FUTURE GOVERNANCE AND VISION OF GEOSPATIAL WORLD: MARSPIRE

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Abstract

Establishing an infrastructure for geospatial information by determining policies and actions is one of the most important essentialities. Importance of making these policies has been perceived by all stakeholders in thelast decade and INSPIRE Directive became the prime mover in Europe. Beyond all these, trendy technologies and radical developments lead to new ideas and inspirations in geospatial techniques in order to shape future by innovation. The human expands geospatial activities even by planetary exploration missions, which also expands the vista of geospatial world.

As technological developments bring necessities of an extended vision and policy improvement, main argument would be based on INSPIRE's continentality and universality. In this context, governance and dataownership would not be in the same identity forms, thus governance would turn into a new futuristic form which should be predicted for21st Century's next decades.

With this futuristic approach's conditional convergence andsolid evidence of inadequate earth resources, we may think of new colonies established in other planets in a few decades'time.There would be colony governmentsreplacing local governments on earth, as well asresource management, sustainability, growth, wealth and inseparable peace-keeping issues still at the top of trends. Besides all these,we may encounter new information system types. Ordinarily, we would access enhanced VR/AR applications, mobilizing 3D big data. Unlimitedly shared, interoperable universal datawould be managed in 3rdgeneration clouds with new data themesandpolicies.Through evolving of future assets, new governance models and opportunities for geospatial business world would arise.

In this article, expanding INSPIRE's vision, possible shifts on geospatial missions, future policies and governance will be examined by discussing the inheritance of today's applications' possible impacts on geospatial world of next decades. In order to constitute the argument on a concrete basement, selection of few themes are tried on real data, which is acquired from HiRISE Programme's demanded high resolution Martian surface images and the study is called Marspire.

Keywords: geospatial policies; governance; planetary data; mars; geospatial convention; UNGGIM; geospatial technology trends

Introduction

20th Century lasted with a wall destroying end for a more peaceful world, fostering this millennium to run new passions of rising technologies for sustainably living.Although by this end and hopeful start of new millennium, disorderly radical thoughts had been trying to rise on earth, butalso radical technologies continued to survive for a peaceful growth.Beyond information technologies, geospatial information is striking by innovation.

World perceived a new state in 21st Century's first decade: The importance of establishing an infrastructure for geospatial information by determining policies and actions has been perceived by all stakeholders of geospatial world in the last decade.Trendy technologies led to new ideas and inspirations in geospatial techniques.In this conjuncture, INSPIRE Directive became the prime mover in Europe.

Globalisation seeks rational and efficient administrative structuring and more collaborative decision making procedures.The authority in charge of controlling resources is defined as the corporate structure which determines usage of resources in order to provide social and economic development. It can be called as good governance if the corporate structure lets and fosters public bodies and stakeholders into these procedures. Notion of good governance is pointing out organisations for restructuring. Good governance has three factors: Restrictions, public body - collaboration mechanisms and competitiveness. Government, private sector and society have common responsibilities in order to implement good governance.

There is a positive correlation between economic development of a country and geospatial policies and implementations. Geospatial policies are implemented by various organisational structures and governance instruments in various countries.Country reports which are published by UNGGIM verify that geographic information is considered as a basic component for national development by the countries.

The variety of geospatial policies and governance strategies are in a range whichconsist approaches like open and transparent government, strategic economic growth instrument to build geospatial leadership, sub-instrument for improving investments and defence. Existing governance organisational structures change according to the administration structure of countries and government bodies which need geospatial information.Besides practices of INSPIRE, many policy forms, governance instruments and SDI building efforts are encountered withgoals of sustainable geospatial future.

Geospatial business worldis pushing great effort in order to shape future by innovation and trendy technologies orient public services. Certainly there would be initial problems in governance, establishing NSDI and challenges in many countries.Convergence of proven policies and practices would be a key to leverage global geospatial good governance. While catching up a global state, it is essential not to fall behind the universal state since the human expands geospatial activities

even by planetary exploration missions, which also expands the vista of geospatial world.

Future Trends

Resource management, sustainability, growth, wealth and inseparable peace-keeping objectives would remain andinvestments on information-communication technologies would rise in order to provide a common-wealth in the future. Hence, ICTand geospatial technology trends can not be distinguished between infrastructure and data baselines. Current technological developments bring forth necessities of an extended vision and improvement of geospatial policies. Main argument would be based on INSPIRE's continentality and universality; in this context, governance and data ownership would not be in the same identity forms, thus governance would turn into futuristic forms which should be predicted for 21stCentury's next decades.

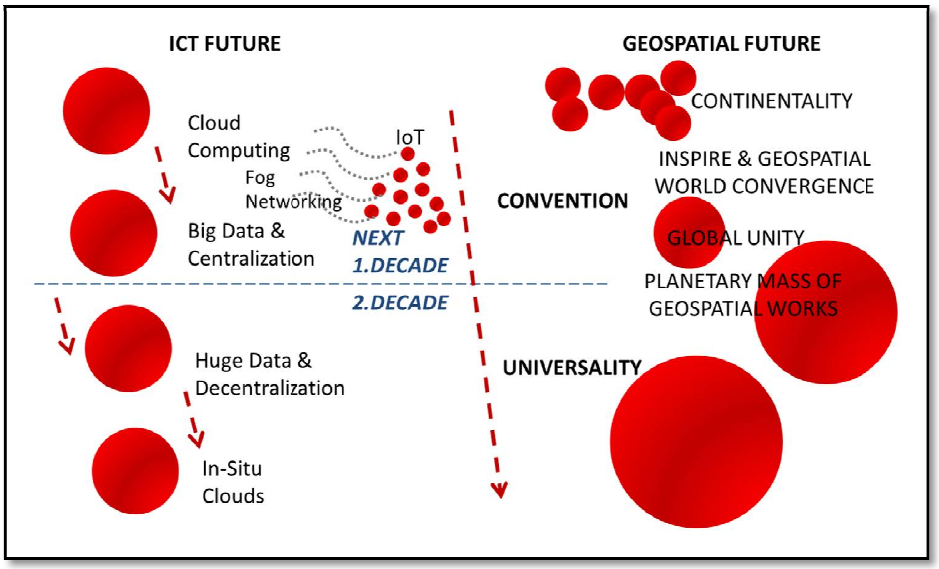


Figure 1A: ICT and Geospatial Future

Information and communication technologies will certainly continue to rise by standing on cloud computing facilities and emerging big data in the next decade. Besides, fog networking - Internet of Things (IoT) will be emerging too. With post-aggregation of data and technology at the second decade, there will be a "Huge Data" which is named by this assumption regarding to the aggregation and a decentralizationthat its occurrence is predicted by in-situ clouds (Figure 1A).

2ndGeneration Clouds would centralize data. This is the evolution stage for collection of data aggregated in clouds. Diversification of clouds and dissemination will drive through compact and low cost systems; just like the dissemination of PC at the end of 20thCentury. Regarding data and technological utilities for storing, processing and serving, geospatial data will be much more needed as cloud computing, fog networking and IoT are also in convergence. By new generation information systems,enhanced geospatial data, 3D and VR/AR applications would be ordinarily accessed.

Second decade's 3rdGeneration Cloudswould decentralize data by in-situ clouds. At this stage database management systems as we own today would turn intosuch an automation that would not necessarily need to be "operated", but operating itself, like many applications would be in the future.

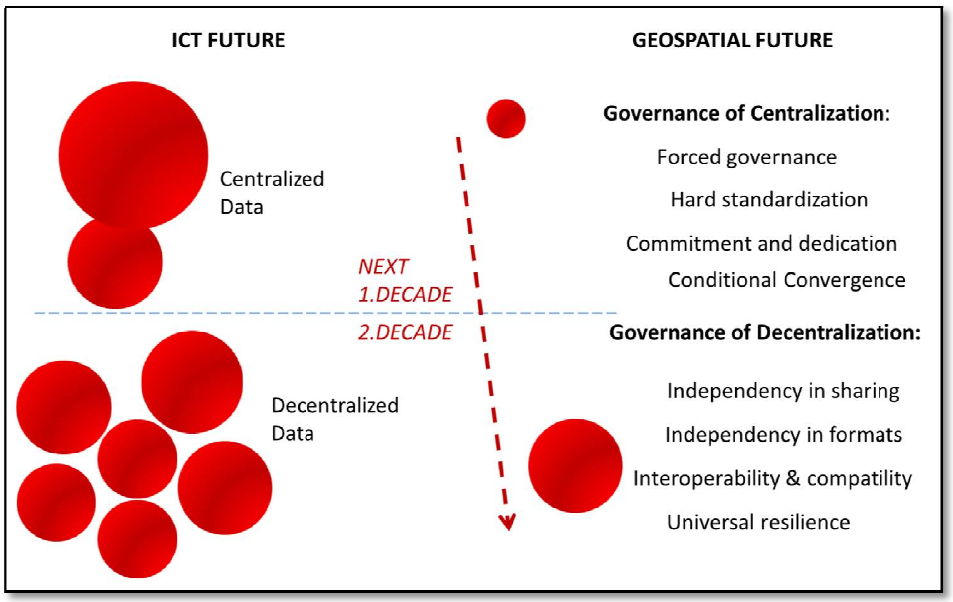


Figure 1B: ICT and Geospatial Future

Technological trends also affect determining governance structure and making geospatial policies. As a main foreseen trend of centralized data, governance structure and geospatial policies will be "centralized". This would be a forced governance and policy stage with hard standardization(Figure 1B). In developing countries, regional and local governance and participation enhancement programs should be developed through this period. Beyond, in decentralization period a state of +good governance is expected which is more resilient and transparent (Figure 2).

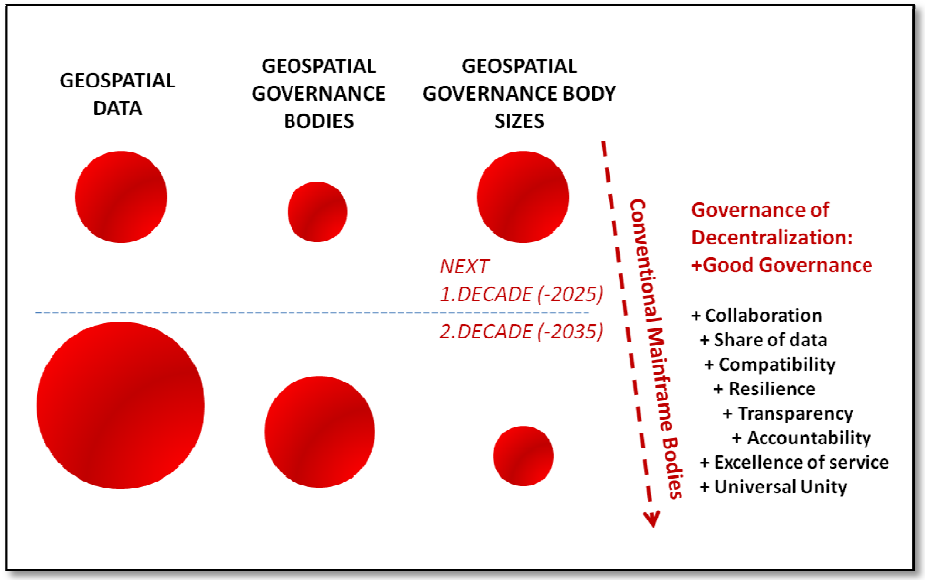


Figure 2: Future Geospatial Governance

Future geospatial human resources policies would changeby replacing ordinary skills with business intelligence which decreases labour. Autocorrelation tools are already being used for image processing works, which would disseminate through an “untouched” series of auto-actions in the next decade. Human resource, one of the five components of GIS shall be examined and new policies shall be developed. Besides all automation tools, intellectualhard-labour would still exist.

MARSPIRE

If human explores valuable resources somewhere in the universe, geospatial information would be its first actor. Space mission investments would not be only for scientific research. Goal would be exploration and research is indeed an instrument. It would not be surprise to encounterMartiancolonies as local governments in the future, where “value” collecting is held in new governance forms.

All technological trends would be valid for producing, processing and operating planetary geospatial data. Besides, ideas of establishing orbital internet networks float, in order to leverage an interplanetary communication network. In the means of processing many data themes at a time, instant 3D or sentimentally more dimensioned geospatial data would be sequentially collected, analyzed and reacquired repeatedly by usingreal time GIS data models and sensors.

Current Mars missions provide RGB imaging and also many instruments which produce geospatial data of Martian surface, atmosphere and structure. Additionally many countries are planning to actuate Mars missions soon; Finland, Netherlands, China, Japan and Russia plan to start series of missions in a decade’s time. By collaboration with Russia’s IKI-Roscosmos, ESA will launch ExoMars 2018 mission, the robotic exploration of Mars. Besides ESA and NASA are planning new missions as well, ESA has plans to land humans on Mars in the next second decade.

The imageESP_026701_1600 (Figure 3) was acquired by HiRISE-Hi Wish Programme and obtained data set is examined.Dataset is named as “Distal Valley Regions on Northern Slope of Tyrrhenus Mons”.

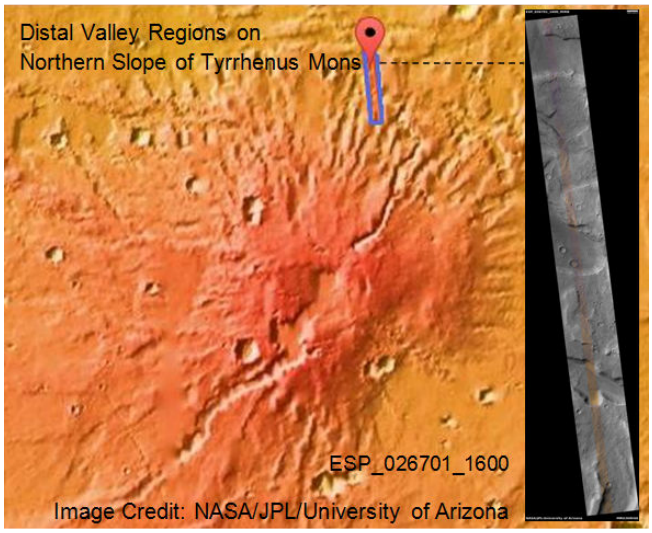
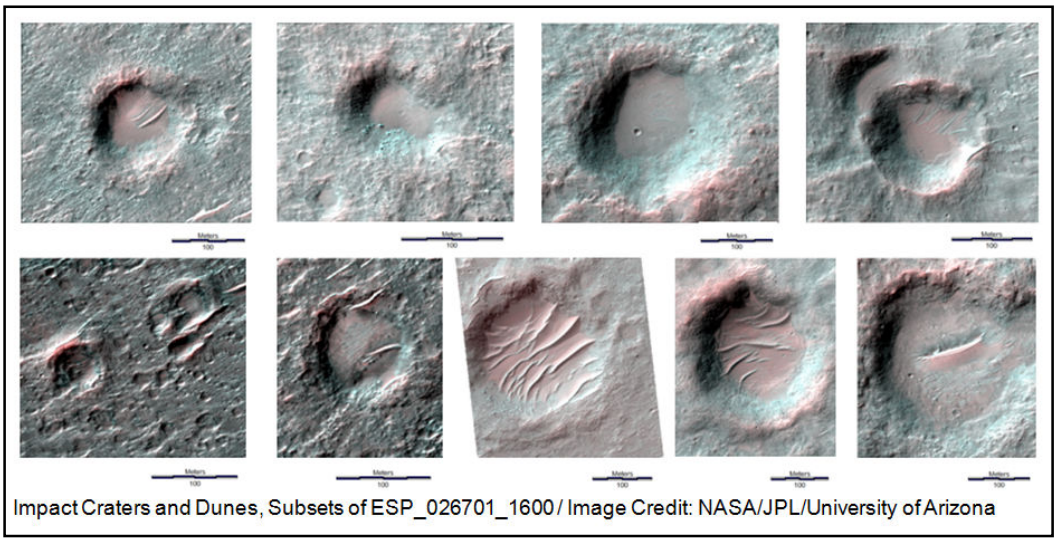


Figure 3

Essentiality of geographical names data theme of INSPIRE would be valid for Mars.Planetary nomenclature is approved by International Astronomical Union, however nations which conduct Mars missions would customize typing and match names. Geographical names theme maybe directly mirrored for Mars studies, with a universality state of INSPIRE.

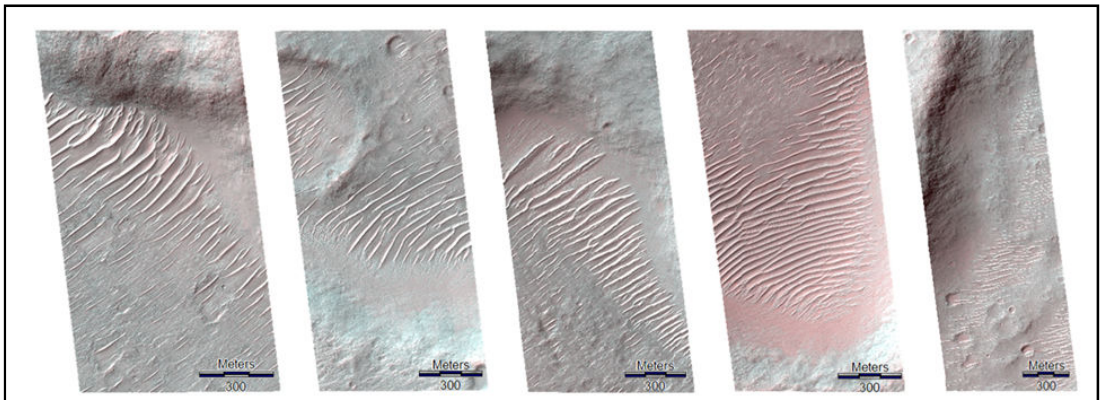
If INSPIRE Mineral resources theme is handled, current Mars mission instruments do not supply depth information, but supplying location and classification information are more essential in order to go forward at this stage. This theme may be applied by the means of operational information which would be filled in by next missions’ goals. In the data set there are many impact craters which would be subject to deep analysis of mineral resources (Figure 4).



Impact Craters and Dunes, Subsets of ESP_026701_1600 / Image Credit: NASA/JPL/University of Arizona

Figure 4

INSPIRE Geology Theme is seen as a reference data theme as it provides information for several themes. Hydrogeological information and ground model of the theme defines rock and groundwater system so that this part should be ignored for an evolved Marspire geology theme. However there are different formations like the ice locked away in deep subsurface. Characterizing geology of Mars is one of the main goals of current missions so that there is already a backlog of information(Figure 4-5).



Ripples and Fluvial Processes, Subsets of ESP_026701_1600 / Image Credit: NASA/JPL/University of Arizona

Figure 5

Climate assessment use case would fit for Marspire which is one of the mentioned use cases in the INSPIRE Data Specification on Atmospheric Conditions and Meteorological Geographical Features – Technical Guidelines Document. Currently there are no terrestrial geographic features for observation on Mars but mission instruments supply many information related to this data theme.

Coordinate reference systems are considered as reference data which presents a basic framework for interoperability. Datasets collected from past and existing Mars missions exist in a variety of disparate coordinate systems. NASA uses

Planetary Data System (PDS) and the dataset (Produced by University of Arizona in PDS Version3) has planetocentric coordinate system and equirectangular map projection which is most commonly used projection for Mars.The ISIS Software used by NASA makes it practical to process PDS but there are constraintsfor wider use of PDS in different kinds of existing geospatial softwares and tools.However GDAL can be used foraccessing to PDS data with read-only purpose. Inthis conjuncture, implementing practices and experiences of INSPIRE's coordinate reference systems theme would be very useful for establishing a universal state of PDS use. Besides, PDS Version 4 offers new data standards, formats, distributed architecture, services as well as international collaboration and using XML. PDS4 covers multi-level governance for data reuse.

Hence there is already a backlog of Mars geospatial data produced by several missions and there is no doubt that the backlog will increase rapidly. It is essential to providea comprehensive "Mars global" standardization including new data themes and instruments forgovernance and geospatial policies. It may not be related with Earth data except scientific comparison reasons but standards would, as auniversal level of geospatial policies application.

Jurisdiction of all celestial bodies has been put on UN Agreement - Moon Treaty, in 1979. Although it is commonly commented that treatment has failed, it defines and maintains a main frame for ownership and planetary activities which provides ethics of sharing data.It is certainly important that policies shall be made in order to acquire a good governance state of planetary geospatial data with the essential occupancy of UNGGIM.

Vision

There had been three consequent High Level Forums on UN-GGIM which were held in Seoul-2011, Doha-2013 and Beijing-2014.Seoul Declaration states the essentiality of sharing experiences in policy-making, supporting legislation, funding strategies, developing best practices in geospatial information management andworking together as an international community, under the coordination of UN. Both Doha and Beijing Declarations state the importance of geospatial information's role in sustainable development.As all declarations have a deep consistence, Beijing Declaration makes a stronger and more comprehensive overlook to the geospatial world. Importance of participation is stated in order to provide a collaborative leadership for the needed change in geospatial information world.

Governance and policies of production may change by nations, whereas world shall meet up at a manifest agreement of sharing and interoperability of geospatial data.This agreement would be a convention which should be set up on a comprehensive structure and established over an examination of INSPIRE, GSDI Cookbook and NSDI bodies.

Expected structure for future governance and geospatial policies is +Good Governance.Thus the expectation from such a convention shall be reaching a universal+Good Governance state for the next decades. The "+" addition is a symbol of more participation, comprehensiveness, agreed statue of ownership and pure

transparent democracy. Collaboration must be frictionless with no hard standardization, but compatibility.

The outer framework that is clinched by the convention should be based on a consensus of technical, legal and participatory statements which define how to share global information derived from both geospatial and statistical “huge data”. Legal frame should define organisation types, roof organisation consistence and charges. Technical frame should filter existing structures; SDI’s, NSDI’s, regional and national experiences. Participation frame should define the collaboration structure, relations, implementation, monitoring, adoption and extendibility.

Conclusions

Geospatial world is leaving the mediaeval ages, passing by a renaissance period by the convergence. History repeats itself; INSPIRE would be liken to Magna Carta, new technological utilities and planetary geospatial data would be liken to explorations of a new world. Geospatial information world’s vision should be expanded to a universal state with more coverage, which will make it more powerful.

Making investments on geospatial information is not less important than investing on a bridge, highway or dam construction project especially for developing countries. Business world investments and research objectives should be oriented to a universal state, indeed. Geospatial companies would get into higher interests in a mid-term period, by focusing on universal data including planetary data. It is an opportunity for geospatial world to recognize business models for processing planetary data and building related applications. Convergence on planetary issues is expanding vision rather than shifting in geospatial missions.

In today’s conjuncture private sector and governmental bodies initiate to establish geospatial clouds, swapping current governance and geospatial policies rising with many new questions in a revolutionary way. This may be seen as an instrument to implement Inspire or other legislations in various fostering techniques.

INSPIRE’s conceptual schema describes a universe of discourse from the real world. It would be same for “Marspire” with a customized “universe of discourse” description. Principle of harmonisation and achieving interoperability goal of INSPIRE express a universal statement, as it stands in the understanding of the soul of Directive. INSPIRE is universal with its practices, experiences and lessons learnt as well as the legal framework discipline.

Governance of INSPIRE and geospatial world lies on convergence, sharing and empathy for the next decades’ possible necessities. Necessity of a worldwide convention rises in order to provide the statements of all declarations made by previous UNGGIM Forums and it may be reached by 2020, at the half of next decade.

In the next decade; standards, transparency, confidentiality and harmonization should be the key targets of geospatial policies.

In the next second decade; sovereignty of states on data and systems would pass over to users by the statue of +good governance and real participation.

Besides, institutional bodies should be set up which undertake necessary actions to reach these targets in agility with innovated instruments. Commitment and dedication to this framework shall be provided in respect and cooperation.

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