



# Blue Planet data use

EO applications-c.doc

*"We image the Earth"*

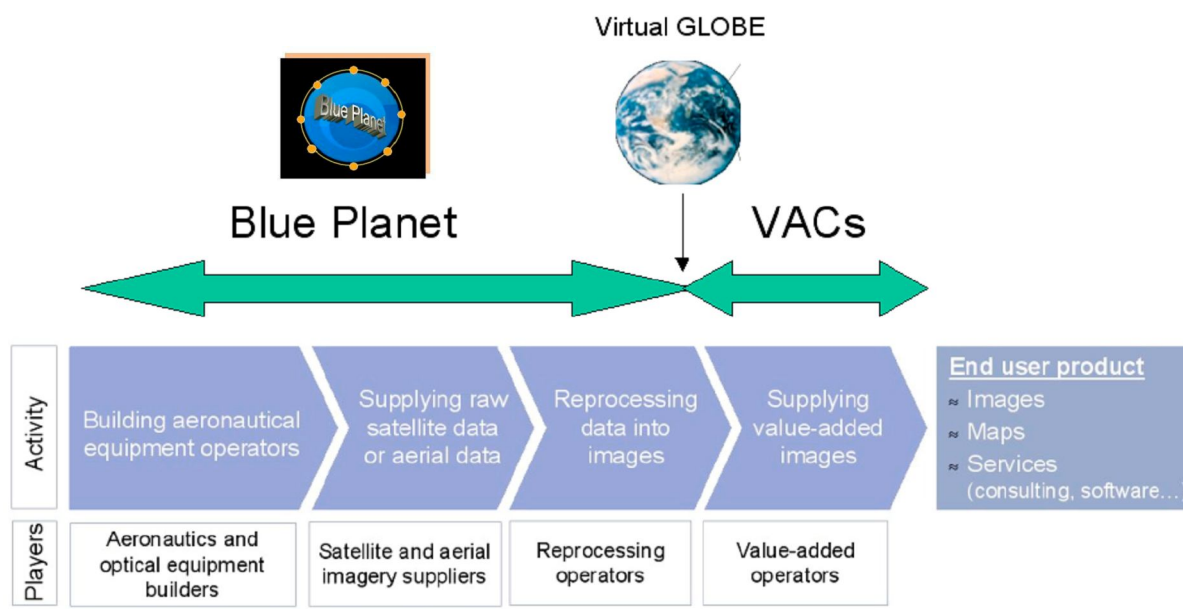
## 1) Forewords:

The potential for social and economic benefits offered by satellite EO arise from its unique capabilities. These include the ability to provide near real-time monitoring of extensive areas of the Earth's surface at relatively low cost, as well as the capability to focus on particular land and sea surface features of interest to provide detailed, localised information. In some applications, satellite EO can offer an alternative source for data which could be acquired by terrestrial or airborne surveying, but in a more timely and less expensive manner. In others, the availability of satellite EO data can provide a unique solution, for example where other techniques would be impractical. Following here-down depicted list of applications represent a fraction of useful cases. Up to now several hundred even thousand of applications of interest relying on fresh high resolution imagery have been described and demonstrated. Needless to say the present imagery business evaluated by several independent consultants is rapidly increasing and today total more than \$1.5B. Blue Planet is an "enabling" company that should become the reference supplier of cheap, quickly refreshed and high resolution imagery able to fuel the whole of the World geo-code industry. Thanks to this, it is expected the number of Value Added Companies able to create highly valuable user information will SkyRocket thanks to Blue Planet offer since :

- Cheap
- Reliable
- Fresh
- High resolution
- Overwhelmingly simple to order and access

## 2) General principles (Virtual Globe makes application easy and cheap)

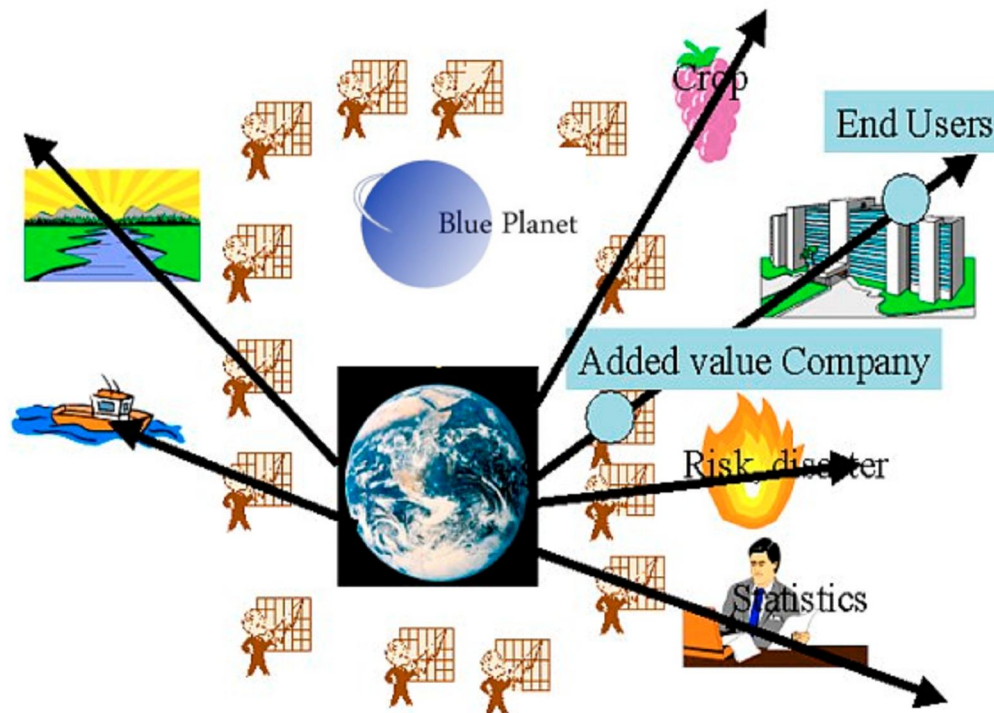
Pressing need for an anytime-anywhere information offer is one of the key drivers of today's economy and technology. Proofs of this trend are demonstrated by mobile telephony success or Personal Navigation Devices (PND) navigation kits, close to become standard equipment in car production. Space imagery is expected to soar in the years to come because of the opportunities it could offer to a demanding mass-market and the dependency of geo-coded portals on technical improvements.



Business consequences on space activity are very promising and v-GLOBE project has been designed to take advantage of new revenues (mass market) while capturing a substantial part of the existing ones (thematic market).

Therefore, the needed product has to combine:

- Metric or less resolution, because this corresponds to the peak demand;
- Full Earth coverage to address without tasking interference all potential usage's needs;
- At least a weekly refreshment cycle to keep track of urban activities, human related events or natural hazards.
- Much lower costs



Blue Planet strategy is to become the most efficient imagery data provider. Added value will be conducted by VACs (Value Added Companies) dealing on a most capable way case by case basis with specific end-user applications. These companies are most of the time more skilled and closer to the final user needs than any satellite operator willing to service by himself the end users.

This principle allows three advantages:

- Drastically lower Blue Planet running cost (since applications are generally inducing heavy and costly manual interaction)
- Avoid Blue planet becoming a competitor of its own clients (as happen for most of the competitors)
- Allows a rapid ramp up of imagery sells business thanks to the enormous capacity of Digital economy to create small scale profitable companies

### **3) Global overview of geo-based services market addressable by optical metric resolution product from v-GLOBE**

The geo-based services as today addressed by civil space programmes breaks down into two major categories:

- Thematic market, already existing but still proposing high unit cost preventing large use;
- Mass market, upcoming business opportunities corresponding to satellite images mass-utilisation.

Therefore New markets will develop in case massive and cheap data availability appears (as will be the case for v-GLOBE programme) with:

- “Long Tail” market based on the fact numerous new companies will emerge in case imagery costs drops down and become more affordable and easy to access. Thematic market, already existing but still proposing high unit cost preventing large use;
- Large size market covering imagery production sold without limitation to a given organisation (eg : coverage of a given country refreshed weekly under a flat rate agreement).
- Intelligence use of civilian data (eg: delivery of the full planet at meter resolution weekly to Defence users, not necessarily willing to target a given place,( as done by conventional defence sats) but willing to extract hidden information from all over the world.

Nota: These three last markets mostly accessible by “saturation-free” systems producing continuously the full planet cover as is pioneered v-GLOBE

### 3.1 Market characteristics ‘thematic’

Thematic applications of Earth images have been historically addressed by rather expensive solutions, either spatial or aerial, often developed through public funding by structures looking for high performance products. This led to a market gathering limited number of clients using costly products for their specific own applications. Players using Earth images can be classified according to three major utilisation categories: public, public & private and private utilization:

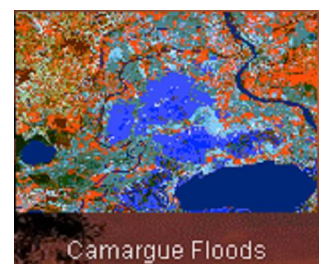
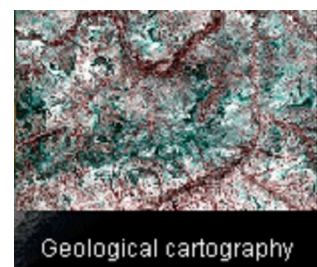
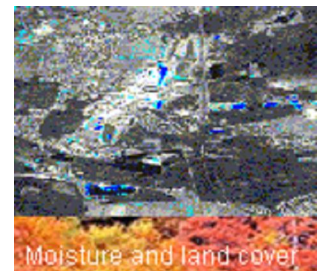
In public fields like defence, land cover, disaster, coastal sea, urbanism, authorities (states, supranational organisations, regional entities or cities) take charge of surveillance, statistic studies, topology studies, post-disaster impact-analysis... and use Earth imagery.

- For instance, Earth imagery is used for prioritisation of emergencies in case of environmental catastrophe.
- Public structures also use Earth images to evaluate implementation of agriculture policies through land cover studies.

In public & private fields like geology, oil, mineral research, forest, agriculture, cartography, water management, cartography... players like gas companies, cultivators, cities... need feasibility studies, surveillance, controls or analysis; tasks in which satellite imagery is needed. Players use it for pollution mitigation monitoring, oil prospecting, management water policy... leading actor in geo-science, are involved in all aspects of mineral-resource management: basic research, exploration, expert assessments, setting up geological and mining infrastructures, post-mining management and understanding major trends in macroeconomics.

In private fields like civil engineering, navigation and insurance, different players need feasibility studies, map illustrations, central basis refreshment or post-disaster impact analysis in which Earth imagery is used.

- As insurance companies lay on satellite imagery to nourish post-impact analysis, value-added operators specialised in damages, have developed a specific offer to post analyse damages.





### 3.2 Applications examples 'thematic'

#### Cartography, cadastre



The usage of satellite imagery to prepare maps is becoming common use. Clients will certainly shift to more and more image resolution while asking price cuts. V-Globe products will allow to :

- Create or update topographic maps, databases and cartographic representation at any scale 1:5000 and above
  - optimise campaigns of field surveys
  - create or update a Topographic background comprehensive and geographically continuous cadastral plans
  - use a map or cadastral information system as Map Update tool or land management service
  - orthoimagery for the production of topographic maps in raster or vector form
- Creation of Fragmented databases: visible parcel boundaries, limits cadastral parcel, and descriptive databases associated (Land, tax, land register ...)

#### Agriculture

statistics Agriculture is one of the first demonstration of successful applications of Earth observation by space. This still a highly demanding application in which data prices per square km is a determining factor. Mapping the changing distribution of croplands, advancing the accuracy of measurements of biomass and improving forecasts of shortfalls in crop production is becoming a must. Space imagery will help implementing sustainable agricultural management practices while assuring the preservation of soil, land and water resources. Value Added Companies (VACs) making use of v-GLOBE imagery are mostly :

- Producing vegetation and surface production estimators and inputs to production aid management
- monitoring the state of cultivated areas: Annual culture, vineyards, olive groves ...
- managing agricultural practices at the plot (precision farming)
- making inventories and crop forecasting (Annual crops, plantations, illegal crops)
- preparing the assessment of harvest needs
- monitoring water irrigation and assess the impact of bad weather
- control and monitor agri-environmental measures and public aids



## **Forest**

Forestry management is quite essential to the world climate evolution monitoring. This is also a strong indicator of the impact of human activities onto our natural environment. That require both massive and frequent cover of large surface while in the mean time a very high resolution to detect early enough the biotop first sign of aggressions. V-Globe is an ideal supplier for such a type of application requiring quick and massive cover. Major Forest application of space imagery data covers:

- awareness of the forest areas and settlements
- planning of cuts, delimitation and monitoring plots,
- biomass estimate,
- monitoring plant health,
- monitoring of plantations (illegal plants or cuts)
- estimate of weather damage: fires, storms, hurricanes ...
- protection of specific areas against wild human or disease aggressions (eg. natural parks protection or urban extensions control)
- creation and updating forest databases
- aid in the identification and monitoring of forest fires systems of deforestation / reforestation



## **Fishing resources**

Remote sensing of ocean properties provides us with a window into the ocean ecosystem on synoptic scales and has the potential to provide essential information for the governance of ocean ecosystems on global and regional scales. Various environmental properties influence fish distribution, abundance, and migration can be assessed thanks to remote sensing sensors.

Thanks to its full Earth cover (including Ocean surfaces) and its spectral observation capability, v-GLOBE is able to help fishery management by observing ocean colour (including Nir Infra Red). For example Chlorophyll concentrations provides an indication of phytoplankton concentrations in the surface layer of the ocean. Marine phytoplankton plays a key role in the marine food chain, and is also an indicator of changes in the ocean environment due to pollution or shifts in the global climate system. The high resolution performance of the v-GLOBE instruments allows ships detection and positions as well. Can be obtained:



- identification of fishing areas
- utilisation of pictures for detection of boats and characterisation of fishing practices
- fight against illegal fishing to ensure compliance with legislation
- estimates of the attendance of fisheries areas
- Coastal zone pollution detection helping a sustainable management of fisheries

## **Territory & Cities Development**

A global vision of a territory is an essential management tool. By being able to look to roads, building and even car parks situation, public organisation can better control and manage the cities development. This can allow to

- create and update occupancy databases
- Establish and monitor master plans
- In dense areas establish floor scales at urban, peri-urban, national and regional level
- carry out impact studies on the environment
- monitor the evolution of the urban spot and optimise workplace census campaigns and urban





### **Wild Life and natural landscape preservation:**

Wildlife habitats are under increasing pressure and monitoring and law enforcement methods must adapt to these changes even in the most isolated places. Satellites with rapid refresh cycle like v-GLOBE are ideally suited for repetitive imaging to help monitor natural changes. Information collected from space supports reliable and consistent monitoring when combined with other digital data can be used to create dynamic maps, images and charts, which can be used in research, or to guide wildlife management. Can be mentioned the possibility to :

- Track change detection to protecting and monitor natural landscapes aggressions
- Make survey of human habitat expansion in protected areas
- Analyse environmental features able to impact on some species development
- Monitor changes occurring in habitats zones and project the impact on wildlife species at risk.



### **Oil, gas, minerals, groundwater, hydraulic energy**

Worldwide offshore resource-based operations such as oil and gas exploration and production have intensified over the past few decades. In the offshore oil and gas sector, the cost of building production platforms capable of withstanding severe weather conditions is becoming a must.

- update the geological information of a prospecting area
- explore oil resources and gas onshore and offshore,
- Pipeline Corridor Monitoring
- conduct infrastructure development (plots, pipeline ...)
- ensure environmental impact monitoring and control of operating infrastructure
- maps g of mineralised zones, fractured zones with strong potential, access to production sites
- monitor of environmental impacts of onshore or offshore operations
- Evaluate dam water level and associated energy potential
- Evaluate snow cover and derive melted water potential



### **Risk management , insurance and prevention**

The monitoring from space of natural hazards such as cyclones, floods, drought and volcanoes provides us with reliable and actionable information that is end-user friendly for planners, technical experts, business, countries, farmers, air traffic, and others; in other words for all of society.

The capability of satellite to quickly observe pollution, floods, forest fires, landslides and earthquakes is of paramount help during the crisis. I should allows to:

- quickly locate affected areas and map damage
- collect and synthesise information to optimise crisis management
- update the risk prevention plans: identifying risk areas and develop emergency response plans
- improve forecasting by the post-processing information acquired before and after the times of crisis
- urgent detection of disaster areas
- organise humanitarian interventions, deploy forces according to refugees sites or access to water



Nota: v-GLOBE because of its continuous capture of the full Earth is a unique system able “in any circumstances” to provide the “before crisis” picture

### **Civil engineering and urban construction management**

Construction of any kind can be easily planned and monitored with the help satellite information.

Over the years, satellite-based remote sensing data have been successfully utilised for mapping, monitoring, planning and development of urban sprawl, urban land use and urban environment. Thank to v-Globe continuously refreshed imagery it is now be possible to monitor and manage the development of urban housing, infrastructure, transportation means. Can also be performed the evaluation of traffic profiles, real estates and tourism offers as well as in many developing countries the encroachment of slums onto vacant lands and urban land use zoning.

Can be easily addressed with the v-GLOBE imagery information:

- The planning of new roads
- The verification of buildings creation or extensions
- The evaluation of building damages
- The tracking of urban population development
- The verification conformity for constructions appearing in a remote situation without prior warning



### **Water management and flood monitoring**

Lack of clean water for drinking, sanitation, agriculture and industry puts a brake on economic and social development. The United Nations considers the average person needs 50 litres of water a day to meet their water and sanitation needs, but people living in 13 countries – nine of them in Africa – have to get by on less than 10 litres a day. The use of Earth observation can improve current water management practices, enabling the identification and sustainable exploitation of underground aquifers, better management of wetlands, and enhancing food security as well as epidemiology research into how disease outbreaks are linked to environmental factors. Images produced by the satellite are used to characterise and monitor land use and water quality near shorelines and public beaches



Floods are one of the most costly natural disasters in terms of property damage. Excessive precipitation, ice jams, coastal storms, soil moisture conditions and snowmelt are the main factors of flooding. Floods also occur along the shoreline of lakes and oceans when water rises after high runoff, during storm surges or the hammering of waves. Fluctuations in water levels are natural occurrences. People generally relate high-water levels to flood conditions if the water threatens homes and lives, industry and our critical infrastructure (such as bridges, roads, pipelines and power sources). Earth observation data is used to help assess the impact of floods, predict the extent and duration of flood waters, analyse the environmental impacts and support the development and implementation of flood mitigation measures.

### **3.3 Market characteristics “mass market ”**

Up to now satellites are capturing images of the Earth upon request of individual users needing careful tasking of the space system according to sometime conflicting requirements. The creation of large surfaces (full country or even continent) is a complicated and lengthy aggregation process. Getting together quick refreshment, high resolution and large cover is out of reach of present systems. New markets asking for massive data delivery is now easy to handle with virtual globes and open up to now little touched new markets.

Some preliminary mass market applications can be identified today:



- **Internet portals proposing free and easy access to a large coverage of mix-resolution satellite imagery, monetizing this offer through online advertisement.**

All these players have identified geographic information (either images or maps) as a key development driver of Internet services.

For instance local search is expected to represent 30% of entry in the Internet portals or search engines.



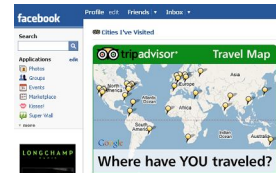
Source: [www.maps.google.com](http://www.maps.google.com)

- **Aggregation of satellite imagery techniques to other tools increases the value of web existing services.**

These hybrid web applications, called “mashup”, combine multi-source data into a single integrated tool. For instance, a current best practice of mashup is the use of cartographic data from Google Maps to add location information to real-estate data, thereby creating a new and distinct web service that was not originally provided by either source.

The development of these services is currently propagating to other services like social networks:

- A mashup between Google Lively and Google Maps has been already released: thanks to Google Maps, users can position themselves at any point of Earth, which results on Google Lively in a geolocalization of users
- Facebook proposes yet geolocalization applications co-provided with Google to advise trip places, restaurant places... For instance, Trip Advisor proposes to create an interactive travel map to pin all the cities, towns, and even suburbs users have visited.
- Apples, Amazon and even Twitter are looking to new users experiences that will aggregate user's individual life with its environment



Source: [www.seloger.com](http://www.seloger.com)



Source: [lively.com](http://lively.com)



Source: [www.facebook.com](http://www.facebook.com)

- **Mobile utilization of Earth images opens new businesses**

#### Personal Navigation Devices (PND)

PND demand has recently soared. Although the main usage for navigation devices is vehicle navigation, the share of personal leisure navigation devices is boosting up as well.

Under the drive of strong market demand, operating performance of the three PND market leaders, Tom-Tom, Garmin and Mitac, increased rapidly in 2006 but have declined since 2010 because of the competition with free navigation offer on mobiles.

Therefore the need for accurate and continuously refreshed navigation maps is still highly required at a pace that ought to be compatible with road network evolutions (close to a fortnight)

#### Handsets manufacturers

W Apple, Samsung ,Nokia just to name a few are willing to provide a fully complete service to their billions of internautes. With Maps, user can plan his trip, find an optimal route to his destination, discover places, addresses or points of interest along the way, and share them with friends.

Most of these are now relying on third party application (mostly Google Maps) but the unsuccessful Apple attempt to get freed from Google offer demonstrate the interest theses company may have on a weekly



Source: [SFR Navigation by Mappy](http://SFR Navigation by Mappy)



refreshed Earth Surface at very high resolution that may simplify maps updates.

#### Telecom & data services operators

Most of the Telecom operators are providing navigation services able to locate more than million of professionals: shops, restaurants, companies, services...) and the Individuals search service. While Google is dominating this market, specific needs are emerging connected to particular applications. Eg travel agents will to show the latest acces situation for a given hotel or leisure centers. People will soon discover how useful a fresh picture information of his own site of interest is useful.

As soon a tornado occurs , millions of access could be recorded from people willing to see their remote house roof situation.

NanoSats because of their limited resolution cannot provide much help, while v-GLOBE can do.

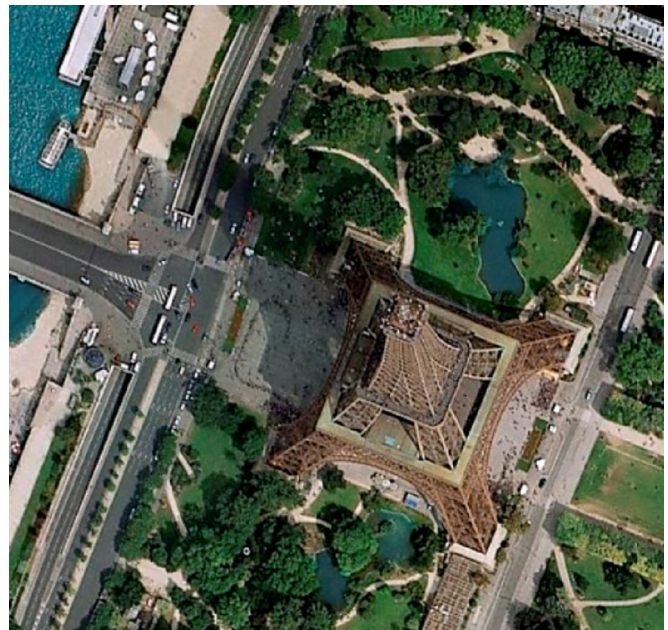


### 3.4 Applications examples “mass market ”

#### Internet users information

Today's market data (images, maps...) available on geo-portals websites are rarely updated (once in one or two years) and offer very irregular resolutions, which limits mass applications development. No doubts geo-portals operators will improve this situation by relying on more refreshed information by adding more satellites in their access strategy. V-GLOBE massive high quality imagery supply is for sure a serious offer that may help making digital economy leader to reinforce their present position. v-GLOBE has been designed according to these requirements in view of capturing those emerging markets.

By tomorrow the whole of internet community will rely on fresh imagery to look to any personal place of interest . Their secondary house, their swimming pool situation when they are away, the tent of their children installed in a wild environment or the visual status of the road they will take soon.



Internet community will shift within a few years from bi-yearly update to weekly update of the Globe Observation at meter resolution or better. Billions of new requests will emerge handled by Google-Earth or equivalent offers. Societal and economical value of such offer will become enormous.

#### Defence, Intelligence

The use of the full planet at metric resolution weekly refreshed is a terrific BIG DATA set that contains invisible but high value Intelligence potential. The information of interest is often at place where no-one looks (means command a defence satellite to bring back a picture) and the value a full Planet set as produced systematically by v-GLOBE could generate a large interest (Should one country Defence get hold of it, can we imagine, others not willing to do so ?). Impact of v-GLOBE thank to its



FULL cover in any circumstance may become quite strong (and profitable)

Ensure the sovereignty and independence of a country in terms of information territorial in times of crisis and in times of peace, in particular:

- produce and quickly distribute geographic information (Maps, databases ...) and Intelligence, an area national or international interest
- prepare, simulate and evaluate projects in conditions of reality
- guiding aircraft, missiles and drones according to space-born information
- ensure consistent geographic data from different sources: information, topographic mapping, ...
- Repeated monitoring of places of interest
- Analyse terrorist threat by systematic search of pre-identified pattern of interest
- Intelligence search covering continents

#### **4) Conclusion;**

In combination with other resources (such as in-situ observations, model outputs, and socio-economic data), satellite EO illustrated by the v-GLOBE Big Data project is an absolutely essential tool in the development of information, providing evidence and supporting the science which underpins strategies for decision-making, and for monitoring our progress on all geographical scales as we explore new development paths aimed at sustainable management of the planet, confronting disaster risk reduction, climate change, and sustainable development in a unified manner.