COMPARATIVE ANALYSIS OF MAIN PARAMETERS OF THE INTERNATIONAL SPACE SYSTEMS FOR DISASTER MONITORING

GEOSS	GMES (Kopernikus)	Sentinel Asia	Charte Disaster	DMS	**IGMAS (proposed)**
AIM OF PROJECT					
Obtaining of compand operations ecological data to monitor and forecast changes in global environment with use of ground, sea, air and space observation systems in the interesting of wide circle of customers	Rendering of geophysical services in the field of environmental protection and safety (security) support (mapping, management support during emergency, long-term forecast) in the interesting of EU and ESA	Operations data delivery for early warning of disasters, minimization of victim and social-economical losses in Asia-Pacific Region with use of informational and space technologies	Reducing of consequences of natural and man-caused disasters by force of rendering of free of charge satellite EOS data	Rendering of operations data to agencies and organizations main task of which is countermeasure to disasters and liquidation of their consequences	**1. Global operations monitoring of Earth surface, atmosphere and near-Earth space in the interesting of forecast and warning of natural and man-caused disasters.** **2. Navigational-informational support of customers.** **3. Distance (remote) learning.**
PROJECT PARTICIPANTS					
GEO Group: 75 countries, 51 organizations. China, France, Germany, Italy, UK, USA, etc.	Canada, France, Germany, Israel, Italy, some non-Europe companies, etc.	51 organization-participants from 19 countries, 7 international organizations. Australia, Bangladesh, India, Indonesia, Japan, Malaysia, Nepal, Philippines, Thailand, etc.	ESA, CNES, CSA, ISRO, NOAA, CONAE, JAXA.	Algeria, China, Nigeria, Thailand, Turkey, UK	**Russia, EU, USA, Canada, countries of Asia-Pacific Region, Africa, South and Central America**
ORBITAL CANSTELLATION					
Existent and advanced EOS	Earth observation satellites with different end-use, particularly: Sentinels, Spot, Pléiades, Jason, SMOS, Calipso, Parasol, Mega Tropiques, IASI, Vegetation, Venμs, etc.	Earth observation satellites, particularly: ALOS (Japan), Terra+Aqua, TRMM, GPM (USA), etc. In future it's possible to use GEO satellites	Earth observation satellites of countries-Charter participants: ERS, ENVISAT (ESA), SPOT (France), RADARSAT (Canada), IRS (India), GOES (USA), SAC-C (Argentina), ALOS (Japan)	7 satellites on SSO orbit (h = 600 – 750 km)	**6 satellites on GEO** **6 КА на ГСО,** **7 satellites on SSO orbit (h = 600 – 700 km),** **Aviation facilities for monitoring,** **Use of data obtained from other systems**

ON_BOARD SYSTEMS					
Optoelectronic systems, multi-channel radiometers, radars, altimeters	Optoelectronic systems, multi-channel radiometers, radars, altimeters	Optoelectronic systems, multi-channel radiometers, radars.	Optoelectronic systems	Optoelectronic systems	**Highly sensitive radiometric visible and heat range equipment, on-board systems on the base of low- and high frequency wave complex, plasma complex, complex to monitor charged particles, magnetometer, Fourier spectrometer**
INFORMATIONAL SERVICES					
- Space images of the Earth Surface (panchromatic and color), - Interpreted remote sensing data, - Meteorological data. Frequency – 1 – 2 hour	- Space photos of the Earth Surface (panchromatic and color), - Radar images, - Data about gravitational and electromagnetic fields, - Data about characteristics of Earth surface movement	- Combined digital images with superimposing of visible data on chart basis obtained with use of Web-GIS technologies in the bounds of "Digital Asia" project, - Input space images of the Earth Surface for transferring with use of Internet protocol FTR, - Images obtained with use of ground digital camcorders	- Space images of the Earth Surface (panchromatic and color, resolution 2.5 m), - Images obtained with use of ground digital camcorders Demand response – 24 – 36 hours	- Space images of the Earth Surface (panchromatic with resolution 4 m and color with resolution 32 m) Frequency – 1 day	**Special operations global data concerning dynamic of changes in the Earth lithosphere, atmosphere and ionosphere, its special-purpose processing and transferring to corresponding control and management institutions which take decisions.** **Frequency – quasi-real scale of time**
GROUND INFRASTRUCTURE					
- GEO-portal, - Ground receiving stations for GEONETCast (comprises 4 satellites). In future – creation of global infrastructure with engaging of see and air observation facilities	Receiving stations and centers for processing of space data obtained from satellites "Sentinel" in Europe. In future – European segment of global ground infrastructure (in the bounds of GEOSS	Partly is created in the countries of region: - Satellite receiving stations with antennas of X- and L-band, - Computing centers data reduction, - Internet	Voluntary granted parts of ground structure of countries- Charter participants (receiving stations, centers for processing of space data) информации).	Voluntary granted parts of ground structure of countries- project participants. Transferring data to pocket terminals	**Aggregate of interconnected topologically distributed ground complexes for obtaining, multi-level processing storage and distribution of geospatial data from aerospace and ground facilities**

PROJECT SPECIFICITY					
- Wide international cooperation, - Preparation of generalized data for statesmen, - Transferring data (Internet) with use of space communication, -Orbital facilities will not be created in the bounds of project. Created in the bounds of IGMAS satellites for short-term forecast of natural and man-caused disasters will be contribution to GEOSS	- Wide international cooperation, - Large multi-purpose constellation of Earth observation satellites that allows to research different natural phenomena	- Wide international cooperation, - High efficiency of obtaining data and transferring them to customers, - Orbital facilities will not be created in the bounds of project	- Wide international cooperation, - Free of charge Earth remote sensing data, - Orbital facilities and ground infrastructure will not be created in the bounds of project	- International cooperation, - Use of microsatellites, - Transferring data to pocket terminals	**- Wide international cooperation, - Use of microsatellites, Orbital facilities and large-scale ground infrastructure will be created in the bounds of project, - Very high efficiency, - Complex use of date from own satellites and satellites of other systems, - Wide circle of solvable tasks**
RESULTS OF COMPARATIVE ANALYSIS					
- Without IGMAS doesn't provide complex decision of main task – forecast of natural and man-caused disasters, - Dependence from many dissimilar Earth observation systems, - Difficulties of coordination of dissimilar data processing	Used existent structure of on-board systems doesn't allow to complex analysis and operations forecast of some natural phenomena (for example, earthquakes)	Limited possibilities of on-board system don't provide the decision of task concerning forecast of natural and man-caused disasters	Limited possibilities of on-board system don't provide the decision of task concerning forecast of natural and man-caused disasters	- Limited possibilities of on-board system don't provide the decision of task concerning forecast of natural and man-caused disasters, - Low efficiency, - Absence of deployed ground infrastructure	**- Providing of main task – short-term forecast of natural and man-caused disasters, - Optimal orbital constellation of space system with corresponding structure of on-board systems in combination with aviation facilities and facilities for sensor monitoring and effective organization of ground infrastructure, - Presence in the bounds of system facilities for navigational-informational support of customers and distance (remote) learning**
STAGE OF PROJECT REALIZATION					
Stage of creation	Stage of deployment	Stage of deployment	Functioning	Stage of deployment	**Initiation of project**