marginal and more work is to be done to change things significantly and holistically for geospatial adoption at enterprise level.

## 3.2 Industry landscape & Value Chain

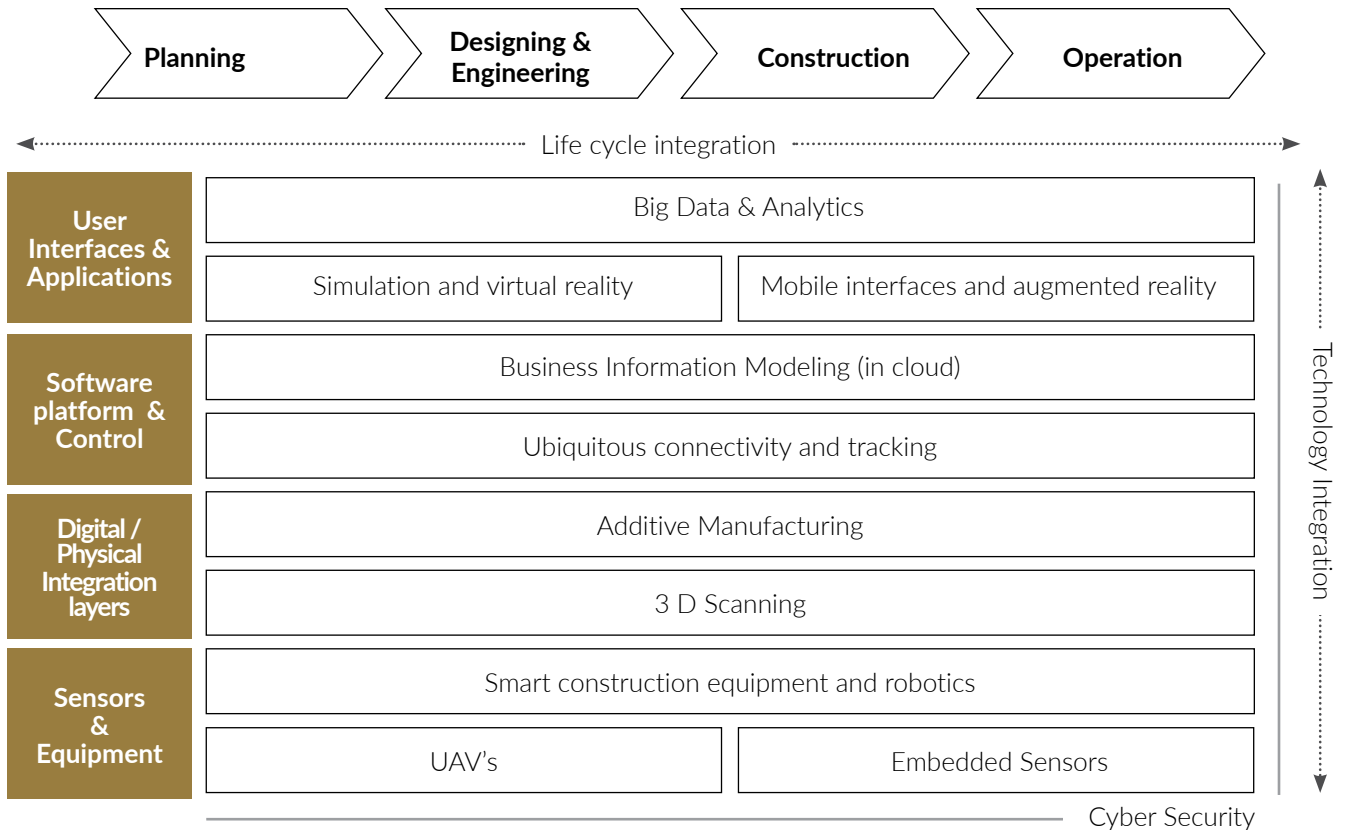


Academic Institutions and Civil Societies are also major player in large scale projects who influence decisions in view of socio-economic & environmental impacts of a project.

### 3.3 Emerging Trends & Directions

Digitization is no longer an option but a critical reality for the AEC industry. In the last few decades the industry has been quite slow in adoption of automation/technologies for end-to-end integration of processes, flow of information, standardization, uniform adoption of best practices across projects of similar characteristics and magnitude.

Here is a snapshot of the technologies that will drive the AEC industry as the compass of the industry is being directed to magnetically moving north.



Source: Boston Consulting Group

New entrants, start-ups and innovators have started to disrupt the conventional business / operating models of the industry. It is no longer the playfield area of local firms/realtors, web-based

technologies have revolutionized all sectors, and AEC is no exception now. The market is becoming fiercely competitive and red ocean strategies will no longer continue to determine the future prospects of the industry stakeholders.

The blue ocean economy taught the industries to stay relevant by creating unique value and IP for projects. For the AEC as well, cost element alone will no longer be a criterion for qualifying in the RFP's in the future – it will be about the quantum of benefits that the bidders will be able to showcase throughout the infrastructure life-cycle.

Many leading organizations have started to demonstrate value of efficient processes and its impact on the project & asset life-cycle. The way automation and computational design and robotics fully transformed the automobile industry. The stakeholders in the AEC industry are equally recognizing the need for technology adoption, bringing about a major shift in the mindset – moving from price to value equations.

**The industry leaders realize the need for cultivating a culture of diversity & inclusion, capitalize on the opportunity of creating smart future cities and build safe and sustainable future**

### **3.4 Strategic Initiatives & Opportunities**

The industry leaders realize the need for cultivating a culture of diversity & inclusion, capitalizing the opportunity for creating smart future cities, and building safe and sustainable future. WGIC secretariat is initiating strategic dialogues with international apex institutions, professional forums and trade associations, and building a platform for knowledge exchange, experience sharing, technical presentations and roundtable discussions.

The construction industry offers manifold opportunities and is projected to grow US\$ 10.3 trillion worth industry by 2020 scaling up from US\$ 7.4 trillion in 2010.

[Source:[http://www3.weforum.org/docs/WEF\\_Shaping\\_the\\_Future\\_of\\_Construction\\_full\\_report\\_.pdf](http://www3.weforum.org/docs/WEF_Shaping_the_Future_of_Construction_full_report_.pdf)]

The cities we live in today will fuel economic growth and social well-being. Geospatial will be crucial for digital future of tomorrow's connected smart cities and for upgrading the existing infrastructure to meet the demands for better amenities at homes, workplaces, commercial spaces, civic amenities and utility infrastructure in the future urban landscapes.

In such transformative phase, demand for BIM continues to rise for centralized data sources that can render 24/7 access to real-time updated data 'anywhere-anytime'. With associated benefits of low maintenance, cost, flexibility, and scalability and upgradation, such seamless integration brings all the stakeholders of the project on the same page. BIM is majorly based on the geo-platform which of course amplifies significance of geospatial in the AEC sector.

### **3.5 Major Challenges for Geospatial Adoption:**

To gather full perspectives on identifying major roadblocks to adoption of BIM+GIS adoption in AEC requires primary surveys on specific questions respectively with the government authorities, contractors, architects, engineers, project managers, planning firms and facility management professionals.

#### **Major reasons cited by several reports are:**

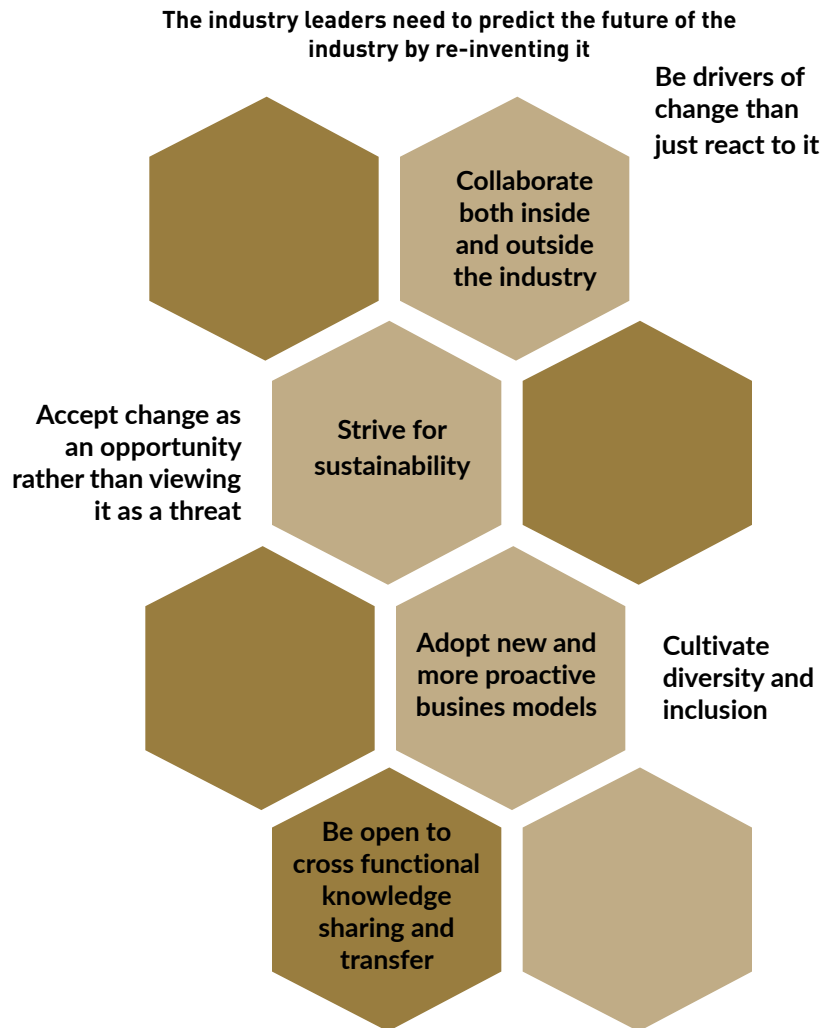
- Digital integration is an important aspect of BIM adoption
- General mindset that innovation requires being open to fail –
  - an industry where acceptance of failure can lead to a legal suit for a project, it becomes very difficult to convince decision makers / project owners to accept a new way of working
  - Time and cost overruns in infra projects narrow down profit margins and any add on value will further escalate costs which will further make profits margins thin. BIM+GIS helps in controlling time and cost overruns.
- There are a large number of businesses and specialties involved in the construction hence bringing integration is must.
- Data interchange and compatibility, standards, operating procedures will be a real challenge in bringing synergies in the processes.
- Lack of skilled workforce to work in technologically advanced work environments is another major roadblock
- Any innovations / technology adoption is an area of R&D in an industry. The costs of R&D are immediate and RoI's are delivered in long term over succession of successful projects. The AEC industry runs form project to project basis, hence such decisions on new technology adoption require farsightedness and 100% conviction about the value of using such know-how.

## 3.6 Future Pathways

The future of the industry is bright when seen in the context of a few estimates by McKinsey Global Institute:

- The world will need to spend \$57 trillion on infrastructure through 2030 to keep pace with global GDP growth
- This is a massive incentive for the construction industry to transform productivity and project delivery through new technologies and improved practices.
- The large construction projects often take 20 percent more time to finish than what is originally scheduled
- Every construction process has its very specific characteristics and many and often changing players

McKinsey Global Institute recommends that the construction industry is at a turning point and two of the technologies that will drive transformation of the AEC industry are geospatial and BIM.



# Industry Focus: Telecommunication

## 4.1 Overview:

The telecom sector is the backbone of all information and communication services through phones, Internet, wireless sensors, satellite networks, airwaves/cables. The key stakeholders being the cable companies, internet service providers, satellite companies and wireless network operators. With ongoing Industry 4.0 and the buzz about the 5G's massive rollout, telecom sector is to drive transformations and equally explore new territories to stay ahead in underpinning technological advancements in the interconnected, shared economies and digital ecosystems of industries.

## 4.2 Industry landscape & value chain

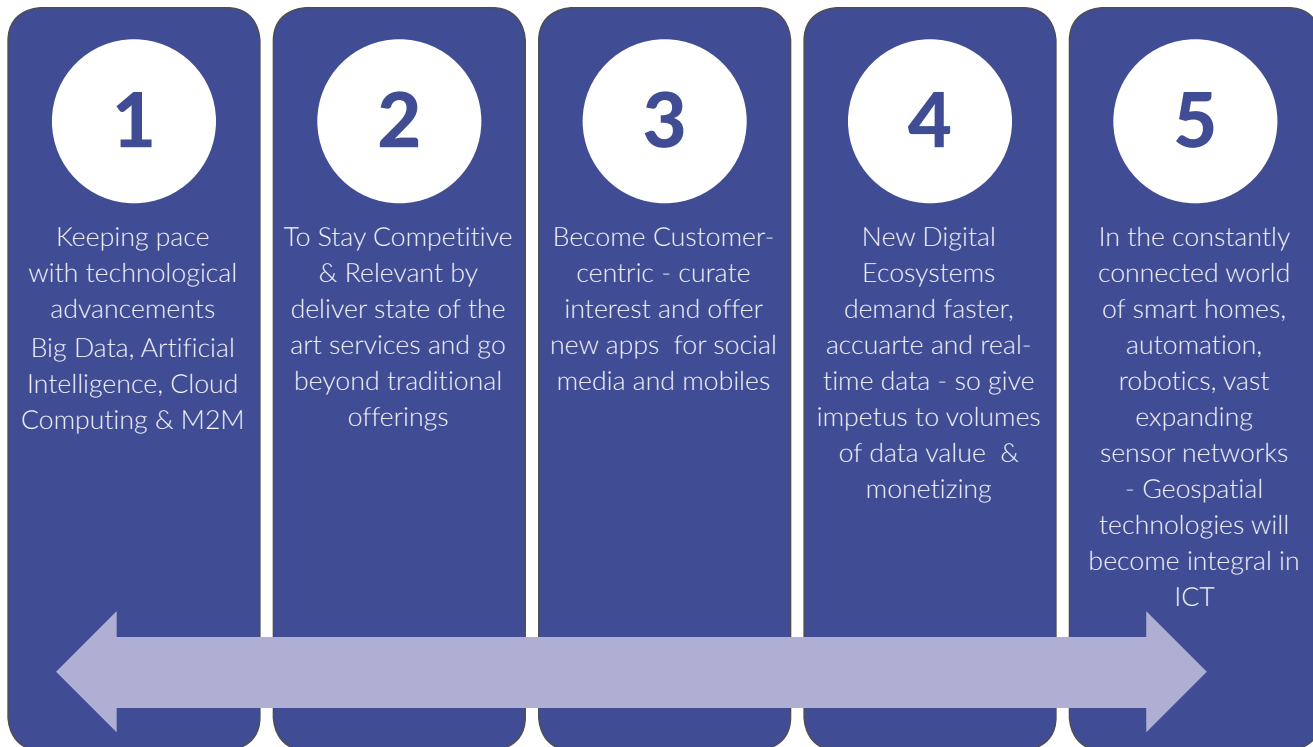
The telecommunications sector consists of three basic sub-sectors: telecom equipment (the largest), telecom services (next largest) and the smallest but fastest-growing, area within the sector is wireless communications, more and more communications and computing shift to mobile devices; demand for content/data services is constantly rising. The biggest winning factor for a company in this domain will be - network bandwidth that offers best speed and connectivity.

A recent report by McKinsey & Company states that 'digitization in the telecom sector could improve profits by as much as 35%, yet the average achieved so far is only 9%.'

The way digitization is reshaping every industry, players in telecom sector have to embrace smart use of technological advancements for a holistic digital transformation.

Transition of telecom sector from being a mere utility service provider to a full-spectrum-services data ecosystem will require investments in new technology infrastructure, know-how & expertise to stay relevant and maintain consistent growth.

**As Telecom Industry takes on the fifth-generation networks, Evolving Landscape of the industry will further undergo a paradigm shift**



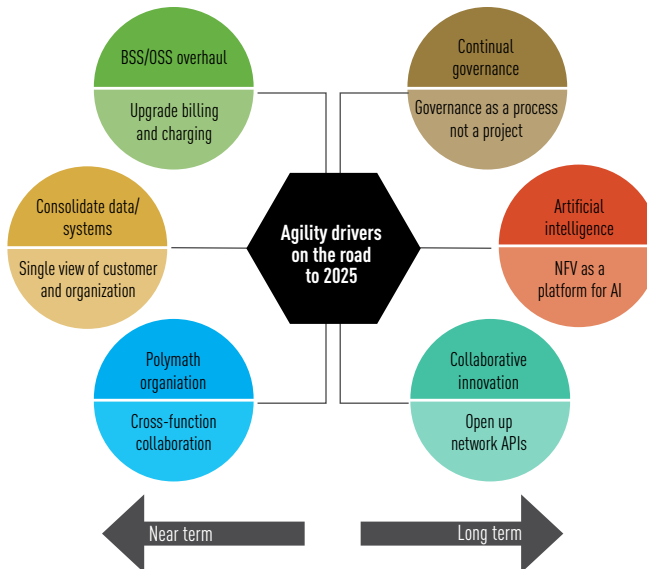
**Here are two distinct business models that are governed by strategic aspiration and brand identity of a telecom company**

The real game changer is how well a telecom company aligns its' resources, capabilities and bouquet of services by either being rigid to continue the legacy or being agile and innovative.



## 4.3 Emerging Trends & Directions

In the midst of disruption, the strategic agenda of the industry will require to dovetail digital business models, process automation, analytics, virtualization, Artificial Learning & Machine learning capabilities to create adaptive data monetization models for business insights, for governance, better citizen services, smart utilities and automation. In these transformative times the winners in telecommunications will be those who move beyond their legacy IT systems and here are a few drivers that will make telecoms more agile



## 4.4 Strategic Initiatives & Opportunities

WGIC is initiating a collaboration with International Telecommunication Union (ITU), the largest professional organization for the Information and Communication Technology – operating under the aegis of the UN. The ITU Telecom World and several strategic events bring several stakeholders of the telecom industry for thought-provoking conversations, presentations and dialogues that pave the way for strategic collaborations in the sector.

The intent of such collaboration between WGIC & ITU will be on initiating reciprocal invitations, white paper publications, dialogues on scope of geospatial integration by showcasing case studies on value and utility of geospatial in the sector.

Here are a few links to explore the opportunities on horizon –

<https://telecomworld.itu.int/> - ITU Telecom World Conference





## 4.5 Major Challenges for Geospatial Adoption

It is widely well acknowledged that the telecom sector is undergoing major transformation. In a deeply disrupted environment, the industry players have to face the challenge of staying at their best for providing fast, secure and reliable networks to fuel vast interconnected digital world. Simultaneously, the telecom companies need to serve virtually every sector with volumes of data for analytics and content for apps that have become critical assets offering unparalleled value for competitive edge.

### Major Challenges faced by the Telecom Sector that act as deterrents for optimum adoption of geospatial technologies in the sector

Lack of Organizational Agility

Concerns about RoI on investments

Uncertain Regulatory environments

Changing customer profiles and needs

## 4.6 Future Pathways

Geospatial data will play significant role in helping telecoms address emerging challenges and pave a roadmap for the future. Geospatial will greatly benefit from the fast speed and connectivity of 5G networks for flawless data capturing and integration. There is no exaggeration in saying that geospatial and 5G are interdependent and both together will drastically change the dynamics for future smart cities, utilities, transportation systems specially in the context of Mobility-as-a-Service (MaaS), robotics, automation tools and almost everything in the hyperconnected world of sensors.

**Geospatial data will help in modelling and for greater precision in setting up of:**

- Advanced wireless network planning for 5G as new small cell models will be composed for each street & block

Geodata can also be accessed by ready-to-use Earth imagery. However for intensive research and development, several organizations would like to approach for custom data sets for unique modelling methodologies and for greater competitive advantage.

- Better infrastructure planning/construction engineering

Rapid urbanization will make laying of new fiber optics/ placement of wireless infrastructure more cumbersome. Most recent and accurate geospatial information will be important to determine optimal placement locations for reliable analysis & modelling of such new infrastructure, to remotely monitor such laying and for surveillance as well.

- IoT Solutions

Optimal penetration and success of IoT depends on high-speed wireless networks, which greatly depends on the coverage and capacity that telecos provide to support smart devices in the remotest village at a farm to most high-tech smart city. Besides this data aggregation, analysis and communication of the patterns / key insights (everything in nearly real-time) – these developments will bring attention to geospatial, location data, sensor technologies, establishing an ecosystem of geospatial and remote sensing resources as well as support services for data processing and analysis as a continuum.

**There is no exaggeration in saying that geospatial and 5G are interdependent and both together will drastically change the dynamics for future smart cities, utilities, transportation systems specially in the context of (MaaS), robotics, automation tools and almost everything in the hyperconnected world of sensors.**

# Industry Focus: Urban Development & Smart Cities

## 5.1 Overview:

Urban areas are facing increased agglomeration and thus, are burdened to develop to self-sustaining environments. This growth of urban areas and the upcoming of smart cities have now coincided. Geospatial technology and its applications have become centric to sustain urban development and growth of smart cities in areas of energy, environment, governance, living conditions, etc. Geospatial technology is imagined to enable automation and real time integrated city monitoring and management.

GIS specifically can be used for a plethora of urban development activities as shown below.



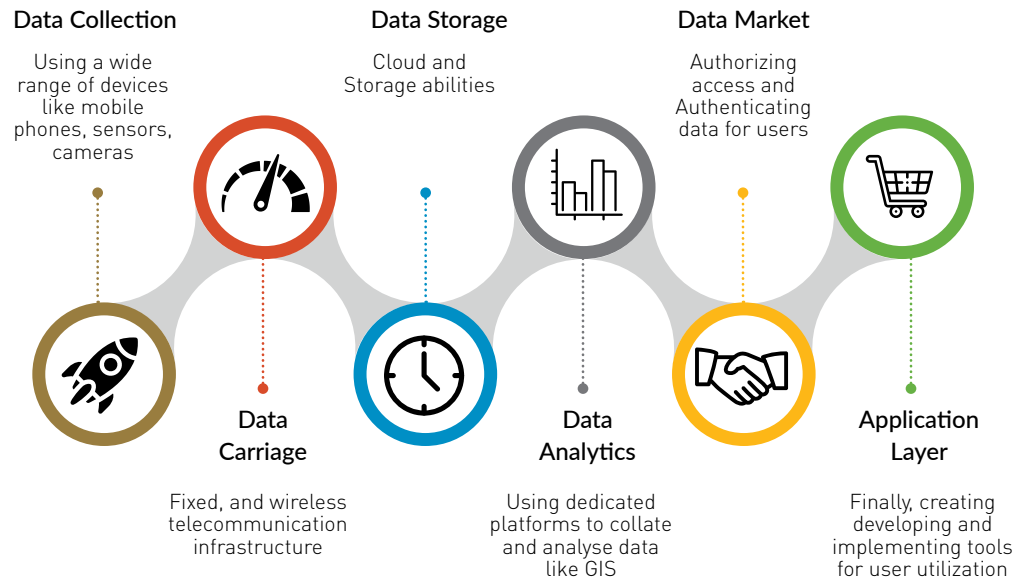
## 5.2 Industry landscape & value chain

The value chain illustrated below describes the most important aspect of the technological landscape in the urban development and smart city sector, i.e., data. The direct implication of this is in data governance and skill development. Using geospatial technology, thus intermittently affects not only the sustainability of the city but also different aspects of urban development.

## Key Aspects of New Urban Development

- Improved dichotomies and description of city challenges using sensors and the Internet of Things (IoT), for areas ranging from transport to energy.
- Enhanced accountability for all measurable policy results.
- Increased transparency between citizens and local governments
- Better targeted innovation and entrepreneurship programs to address city needs.
- Upgraded collective intelligence for the transformation of cities.

## Smart City and Data Based Analytics



## 5.3 Emerging Trends & Directions

To succeed, a major trend that has come up across multiple smart cities (for example, Casablanca) is the involvement of the citizens.

The importance of data and reduction of the digital divide is a common theme that occurs across all smart cities. This has resulted in a stronger inclination towards open and interoperable data. Some recent initiatives and trends are;

- The Open Agile & Smart Cities
- Fireware Community
- The City Protocol Society

These programmes help connect cities across the world on the platform of technology, using and developing APIs in open source to help collect and apply technology in all geographies.

### CITY OPEN DATA STRATEGY

- Citizens become contributors of data.
- Access to consumer and real time data increases.
- The cost of implementation is not too high. Installation, standardization and capacity building cost.



### SOCIAL MEDIA TOOLS

- Data dependent on geographies can be collated.
- Easier access to collective intelligence.
- Low implementation cost.

### MATCHMAKING PLATFORMS

- Reduces digital divide.
- Fosters Transformation.
- Medium cost of implementation. However, does require a long term strategy

### SOCIAL AND INNOVATION LABS

- Reduces digital divide.
- Fosters innovation and infrastructure, technoparks, smart technology villagers
- Medium cost of implementation

## 5.4 Strategic Initiatives and Opportunities

These initiatives mentioned above are initial points for collaboration. Some others in the EU region include:

- UCLG – Urban City & Local Governments – championing the cause of ULB’s, governance, municipalities and key urban authorities worldwide – [www.uclg.org](http://www.uclg.org)
- Smart Cities Council - <https://smartcitiescouncil.com/>
- Street Lab <http://www.streetlab-vision.com/>

## 5.5 Major Challenges for Geospatial Adoption

Due high rate of urbanisation across the world, there are still some challenges that Geospatial Adoption may face across the sector of urban development.

- High Population Growth and Urbanization: With the high rate of migration from rural areas to urban areas and the growth in urban populations it is hard for geospatial applications to be relevant unless surveys and population to land scans are conducted on a regular basis and possibly provide real time data.

By 2030, UN predicts that there will be more than 500 million cities in the world. The growing number of these cities in Asia and Africa show a sign of very high urban development. They are also posing challenges to the government and planning agencies. Government, public and developers

have to work in collaboration as such massive projects will require huge financial investments and teams that worked in silos are now required share data to the central data centers.

- Unclear project guidelines, lack of coordination among different agencies and urban local bodies, vast amounts of structured and unstructured data, legacy systems, inadequate modern infrastructure tools - are some factors that cause hindrances in full scale adoption of geospatial tools.

## **5.6 Future Pathways**

- With the introduction of BIM, urban development has come further into the forefront in geo-design for data integration and management, visualization mapping and modelling and decision making and implementation.
- With data being so central to the future of urbanisation, with common databases as those maintained by Urban Observatory. GIS platforms paint a future where GIS is a common ingredient for transparent and comprehensive frameworks that uphold the development and growth of urban areas and cities.

# Industry Focus: Energy

## 6.1 Overview

The energy sector encompasses and signifies interrelated companies involved in the exploration and development of oil or gas reserves, oil and gas drilling and refining, or integrated power utility companies including renewable energy and coal.

The industry is currently undergoing two-pronged transformation. On the one hand, countries continue to build/update modern transmission and distribution infrastructure, constantly expanding and modernizing the system. While on the other hand, the global-energy mix is shifting towards using more renewable sources of generation. Both of these areas are hugely impacted by the application of geospatial technologies.

For the management of transmission and distribution infrastructure, geospatial technologies like GNSS, GIS, GPR, LiDAR, Earth Observation, etc. play a critical role. Similarly, for mapping the new source of the renewable generation and to estimate their potential and feasibility, geospatial technologies are instrumental.

## 6.2 Industry Landscape & Value Chain

Every aspect of modern life, economic growth and prosperity is underpinned by energy. The sector dynamics reel under the heat of demand and supply. The traditional energy sources like coal and oil are exhaustible, hence a paradigm shift is required towards renewable & alternative sources of energy for sustainable and more secure energy future.

Geospatial and Smart-grid technologies have an important role to play in developing and managing renewable energy resources. By providing timely and detailed information on energy consumption, a smart grid will allow utilities and consumers alike to be more efficient in their energy use.

Increasing demand, aging infrastructure, environmental concerns and regulations, and fast depleting energy sources necessitate that stakeholders & companies look at 'intelligent' and 'smart' processes and leveraging appropriate technologies to tap energy alternatives.

## 6.3 Emerging Trends and Directions

World Energy Council published a report on Energy Trilemma and key factors that will drastically redefine industry landscape.

Key themes that will be impacting the energy industry towards driving significant changes and for strategic decisions shall be:

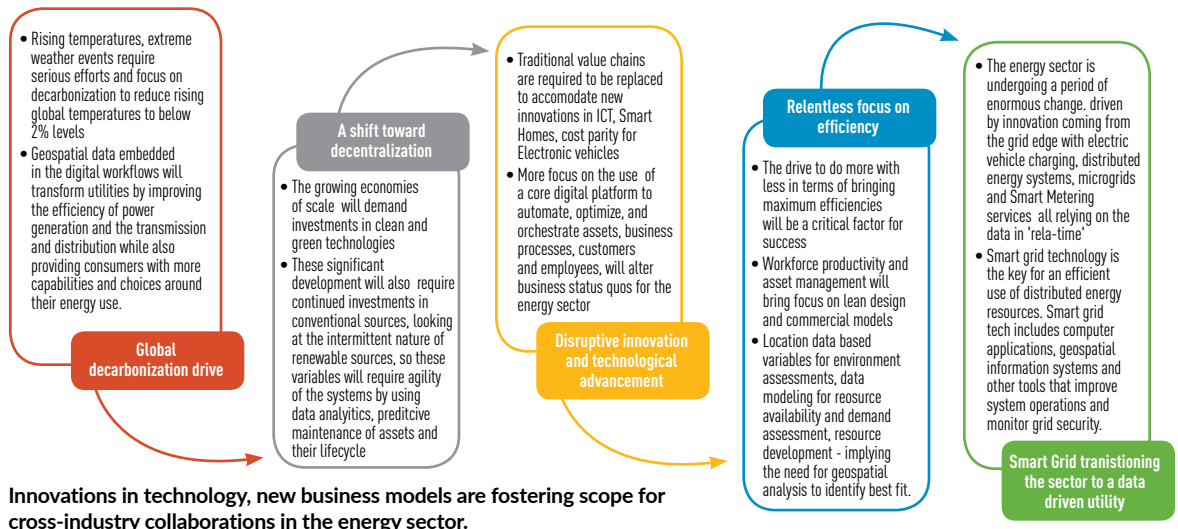
- Security of supply
- Affordability
- Sustainability

**80%**  
**Rise in Global Electricity Demand**  
 by 2040 from 2010 (Source: ExxonMobil)



Depending upon regional priorities, governments and energy companies will be required to do trade-offs within this framework of energy trilemma.

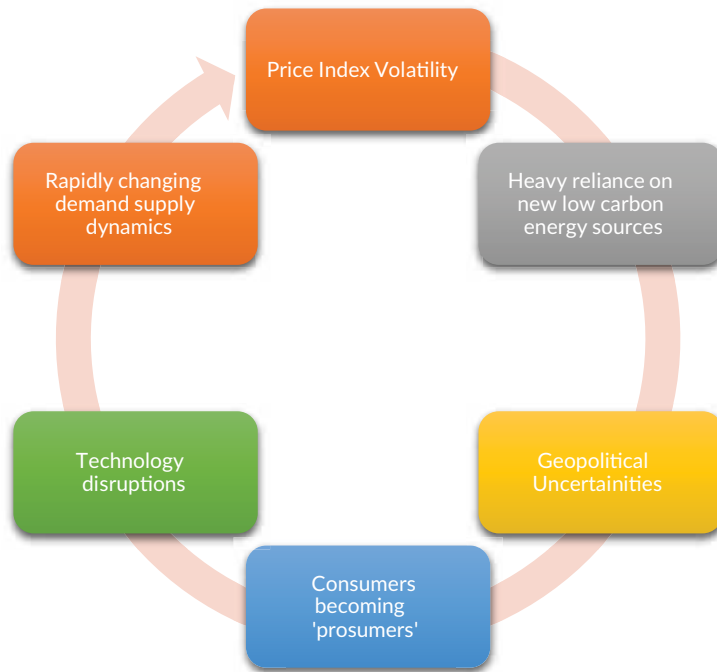
### Key trends in the Energy Sector and Role of Geospatial





## 6.4 Strategic Initiatives and Opportunities

The energy industry today faces complex challenges that have far reaching implication on the sector



All these changes are necessitating consolidation and diversification for optimum environmental efficiency and profitability.

WGIC is exploring potential synergies and initiating dialogues for long-term meaningful cross-sectoral collaborations with apex industry associations and professional forum in the energy sector:

- International Energy Agency for Geospatial Data for Universal Energy Access Assessment in developing world (discussions at initial stage)
- World Energy Council for a white paper presentation during the World Energy Congress in September (discussions at initial stage)

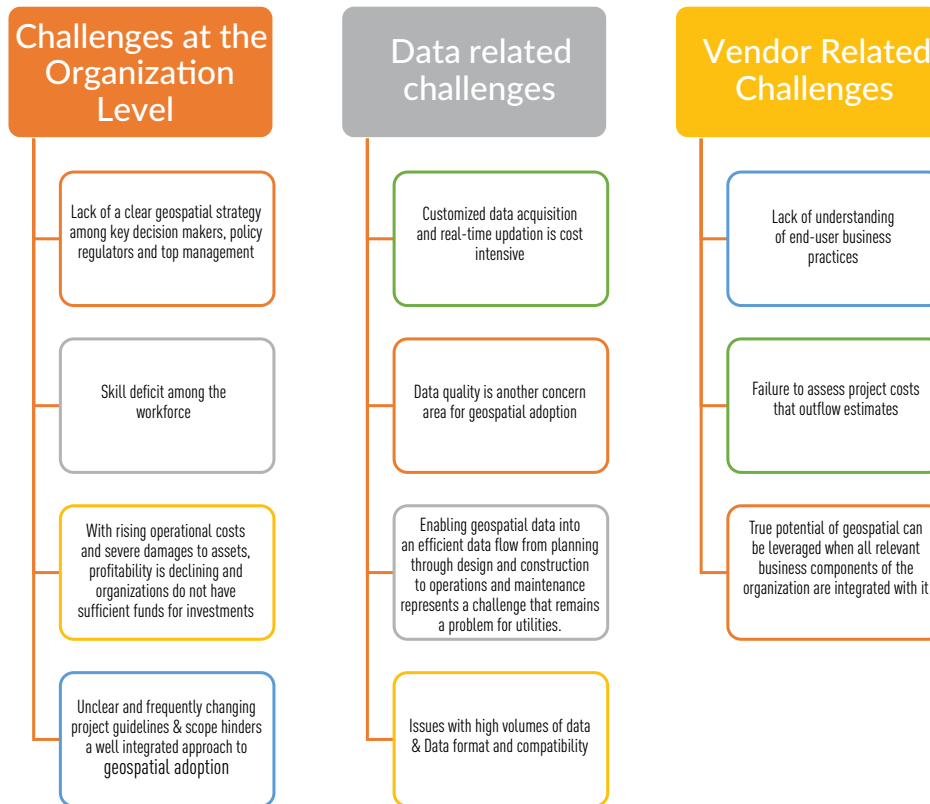
### **Other significant organizations on the radar are:**

- European Energy Research Alliance
- International Energy Forum
- Global Institute for Energy Environment & Sustainability
- International Renewable Energy Agency

## 6.5 Major Challenges in Geospatial Adoption

Energy is becoming the pulse of every modern activity today. Besides extensive use of power for residential purposes, several other sectors are also hugely dependent on energy – Agriculture, Construction, Manufacturing, ICT, Health Services, Food Supply Chains, Automobile and many more. The sector is under tremendous pressure to perform efficiently, generate enough to meet the rising demands and be sensitive to environment concerns as well. GIS, Remote sensing, IoT, 3D technologies offer powerful tools for a whole new perspective and nuanced insights to solve complex problems in the realm of integrated utilities, oil & gas, renewables and coal.

### Challenges in Geospatial Technology Adoption



Source: Geospatial Media Analysis

## 6.6 Future Roadmap

- For fully harnessing the power of geospatial technologies, energy utility, government & solution providers are required to explore knowledge exchange opportunities on data use and its utility across the value chain
- A well carved out energy data roadmap will help in dynamic assessment of changes in the energy market and by exploring new business models
- Distributed energy resources (DERs) and the associated prosumers will continue to grow in number.

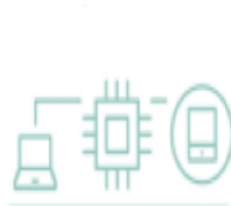
GIS based analytics helps in customized offerings by modelling consumer demographics and growth patterns – to predict demand & resources for future needs. If today's power providers learn to harness location intelligence for changing needs and customer segmentation across smart homes, industrial automation, transportation and other utilities, the sector will be able to successfully steer innovations towards clean & green energy initiatives for ensuring a sustainable future.

# Industry Focus: Intelligent Transport & Logistics

## 7.1 Overview

An Intelligent Transport System (ITS) has seamless communication and integration between different modes of transportation. Multiple public and private institutions need to function in tandem with each other to efficiently run such largescale systems. Efficient management of information and infrastructure within and ITS requires a high degree of location awareness built into the system. Geospatial technologies are an indispensable element. Integrated GIS systems, map contents, location data, etc. are of critical importance for such operations.

### Various Components of Intelligent Transport Systems (ITS)



#### Software

- Algorithms
- Mobile apps
- Operating & Management systems



#### Modes

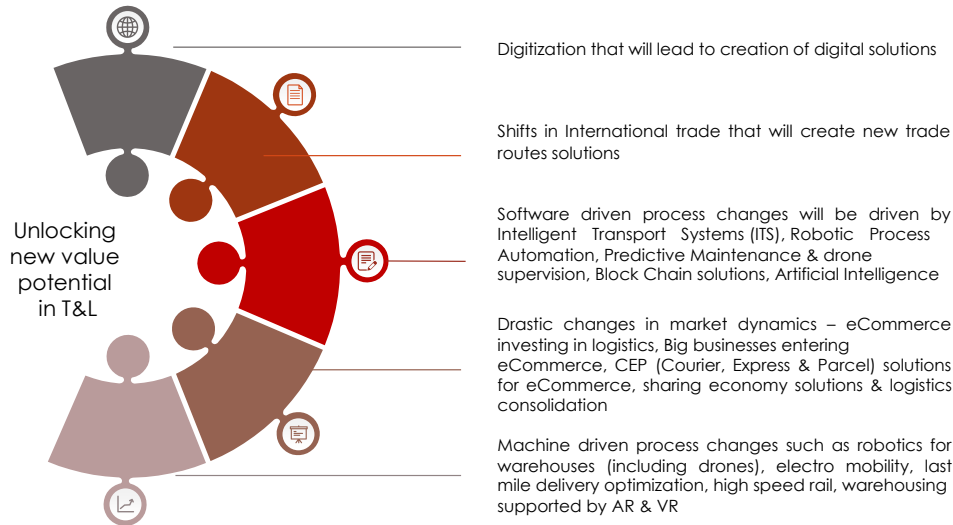
- Car
- Train
- Airplanes
- UAV's



#### Infrastructure

- Fiber network
- Mobile network (4G / 5G)
- Sensor Network
- Infrastructure for public transport
- Wireless infrastructure (terrestrial)

## Five Key Forces that will transform Transport & Logistics Sector



Source: Adapted from a report by PwC

## 7.2 Industry Landscape & Value Chain

Intelligent Transport Systems (ITS) include integrated network of information & communication technologies, navigation systems, data sensors and other devices for data collection and transmission systems blended with spatial analytics and positioning technologies that collectively enhance real-time mapping and smarter inner-city travel making commuting hassle free by better traffic management, faster response to emergencies, automated vehicle tracking, toll collections and fleet management.

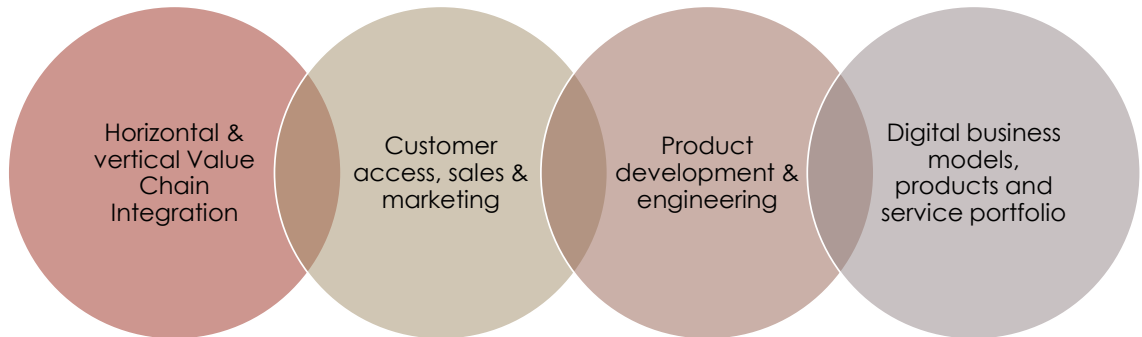
How to tap full potential of geospatial technologies for agility in public transport & logistics is an integral theme of discussions. In this data driven intelligent transport systems spatial data is delivering tangible value and further integrated planning, multi-stakeholder collaborations and multi-model partnerships will help the sector in harnessing the benefits of geospatial data economy.

## 7.3 Emerging Trends & Directions

In the 21st century information age, many new opportunities are opening up to make existing transportation network far more efficient & user friendly to offer precisely what users want, when they want and how they want it.

Undoubtedly, the transport and logistics sector is undergoing an important transformation as new technological solutions come into everyday use, driven by market trends. Transport & Logistics

## Imperatives for Digitization & integration



sector is progressively digitalizing across for integrating entire value chain, customer-centric business processes, for innovating new products and well-integrated business models to render its bouquet of product & services, seamlessly.

Another emerging trend is Mobility as a Service (MaaS) / Micro-mobility Model / Integrated Mobility that are interchangeably used phenomena in the intelligent transport / public transport space and cities are piloting versions of 'peer-to-peer' (P2P) offerings to Integrated public transportation to combined mobility. The vision is that citizens should fully start to rely on multi-modes of public transport with no need to own a personal car.

Public transportation now stands at a new frontier as most public transport planners in cities are conceptually embracing MaaS:

- to make cities less vehicle-centric
- to offer wider mobility options for the users

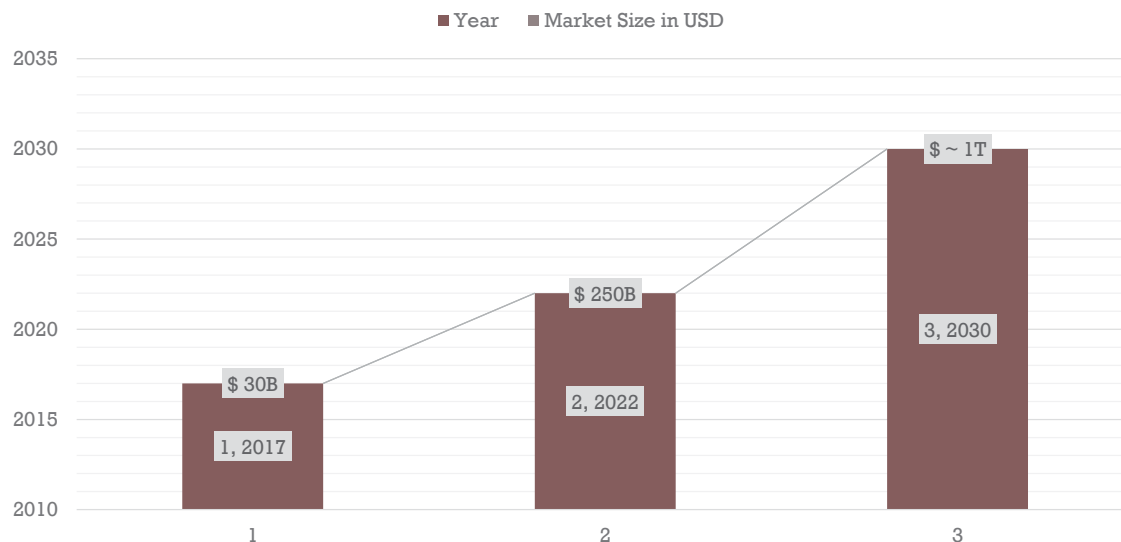
Market for MaaS is set for a growth of 23% CAGR between 2017 - 2030 , from \$ 30 billion in 2017 to \$ 250 billion in 2022 and \$ 1 trillion in 2030.

As the competition dynamics are changing - automation, digitization and integration with spatial analytics and location intelligence blended with host of other technologies such as AI and IoT, is

becoming the key differentiator to businesses to improve customer experience, drive revenue and increase operational efficiency; and make smarter decision for smart mobility & logistics.

## 7.4 Strategic initiatives & opportunities

### MaaS Market Growth Forecast at a CAGR of 23%



The secretariat at WGIC is initiating dialogues with International Public Transport Agency (UITP), International Road Transport Union and International Transport Forum to come together for dialogues on policies, regulatory frameworks and use of geospatial data in the changing dynamics of the industry.

## 7.5 Major Challenges in Geospatial Adoption

High costs of the technology is a major challenge that hampers adoption of geospatial technology despite a wide number of applications and the unparalleled value this technology offers. In addition to this, national policies, regulatory frameworks, interoperability issues in several countries are also key factors that impact adoption of location technologies.

### Lack of financing

The use case studies are sparse to demonstrate great returns on investment and combined socio-economic & environmental benefits. Hence public funding, company budgets or government projects do not factor-in major investments in geospatial technologies.

### Lack of technical expertise & skilled personnel

Institutional capacity and curriculum in a country follows 'the demand & supply' factors for capacity development to ensure that the majority of certified skilled people have employability / avenues to generate incomes. As geospatial is gradually considered 'mainstream' - choices are limited for current workforce to upgrade their knowledge or next generation to be fully equipped with know-how on geospatial and allied streams.

### Technical complexities

ITS systems are in itself so complex & wide and many a times working upon data which is either not accurate or out of time - to discern certain replicable patterns / predictive modeling is a complex issue. Geospatial suite of technologies being so 'niche' is considered as unfathomable and hence any strategic decisions on full scale integration of these technologies require strong will & conviction on part of key decision makers.

### Regulatory Constraints & Uncertainties

For each specific use and analysis, unique data sets are required for infrastructure planning and management, safety analysis, travel demand analysis, traffic monitoring and control, public transit planning and operations, environmental impacts assessment, intelligent transportation systems (ITS), routing and scheduling, vehicle tracking and dispatching, fleet management, site selection and service area analysis, and supply chain management. For developing such vast applications, data regulations have to introduce an environment that enables data accessibility & equally addresses sensitivities & security aspects associated with public data.

## 7.6 Future Pathways

Moving towards fully autonomous vehicles is the future of transport. The use of GIS and GNSS technologies in transport cannot be undermined. They are crucial in developing sound urban mobility solutions. Traffic mapping, route selection, traffic modelling, accident analysis, charting out safe routes for autonomous vehicles are areas where GIS and GNSS will play a key role by helping companies develop sustainable mobility solutions for the future and in mitigation of woes for city planners and travellers.



# Industry Focus: Agriculture

## 8.1 Overview:

The digitization and innovations are bringing massive transformations in every sector, however agriculture sector is still outside of technological ambit and agricultural production is still heavily dependent on naturally favourable conditions (rain-fall, temperatures, environmental conditions) and centuries old techniques of farming in many developing countries. Global population will grow by 35% over the next three decades, and to feed such growing population with fast changing dietary preferences, traditional practices have to be fast replaced and sector has to adopt modern techniques and geospatial tools to ensure food security for everyone.

Agriculture sector contributes approx. 6.4% to the overall GDP, however in many developing economies its Africa & Asia its overall contribution to the national GDP is three times higher than global levels. Rising age expectancy of the growers, shrinking numbers of people who opt farming as a career choice, climate change, debt traps, marginal incomes & rising expenses further complicate the issues for this sector.

The first green revolution brought about many shifts and advancements in the agriculture sector. It is time now that climate smart farming technologies come to revolutionize agriculture sector by significant value & demonstrating compelling to the farm producers.

## 8.2 Industry Landscape & Value Chain

In agriculture from practical and technical inputs on seeds, soil, water, control of weeds, diseases, insects & for yield mapping through sensor & UAV's to various forms of farming – farm cultivation to livestock and aquaculture to various other stages of storage facility, farm equipment, packing and distribution, geospatial technologies are crucial. Other success factors will be:

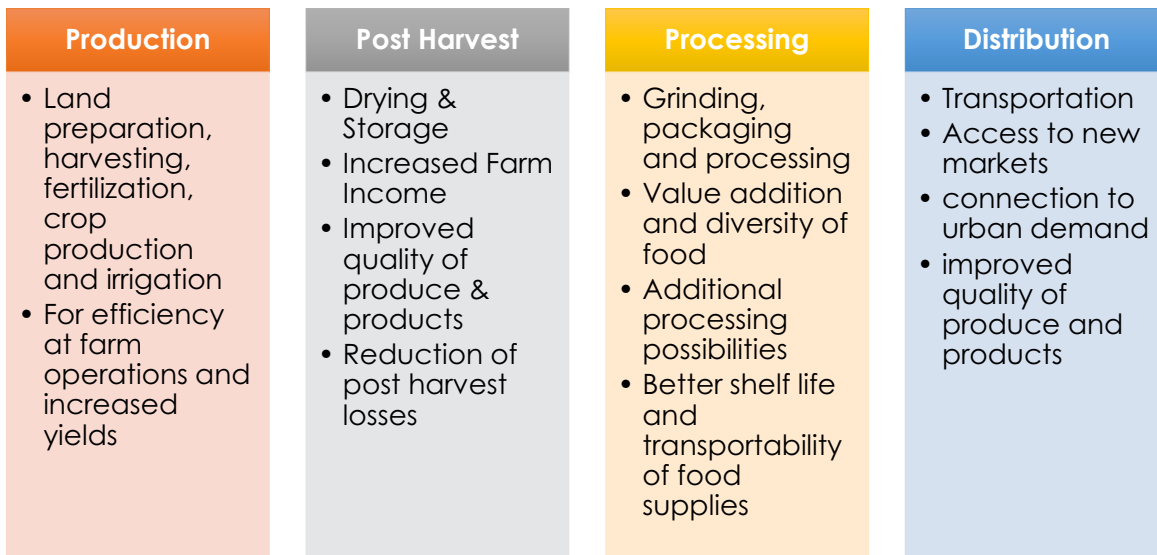
- productivity and sustainability of the value chain
- how well the environment and natural resource are conserved
- adaptability to climate change, price fluctuations and consumer needs; and
- bring improvements in people's lives and livelihoods

## The typical agricultural value chain



Source: A.T. Kearney analysis

## Benefits of technological advancements along the agriculture value chain

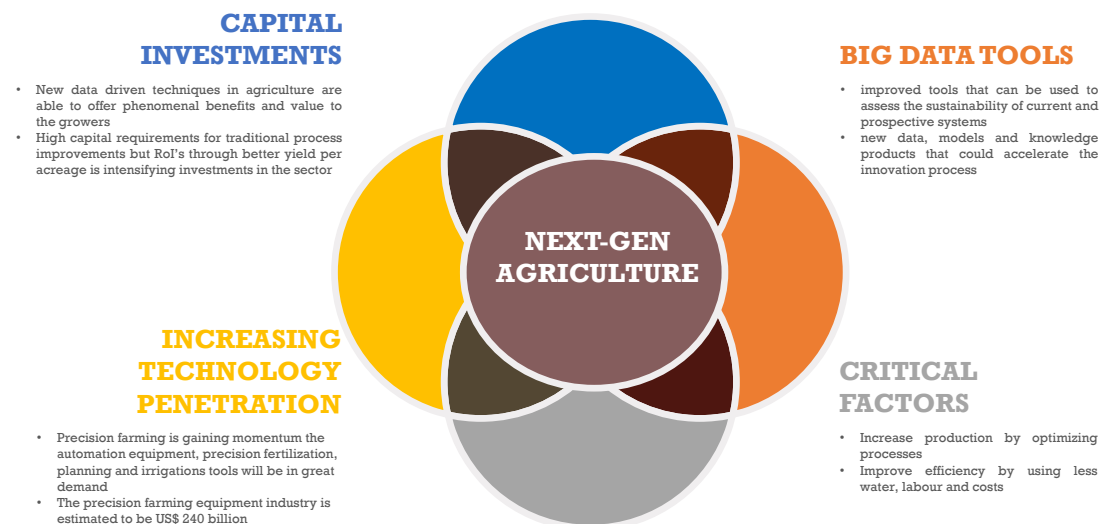


Technological advancements in agriculture sector with application of geospatial and communication technologies (ICTs), precision farming techniques and valuable insights based on contextual data in 'real-time' – have been quite rapidly creating an enabling environment for investments and innovations that unlock the potential of agriculture value chains from 'farm-to-fork' with sustainable pathways for sufficient, nutritious and affordable food.

### 8.3. Emerging Trends and Directions

Globally, a consensus is emerging that to meet global food security challenges of the 21st century, NextGen agricultural systems and climate adaptable farming techniques require vertical integration across the entire value chain.

### 8.4 Strategic Initiatives and Opportunities



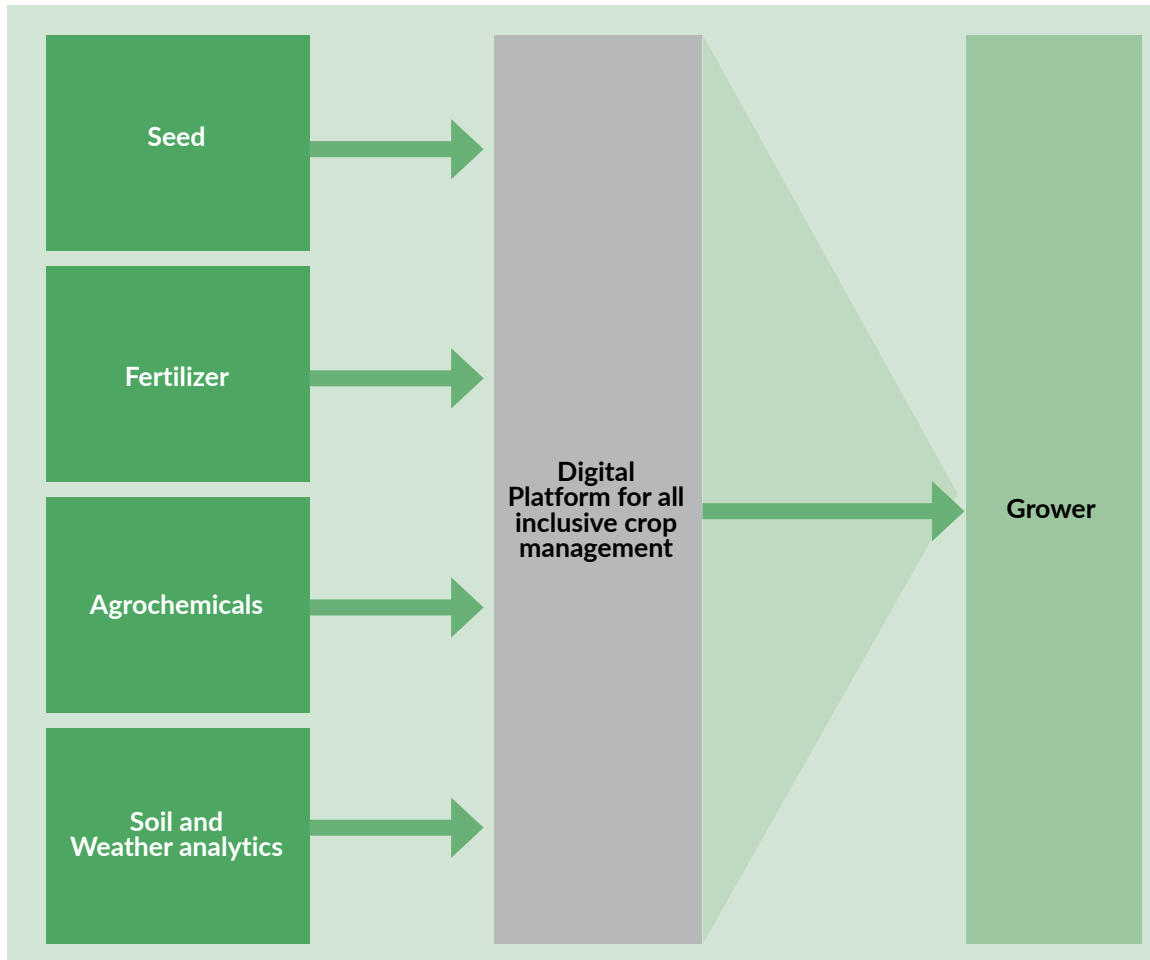
The process of technological advancement in the sector has been slow but steadily geospatial technology is used for surveying and mapping of plantation crops. At the micro level implementation of geospatial tools is mainly used for mapping of ground water resources, drainage patterns, variable rate application and management of fertilizers, pesticides and insecticides.

Geospatial technologies play an influential role in digital value chain of the agriculture sector by increasing yields, managing of resources, prediction of outcomes and improving farm practices.

Various opportunities for collaboration are unfolding for collaboration such as:

- Alliance for Farmers' Driven Climate Change Agenda - <http://www.theclimakers.org/>
- World Bank is leading Financer of Agriculture - <https://www.worldbank.org/en/topic/agriculture>
- Canadian Agriculture Partnership Program

## Digital Platform-based value chain



Several industry reports and case studies on best practices indicate growing interest on IoT and many other innovative technologies such as real-time farm monitoring, weather forecasting, optimal field requirements and similar others which will come up eventually and are thereby envisioned to make this industry garner a valuation of somewhere around USD 7.8 billion by 2022, registering a decent CAGR of more than 14% at the same time. Digitization will be path to prosperity for the agriculture sector.

### 8.5 Major Challenges for Geospatial Adoption

Geospatial technologies play a crucial role, a recent report by KPMG on Precision to Decision, highlights US\$ 20.3 billion (or 25% for the base year 2014 -15) gross value

production increment with the use of digital technologies without any constraints. Digital inequalities, lack of access to data on demonstrable value in adoption of technologies such as GIS, Remote Sensing – are some of the major factors that cause hurdles to geospatial adoption.

Bridging the digital divide by investments in Information and Communication Technology infrastructure to provide internet access / mobile networks will boost penetration of geospatial know-how at massive scales.

- Digital literacy is another major barrier to adoption across all regions.
- A general lack of awareness regarding technologies available, the knowledge required to understand the impact of technology, as well as the skills required to implement, effectively use and maintain technology.
- There is a general lack of interoperability between farm datasets, which makes it particularly difficult for farmers to easily combine and overlay data from different systems in order to access optimal insights with the technology they already have.
- Connectivity is another foundational element of IoT and other on-farm digital solutions. Challenges with access to mobile and internet telecommunications infrastructure is a deterrent for vast adoption.
- Lack of proven return on investment (ROI). Farmers are typically unwilling to outlay on new technologies which are largely-unproven.

## 8.6 Future Pathways

The adoption of technology in farming is still at a nascent stage and hence leaves immense scope for technology entrepreneurs to make a mark by introducing innovations in farming. The path to success will be determined by understanding collaboration needs with agriculture businesses and communities at the local level and designing business models and organizational structure in alignment with such needs. Besides this, being able to smoothly navigate through regulatory

frameworks, political affiliations, personal aspirations and government programs will also be a key factor in the success of such enterprises.

According to estimates from the United Nations, by 2050, the world's population expected to touch 9.1 billion, to feed rising population, agricultural production will have to be enhanced by 70%. Technological innovations combined with geospatial, will be able to scale up higher efficiency, effectiveness and productivity in the agriculture sector.

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